Latino Father-Focused, Healthy Lifestyle Intervention to Improve Adolescent Energy Balance-Related Behaviors

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE
UNIVERSITY OF MINNESOTA
BY

Aysegul Baltaci

IN PARTIAL FULFILLMENT OF THE REQUERMENTS
FOR THE DEGREE OF
DOCTOR OF NUTRITION

Marla M. Reicks

January 2022

Acknowledgment

I would love to give the most thanks to my advisor, Dr. Marla Reicks. This dissertation may never have been started or completed without her knowledge, guidance, advice, time, and patience. I would like to express my deepest appreciation to my amazing committee members, Drs. Ghaffar Ali Hurtado, Abby Gold, Nicole Larson, and Melissa N. Laska for their invaluable contributions to my dissertation. In addition, I would like to thank Cynthia Davey for her guidance and contributions to conducting the data analysis of my dissertation.

I am also grateful to be part of a great research team including the program coordinator, educators, research assistants, and other supporting staff. Special thanks to program participants and community partners. Your participation and support were essential and makes all time and effort meaningful. Also, I would like to thank the University of Minnesota Center for Family Development Applied Research and Evaluation team for their unwavering support, encouragement, and their positive energy. In addition, I would like to acknowledge the Agriculture and Food Research Initiative research funding (Grant no. 2016-68001-24921) by the USDA National Institute of Food and Agriculture.

Last, but certainly not least, I would like to thank my husband, my children, and my parents, my brother, and my friends for their infinite love, prayers, support, and encouragement during my education at the University of Minnesota. Especially, to my wonderful husband who did an amazing job helping me with our children and being my mentor for my academic career.

This dissertation is dedicated to my beloved husband “Kenan Baltaci” for his unconditional love and support.

Abstract

Background: Poor dietary habits, lack of physical activity, and sedentary behaviors including frequent screen time have been identified as critical behavioral determinants of childhood obesity. Hispanic youth have disproportionately high rates of overweight and obesity in the U.S. The majority of Latino/Hispanic adolescents have lower healthy food and higher unhealthy food intakes and lower physical activity and higher screen time behaviors than recommended. Parenting practices were associated with child and adolescent food- and activity-related behaviors. Intervention studies focusing on positive parenting practices (setting expectations/limits, role modeling, home availability) to prevent overweight/obesity among Latino children and adolescents are limited with an underrepresentation by Latino fathers. Thus, the Padres Preparados, Jóvenes Saludables (Padres) program was developed based on principles of community-based participatory research and social cognitive theory to prevent overweight and obesity among Latino adolescents (10–14 years) by improving adolescents' energy balance-related behaviors (EBRBs) and the frequency of positive paternal parenting practices. A two-arm (intervention versus delayed-treatment control group) randomized controlled trial was conducted to assess the effectiveness of 8 weekly 2.5-hour experiential learning sessions delivered to 103 fathers and 110 adolescents (mothers were encouraged to attend) in four trusted community locations in the Minneapolis/St. Paul urban area. Families completed surveys and anthropometric measurements for the assessment of changes in paternal parenting practices, and father and adolescent EBRBs and weight status at baseline and post-intervention. Adolescents also completed 24-hour dietary recall interviews at baseline and post-intervention. The intervention group participated in the learning sessions immediately after baseline data collection while the delayed-treatment control group participated in the learning sessions three months after the post data collection.

Overall objective: The first objective was to assess associations between paternal food parenting practices and family meals and paternal food/meal involvement and adolescent dietary intake separately and in combination in a cross-sectional study design using Padres baseline data. The second objective was to evaluate the impact of the Padres program and intervention dose on father and adolescent EBRBs based on a randomized controlled trial. The third objective was to determine the Padres program impact and

modifier effect on father- and adolescent-reported paternal food and activity parenting practices based on a randomized controlled trial.

Methodology: The data analysis methods of the first study included multiple linear regression models to assess associations of paternal food parenting practices, family meals and paternal food/meal involvement with adolescent intake separately. In addition, adjusted GLM (generalized linear mixed model) procedures and slice statements and PLM (post GLM processing) procedures with Bonferroni corrections were used to evaluate the combination of paternal food parenting practices and family meals and paternal food/meal involvement on adolescent intake. The second study used baseline and post data to assess intervention impact (intervention vs. delayed-treatment control group) and dose effects on father and adolescent EBRBs. Analyses included paired and two sample t-tests and adjusted linear regression models (within groups), and mixed models (between groups) for continuous outcomes and McNemar's tests (within groups) and Generalized Linear Mixed Models (GLMM) (between groups) for binary outcomes. The methods of the third study using baseline and post Padres data consisted of McNemar's tests (within groups) and GLMM models (between groups) to assess intervention impact (intervention vs. delayed-treatment control group) and modifier effects on father- and adolescent-reported paternal food- and activity-related parenting practices.

Results: The first study demonstrated that Latino adolescents consumed more healthy foods and less unhealthy foods when their fathers had more frequent positive food parenting practices. The first study also indicated significant combined associations of paternal food parenting practices and family meals on adolescent intakes of fruit, sweets/salty snacks, and sugar-sweetened beverages (SSBs). The second study showed lower intakes of SSBs, sweet/salty snacks, and fast food by intervention group fathers after attending the Padres program but did not show any intervention effect on adolescent EBRBs and father and adolescent weight status. In further analysis, the second study demonstrated that father SSB, sweet/salty snack, and fast food intakes and adolescent sweets/salty snack intake were lower after the Padres program for those who had a high intervention dose compared to low intervention dose. Also, a low adolescent BMI percentile was related to high intervention dose and mother attendance.

In the third study, father-reported frequency of paternal fruit role modeling and fast food availability and adolescent-reported paternal allowance of adolescent screen time and frequency of fruit role modeling were improved after the intervention in the intervention compared to the delayed-treatment control group. Discrepancies in the frequencies of improved paternal parenting practices were shown except for the frequency of fruit role modeling. Paternal food responsibilities (father-reported) and family meals (adolescent-reported) were identified as modifiers of paternal food parenting practices.

Conclusion: This dissertation research demonstrated improvements in only a small number of paternal parenting practices and father and adolescent EBRBs and weight status after the intervention. Possible explanations for the lack of significant findings include the small sample size, low family socioeconomic status and time constraints due to busy work schedules based on social determinants of health, and inadequate time for behavioral change to occur by measuring change immediately after the last learning session. Further family-focused intervention studies with a larger sample size are needed to further examine associations between parenting practices and Latino adolescent food and activity related behaviors to prevent childhood obesity. In family-focused interventions, increasing Latino fathers' representation and recognizing the roles of social determinants of health and Latino family strengths are essential.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ATUS: American Time Use Survey

BMI: Body Mass Index

CDC: Centers for Disease Control and Prevention

CI: Confidence Interval

DGA: Dietary Guidelines for Americans

EBRB: Energy Balance Related Behavior

FLASHE: Family Life, Activity, Sun, Health, and Eating study

HCHS/SOL: Hispanic Community Health Study/Study of Latinos

HEI-2015: Healthy Eating Index 2015

kcal: kilocalorie(s)

MVPA: Moderate to Vigorous Physical Activity

NHANES: National Health And Nutrition Examination Survey

Padres program: Padres Preparados, Jóvenes Saludables

RCT: Randomized Controlled Trial

SSBs: Sugar Sweetened Beverages

SOL: The Study of Latinos

U.S.: United States

USDA: United States Department of Agriculture

Introduction

In 2014, Hispanic youth who were under 18 years of age made up one-quarter of the total United States (U.S.) child and adolescent population (Colby & Ortma, 2015). Estimates showed that Hispanic children and adolescents will represent 33.5% of the total U.S. youth population by 2060 (Colby & Ortma, 2015). The prevalence of overweight and obesity was disproportionately higher among Hispanic youth compared to youth of other races/ethnicities (Hales et al., 2017; Skinner et al., 2018). Thus, health disparities impacting Hispanic/Latino youth need to be addressed to support healthier families and communities.

Both mothers and fathers play an important role in preventing childhood obesity through supporting the formation of healthy food- and activity-related behaviors among youth (Lindsay et al., 2006). Yet, studies have primarily focused on mothers when examining parenting practices regarding adolescents' diet and physical activity with little attention on the role of the father (Davison et al., 2016). The impact of paternal food- and activity-related parenting practices on children and adolescents' behaviors have been examined to a limited extent (Davison et al., 2003; Lloyd et al., 2014). Positive associations were observed between fathers' and children's body weight, food intake, physical activity, and screen time (Freeman et al., 2012; Hall et al., 2011; Neshteruk et al., 2017). However, limited studies have examined Hispanic/Latino fathers' perspectives and roles in managing healthy behaviors of children and adolescents at home (Ferrer et al., 2014; Fielding-Singh, 2017; Turner et al., 2014). Therefore, public health interventions involving fathers to promote healthy lifestyles among Latino youth need to be implemented and evaluated to determine effectiveness.

This dissertation consists of a literature review (Chapter 1), three manuscripts which present findings from research studies (Chapter 2, 3, 4), overall discussion and research directions (Chapter 5) and a comprehensive bibliography and appendices that include supportive documents.

Chapter 1 consists of a comprehensive literature review focused on Latino fathers and adolescents. The review topics include prevalence and disparities regarding childhood obesity, and associations among energy balance related behaviors (intakes of fruit, vegetable, SSBs, sweets/salty snacks, fast food, physical activity, and screen time) and food- and activity-related parenting practices (setting expectations, role modeling, and availability at home), father's role in childhood obesity prevention, childhood obesity prevention interventions among Latino families, and a summary. This chapter ends with the research objectives and hypotheses of the studies that will be presented in this dissertation.

Chapters 2, 3, and 4 provide findings from three studies using data from Padres Preparados, Jóvenes Saludables (Padres program), a father-focused, community-based program for Latino fathers and adolescents (10-14 years) to promote healthy energy balance-related behaviors (EBRBs) among adolescents to prevent overweight and obesity in the Minneapolis/St. Paul metropolitan area. Chapter 2 presents findings from a cross-sectional study using baseline survey data from the Padres program to assess associations among paternal food parenting practices, family meals, and paternal food/meal involvement separately and in combination on adolescent dietary intake. This study was published in the International Journal of Environmental Research and Public Health. Chapter 3 presents the results of a randomized controlled trial, which involves an evaluation of the baseline vs. post effectiveness of the Padres program on father and adolescent EBRBs among intervention vs. delayed-treatment control groups. A manuscript reporting these findings is under review by BMC Public Health. Chapter 4 presents the findings of the randomized controlled trial for the evaluation of the baseline vs. post effectiveness of the Padres program on father- and adolescent-reported paternal food and activity parenting practices among intervention vs. delayed-treatment control groups.

Finally, Chapter 5 presents an overall discussion regarding the major findings of the three studies presented in Chapters 2, 3 and 4 and implications for research and practice that focus on the health and wellbeing of Latino families.

Chapter 1: Review of Literature

1. Prevalence, Disparities, and Trends in Childhood Obesity

Childhood obesity is a crucial public health concern in the 21st century, affecting nearly one in five children in the U.S. (Hales et al., 2017; World Health Organization and World Obesity, 2018). National Health and Nutrition Examination Survey (NHANES) (2017-2018) data indicated that the prevalence of obesity was 19.3% among 2- to 19-year-old children and adolescents in the U.S. (Fryar et al., 2020), while the obesity prevalence goal of Healthy People 2020 was 14.5% for youth.

The prevalence of overweight and obesity among U.S. youth was disproportionately higher among Hispanic, Mexican American, and non-Hispanic Black youth compared to non-Hispanic White and non-Hispanic Asian youth (Fryar et al., 2020). According to the most recent NHANES 2017-2018 cycle, Mexican American and Hispanic children and adolescents had the highest obesity rates compared to other groups with over one fourth of all Mexican American and Hispanic children and adolescents categorized as obese (Fryar et al., 2020). Based on data from 2017-2018, 29.2% of Mexican American boys and 28.1% of Hispanic boys 2-19 years were categorized as obese while 24.9% of Mexican American girls and 23% of Hispanic girls 2-19 years were categorized as obese (Fryar et al., 2020).

Obesity rates among Mexican American children and adolescents increased between 1999-2018 based on NHANES data (Ogden et al., 2020). Among Mexican American children ages 6-11 years, the prevalence of obesity marginally increased from 21.8% to 28.2% ($p = 0.05$) while the prevalence of severe obesity showed a nonsignificant increase from 6.2% to 8.9% ($p = 0.33$) (Ogden et al., 2020). The prevalence of obesity among Mexican American adolescents ages 12-19 years increased from 22.3% to 30.6% ($p = 0.005$) and the prevalence of severe obesity increased from 7.6% to 12.9% ($p = 0.003$) (Ogden et al., 2020).

Childhood obesity can contribute to a variety of health complications and chronic diseases, such as increased risk of becoming overweight or obese as an adult, and developing diabetes, metabolic disorders, and heart disease (Gordon-Larsen et al., 2010; World Health Organization and World Obesity, 2018). Other negative effects of overweight or obesity in childhood include lower self-esteem, a higher possibility of being bullied, lower school attendance levels and performance, and fewer job prospects and lower-paid employment as an adult compared to children with a healthy weight (World Health Organization and World Obesity, 2018).

2. Energy Balance-Related Behaviors

Weight gain has been associated with energy balance-related behaviors (Kremers et al., 2005). Energy balance-related behaviors refer to lifestyle behaviors that are related to diet, physical activity, and sedentary behaviors (Kremers et al., 2005). Critical behavioral determinants of obesity for children and adolescents have been identified as energy dense-foods, low levels of physical activity, and frequent television viewing and computer use (Rennie et al., 2005).

2.1. Dietary Behaviors

Nutrients and energy obtained from foods play an essential role in human health (Scaglioni et al., 2018). Associations have been observed between nutrients, food, and dietary patterns and reduction in the risk of chronic diseases, including cardiovascular diseases, cancers, and diabetes (Bowen et al., 2018). The current Dietary Guidelines for Americans (DGAs) (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020) recommends that U.S adults and children increase intakes of nutrient-dense foods and a variety of fruits and vegetables while limiting energy-dense foods and beverages to meet the recommended food group and nutrient needs to achieve healthy dietary patterns.

U.S. children and adolescents, across all age and ethnicity groups, had poor dietary behaviors that failed to meet the DGAs (Banfield et al., 2016; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). Based on NHANES 2009-2010, 2011-2012 and 2013-2014 cycles, the average HEI-2015 score for US children and adolescents aged 2-17 years was 54.9 of 100 (Thomson et al., 2019). In addition, HEI-2015 scores for Mexican American children and other Hispanic children were 57.0 and 56.8, respectively (Thomson et al., 2019).

Hispanic men had inadequate dietary behaviors based on the Dietary Guidelines for Americans (DGAs) (Overcash & Reicks, 2021). A cross-sectional study using three two years cycles of NHANES data (2011-2016) showed that the average HEI-2015 score for Hispanic men (25-50 years) who lived with a child (ages 6-17) was 48 of 100 (Overcash & Reicks, 2021), indicating a poor diet compared to a score of 80, which represents a good diet (Basiotis et al., 2002).

Therefore, the following sections address intakes of fruits and vegetables, SSBs, sweets/salty snacks and fast food and associations with obesity and obesity-related health problems among Latino children and adults in the U.S.

2.1.1. Consumption of Fruits and Vegetables

Fruit and vegetables contain many essential nutrients that are under-consumed in the diet of Americans, including dietary fiber, potassium, magnesium, choline, and vitamins A, C, and E (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Fruit and vegetable intakes are an essential part of overall healthy eating patterns (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Associations have consistently been observed between fruit and vegetable intakes and reduction in the risk of developing type 2 diabetes (Li et al., 2014), cardiovascular diseases, cancer, and all-cause mortality (Aune et al., 2017). In addition, increased fruit and vegetable consumption was related to a lower risk of adiposity, weight gain, overweight, and obesity in adults (Hebden et al., 2017; Ledoux et al., 2011; Nour et al., 2018; Schwingshackl et al., 2015).

Hispanic/Latino men and children had low fruit and vegetable intakes (Kim et al., 2014; Overcash & Reicks, 2021) compared to DGAs' recommendations (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). For example, 60% and 93% of American children aged 2-18 years did not meet the recommended daily fruit and vegetable servings, respectively, based on NHANES (2003-2010) data (Kim et al., 2014; National Cancer Institute, 2019). Based on NHANES 2003-2010, U.S. children had 0.62 cups per 1,000 calories of fruit intake and 0.53 cups per 1,000 calories of vegetable intake. Mexican American children had 0.72 cups per

1,000 calories of fruit intake and 0.56 cups per 1,000 calories of vegetable intake, which were all below recommended levels (Kim et al., 2014). Based on NHANES data between 2011-2016, Hispanic men who resided with a child (ages 6-17) reported consuming 0.92 cups of total fruits (including fruit juice) and 1.31 cups of total vegetables (Overcash & Reicks, 2021) which was lower than the recommended daily intake for adults (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020).

2.1.2. Consumption of Sugar-Sweetened Beverages (SSBs)

Sugar-sweetened beverages (SSBs) have little nutritional value and have been associated with numerous health problems (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). SSBs consist of non-diet sodas, fruit-flavored drinks, sport and energy drinks, sweetened tea and coffee drinks, and powdered or reconstituted drinks. SSBs as a form of liquid carbohydrate were shown to provide less satiety and higher overall energy intake due to incomplete dietary compensation compared to isoenergetic solid carbohydrates (Cassady et al., 2012; Pan & Hu, 2011). Intake of SSBs has been linked to weight gain and dental caries as well as obesity and obesity-related health problems including metabolic syndrome, type 2 diabetes, coronary health disease, and stroke in the U.S. and worldwide (Bernabé et al., 2014; Malik et al., 2010, 2013; Marriott et al., 2019; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015).

The amount and percentage of calories consumed from SSBs were high among Latino children and adolescents in the U.S. with gender differences observed (Rosinger et al., 2017). Based on NHANES 2011-2014 data, the average calorie intakes from SSBs were 156 kcal for Hispanic boys and 115 kcal for Hispanic girls. Also, the percentage of total daily calories consumed from SSBs was 7.3% for Hispanic boys and 6.8% for Hispanic girls (Rosinger et al., 2017).

Prevalence of SSB intake across race/ethnic minorities and low-income adults and children declined between 2003-2014, and yet the amount of calories consumed from SSBs is still high (Bleich et al., 2018; Marriott et al., 2019). NHANES 2003-2014 data showed that prevalence of SSB intake significantly decreased from 87% to 70% ($p = 0.01$) for Mexican American children ages 6-11 and from 86% to 72% ($p<0.001$) for

Mexican American adolescents ages 12-19. The prevalence of SSB intake decreased from 97% to 77% (p = 0.17) for non-Mexican Hispanic children ages 6-11 and from 89 to 74% (p = 0.08) for non-Mexican Hispanic adolescents ages 12-19 (Bleich et al., 2018). The prevalence of SSB intake among Mexican American and non-Mexican Hispanic children and adolescents (ages 6-19) was higher than non-Hispanic White children and adolescents (ages 6-19) and non-Hispanic Black children (ages 6-11) and lower than non-Hispanic Black adolescents (ages 12-19) (Bleich et al., 2018).

The prevalence of SSB consumption decreased from 83% to 77% (p = 0.05) for Mexican American adults ages 20-39 and from 66% to 58% (p = 0.23) for Mexican American adults ages 40-59 based on NHANES 2003-2014 data. The prevalence of SSB consumption decreased from 69% to 63% (p =.74) for non-Mexican Hispanic adults ages 20-39 and from 60% to 57% (p = 0.80) for non-Mexican Hispanic adults ages 40-59 (Bleich et al., 2018).

Latino adults had the highest mean daily SSB intake compared to other races and ethnicities in the U.S. (Langellier & Massey, 2016). Based on 2007-2010 NHANES data, U.S born Latino adults had a mean SSB intake of 0.71 times/day and foreign-born Latino adults had a mean SSB intake of 0.68 times/day (Langellier & Massey, 2016).

2.1.3. Consumption of Sweets/Salty Snacks

Many sweets and salty snacks were shown to be energy-dense and nutrient-poor (Hess & Slavin, 2018; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Common sweets and salty snacks in the U.S. diet include chips and other salty snacks, grain-based desserts, dairy desserts, candies, sugars, jams, and syrups (Hess et al., 2016; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Sweets and salty snacks were a common source of excess calories due to their high sugar, sodium, and/or solid fat contents (Hess et al., 2016; Hess & Slavin, 2018; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015).

Frequent snacking has been associated with increased total energy intake; however, the association with weight status of adolescents was inconsistent. Findings from NHANES 2005-2016 data showed that overweight and obese adolescents aged 12-

19 years consumed more snacks daily (1.85 and 1.97 snacks/day, respectively) compared to those with normal weight (1.69 snacks/day) (Tripicchio et al., 2019). A cross-sectional study with 400 adolescents aged 11-13 years showed that among adolescents, consuming snacks that contributed more than 15% of their total daily energy was significantly related to BMI $\geq 85^{th}$ percentile (Bo et al., 2014). Also, based on the EAT 2010 (Eating and Activity in Teens) study, a significant direct association was found between consumption of more energy-dense snack foods and higher adolescent body mass index (BMI) z scores among 2793 adolescents with a mean age of 14.4 years (Larson et al., 2016). However, there was an inverse relationship between the total number of snacks consumed daily and BMI z scores.

Snacking constitutes about one-third of children's daily energy intake, with intake significantly increased among U.S. children and adolescents in all race/ethnic groups over the past few decades (Piernas & Popkin, 2010). According to the findings from dietary recalls of eight nationally representative surveys, average energy intake from snacks per capita significantly increased among Mexican American children aged 2-18 (from 205 to 453 kcals per snacking occasion) between 1977-2014 (Dunford & Popkin, 2018). A significant subsequent decrease was observed between 2006-2014 (from 509 to 453 kcals per snacking occasion). Overall, the same trend was observed in average energy intake from snacks per capita for all U.S. children and adolescents (Dunford & Popkin, 2018).

The number of snacks high in calories and low in nutrients among Hispanic adolescents decreased from 1999 to 2010; however, intake depended on whether adolescents attended school (Larson, Story, et al., 2016). Data from Project EAT showed that the mean number of energy-dense, nutrient-poor snacks consumed per day among Hispanic adolescents was slightly decreased from 3.7 to 3.3 snacks/day during school days and from 4.9 to 4.4 snacks/day during vacation/weekend days between 1999-2010. However, the differences were not statistically significant (Larson, Story, et al., 2016).

The contribution of snacking to total energy intake of Hispanic adults increased in the past three and a half decades (Dunford & Popkin, 2017). Hispanic adults' average energy intake from snacks (SSB, salty snacks, and desserts and sweets) per capita increased from 167 to 418 kcals/day between 1977-2012 according to eight nationally representative cross-sectional surveys (Dunford & Popkin, 2017).

2.1.4. Consumption of Fast Food

Fast food is defined as food prepared and served quickly in self-service or carry out eating places without waiter service (Lin & Frazao, 1997; Pereira et al., 2005). Fast food tends to be excessive in portion size and high in unhealthy fats, salt, and sugar as well as low in micronutrients and fiber (Bowman et al., 2004; Isganaitis & Lustig, 2005; Jaworowska et al., 2013; Pereira et al., 2005). Frequent fast food consumption has been related to weight gain and BMI (Niemeier et al., 2006; Prentice & Jebb, 2003; Rosenheck, 2008). In addition, an international cross-sectional study with 199,135 adolescents from 36 countries and 72,900 children from 17 countries found that frequent fast food intake was related to high BMI in children. However, an inverse relationship was observed between fast food intake and BMI among adolescents (Braithwaite et al., 2014).

Daily calories consumed from fast food for Hispanic children and adolescents differed by age (Vikraman et al., 2015). Hispanic children aged 2-11 consumed a lower daily percentage of calories (8.4%) from fast food than Hispanic adolescents aged 12-19 years (14.9%) (Vikraman et al., 2015).

Hispanic children and adolescents consumed lower daily percentage of calories from fast food than non-Hispanic black and non-Hispanic white children and adolescents and higher than non-Hispanic Asian children and adolescents (Vikraman et al., 2015).

NHANES 2011-2016 data showed that the average number of meals from fast food or pizza places among Hispanic/Latino men was 2.7 times a week, while the average number of ready-to-eat foods and frozen meals/pizzas was 2.6 times/month and 1.6 times/month, respectively (Overcash & Reicks, 2021).

2.2. Physical Activity

Physical activity is defined as any kind of body movement produced by the skeletal muscle that substantially increases energy expenditure (World Health Organization, 2018). The Physical Activity Guidelines for Americans (2018) recommend that children and adolescents have 60 minutes or more of moderate-to-vigorous physical activity (MVPA) every day for substantial benefits to health and well-being (U.S. Department of Health and Human Services, 2018).

Adequate physical activity during childhood and adolescence may contribute to various short- and long-term benefits for the health and wellbeing of children and adolescents (Wu et al., 2017). Being physically active during childhood and adolescence has been associated with a higher level of cardiorespiratory fitness, stronger muscles and bones, lower body fat, and lower symptoms of depression compared to having an inactive lifestyle (U.S. Department of Health and Human Services, 2018). Also, physically active children and adolescents were more likely to become healthy adults because of a low risk of developing chronic diseases such as heart disease, hypertension, type 2 diabetes, and osteoporosis (U.S. Department of Health and Human Services, 2018).

The majority of Latino children and adolescents in the U.S. did not meet daily physical activity recommendations based on the 2018 U.S. Report Card on Physical Activity for Children and Youth (National Physical Activity Plan Alliance, 2018). Only a total of 21.9 % of Hispanic children and adolescents aged 6-17 years participated in 60 minutes of physical activity every day. The Study of Latinos (SOL) Youth, which used Actical accelerometers for one week to measure physical activity, showed that Hispanic/Latino youth aged 8-16 participated in light, moderate, and vigorous activity for an average of 178.9 minutes/day, 25 minutes/day and 10 minutes/day, respectively between 2012-2014 (Evenson et al., 2019). A population-based cohort study called the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) showed that 51.1% of U.S. Hispanic/Latino men had sufficient levels of moderate to vigorous physical activity per week (≥150 minutes/week) between 2008-2011 (Arredondo et al., 2016) based on U.S. national recommendations (U.S. Department of Health and Human Services, 2018). HCHS/SOL data also indicated a total of 231.3 minutes of daily light activities among Hispanic/Latino men.

2.3. Screen Time

Screen time is a common sedentary behavior among children and adolescents in the U.S. (Pearson & Biddle, 2011). Based on the NHANES 2015-2016 cycle, 63.8% of

Hispanic children (5-11 years old) and 62.8% of Hispanic adolescents (12-19 years old) reported that they spent two hours or more per day sitting watching television or videos compared to all children (62.2%) and adolescents (59.4%) in the U.S. (Yang et al., 2019). Also, according to the SOL Youth, Mexican American youth aged 8 to 16 years participated in sedentary behaviors for an average of 604.6 minutes/day between 2012-2014 (Evenson et al., 2019). Mexican American youth aged 15-16 years had a higher level of sedentary behaviors (648.4 minutes/day) compared to younger groups (8-10, 11-12, and 13-14 years). Another study showed that the prevalence of screen-based sedentary behaviors for 2 hours/day or more slightly increased for Hispanic children (63.1% to 63.8%) from 2001 to 2016, but declined for Hispanic adolescents (66.3% to 62.8%) (Yang et al., 2019). Latino men ages 21-85 reported 7.9 ± 4.9 hours per day of sedentary behaviors including sitting while watching television, playing computer/video games, listening to music, sitting while texting, computer or internet use, driving/riding, and reading in a cross-sectional analysis of the Lawrence Health and Well Being Study (Silfee et al., 2017).

Sedentary behaviors, especially sitting watching television, have been associated with various diseases, but the relationship with obesity was not consistent (Piercy et al., 2018). Many epidemiological studies suggested that sedentary behaviors were related to increased risk of cardiovascular disease (Same et al., 2016), cancer of the colon, endometrium, and lung (Schmid & Michael, 2014), diabetes (Wilmot et al., 2012), and overall mortality (Wilmot et al., 2012) in adults. A review of 10 systematic reviews showed limited evidence for a relationship between sedentary behaviors and obesity among adults (Biddle et al., 2017). However, screen time was positively associated with adiposity, triglycerides, and metabolic syndrome in adolescents (Barnett et al., 2018).

3. Parenting Practices

As key gatekeepers, parents play an essential role in their children's dietary behaviors in the home environment through their parenting style and parenting practices (Vaughn et al., 2016). Parenting style has been defined as the emotional climate of the parent-child relationship in which parents express their attitudes and behaviors to influence child outcomes (Vaughn et al., 2016). Parenting practices refer to certain types of intentional or unintentional behaviors/actions by parents to shape their child's attitudes, behaviors, or beliefs (Vaughn et al., 2016). Parenting practices have been associated with children's and adolescents' dietary behaviors (Yee et al., 2017), physical activity, and screen time (Hutchens & Lee, 2018; Ramirez et al., 2011; Xu et al., 2015).

3.1. Food-Related Parenting Practices

Food parenting practices play an important role in adolescents' dietary behaviors (Vaughn et al., 2016). Several reviews and a qualitative study have identified a variety of food parenting practices thought to promote healthy diets including setting expectations, role modeling, and making healthy food available at home (Birch & Davison, 2001; Loprinzi et al., 2012; Scaglioni et al., 2018; Vaughn et al., 2016; Zhang et al., 2018).

A review of research studies regarding food parenting practices showed relationships with adolescents' dietary habits in positive and negative directions (Yee et al., 2017). A cross-sectional study which used data from two coordinated surveys, Project EAT 2010 and Project F-EAT (Families and Eating and Activity among Teens), showed that availability of healthy food at home and positive parent modeling were related to higher daily fruit and vegetable intakes, and less SSB and snack food intakes for adolescents (Loth et al., 2016). A Family Life, Activity, Sun, Health, and Eating (FLASHE) study with 1859 parent-adolescent dyads showed that food parenting practices including fruit and vegetable availability at home, encouragement and rules/limits for adolescents' fruit and vegetable intake were positively associated with fruit and vegetable intakes of adolescents. However, a positive relationship was also observed between parent/caregiver rules/limits to avoid junk food and SSBs and availability of junk foods and SSBs at home and adolescent junk food and SSB intakes (Fleary & Ettienne, 2019). Another Project EAT 2010 study with diverse adolescent samples showed that adolescent SSB intake was positively associated with home availability of SSBs ($\beta = 0.18$, $p <0.001$) and parent SSB intake ($\beta = 0.08$, $p <0.001$) (Watts et al., 2019).

Some qualitative research exists that explored Latino parent perspectives on parenting practices and how parenting practices influence adolescent dietary behaviors (Flores et al., 2012; Zhang et al., 2018). A focus group study identified eight primary food and activity parenting practices reported by Latino fathers (n = 26) related to improving their children's healthy lifestyles (Zhang et al., 2018). Another focus group study examined Latino parent perspectives on healthy eating, physical activity, and weight management strategies for overweight Latino children (Flores et al., 2012). A total of 19 parents were interviewed and also sampled several healthy substitutes for traditional Latino foods. In the interviews, parents reported 22 important ways they could help their overweight children lose weight including making healthy foods available at home, setting limits for intake of unhealthy foods and expectations for fruit and vegetable intake, being a positive role model, and eating healthy foods together (Flores et al., 2012). In both qualitative studies, mothers and fathers reported several same ways to improve their children's healthy behaviors to decrease overweight and obesity.

Studies that have examined the influence of food parenting practices on Latino adolescent dietary behaviors were limited (Yee et al., 2017). For example, a cross-sectional study with 187 Hispanic children, 10-14 years of age, and their parents showed that availability of SSBs and fruit drinks at home were both moderately related to lower HEI-2010 scores of adolescents (HEI-2010: 60.9 vs. 57.7 and HEI-2010: 61.1 vs. 58.1, respectively; $p < 0.05$). Also, parent fruit and vegetable intakes were positively associated with adolescent total HEI-2010 score (*p-value* for trend = 0.03 and 0.02, respectively) (Santiago-Torres et al., 2014). Another cross-sectional study with Mexican American children aged 8-18 years and their mothers showed that children whose families brought fast food home once a week or more and drank a median of three sodas per day, consumed more dietary fat and spent more money on snacks compared to those whose families brought fast food home less than once a week and drank a median of 2 sodas per day (Ayala et al., 2007). Results of a 2-year longitudinal study with Mexican American families and their adolescents indicated that feeding practices of both parents (Latino mothers and fathers) were associated with weight status of children (Tschann et al., 2015). Lastly, a HCHS/SOL study with 1214 Hispanic/Latino parents/caregivers (88.8% of female) and their children ages 8-16 evaluated three food parenting practices (rules and limits, monitoring, and pressure to eat) in the context of controlling, pressuring, disciplining, tracking, and indulging on youth dietary intakes of snack foods, sweets, and high-sugar beverages (LeCroy et al., 2019). This study demonstrated that parents who were in the controlling (low scores for all food parenting practices) cluster had 1.75 times greater odds of having youth with high snack food, sweets, and high-sugar beverage intakes compared to parents who were in the indulgent (high scores for all food parenting practices) cluster.

3.1.1. Family Meals

Family meals have consistently been shown to influence dietary behaviors of school-aged children and adolescents (Scaglioni et al., 2018). Studies suggested that having meals as a family played an important role in healthful eating habits among youth (Hammons & Fiese, 2011; Neumark-Sztainer et al., 2003; Scaglioni et al., 2018). Frequent family meals were positively correlated with consumption of fruits, vegetables, grains, and calcium-rich foods and negatively correlated with soft drink consumption among 4,764 middle and high school students from diverse backgrounds (Neumark-Sztainer et al., 2003). Positive impacts of family meals which were observed during early ages tracked into teenage years and young adulthood (Scaglioni et al., 2018). A population-based, 5-year longitudinal study found that young adults who ate meals with their family during adolescence consumed more fruit, vegetables, dark green and orange vegetables and essential nutrients (calcium, magnesium, potassium, vitamin B-6, and fiber) and less soft drinks in their young adulthood than those who ate fewer family meals during adolescence (Larson et al., 2007). Moreover, family meals play an important role in child weight status. A meta-analysis study concluded that children and adolescents who ate meals with their families three or more times a week were 12% less likely to be overweight compared to those who had family meals less than three times a week (Hammons & Fiese, 2011).

Numerous studies have examined the impact of family meals and food parenting practices on food behaviors of children in the general population, but limited data were available on the relationship between family meal frequency and Latino child and adolescent food behaviors. In addition, the impact on diet quality among Latino adolescents was not consistent across studies. A cross-sectional study showed that Latino children who had family meals without watching TV or rarely watching TV at least four times per week were more likely to consume fruit and vegetables and less likely to consume soda and chips compared to those who had family meals less often (Andaya et al., 2011). However, another study with 187 Hispanic children, 10-14 years of age, and their parents did not show an association between frequency of family meals and adolescent total HEI-2010 scores (Santiago-Torres et al., 2014). However, adolescents had lower HEI-2010 scores when they had family meals while watching TV more frequently than 5 times a week compared to never, 1 time a week, and 2-4 times a week (HEI: 61 vs. 55; p for trend = 0.04).

3.2. Activity-Related Parenting Practices

Studies have examined various activity-related parenting practices that influence child and adolescent physical activity and screen time. Parenting practices included parental role modeling, parental encouragement, monitoring, and setting limits/rules (Hutchens & Lee, 2018; Jago et al., 2013).

3.2.1. Physical Activity Related Parenting Practices

Limited research was available to assess the association between physical activity-related parenting practices and adolescent physical activity based on an integrative review with only 3 experimental studies of 38 total studies included in the review (Hutchens & Lee, 2018). In a focus group study, parents identified practices thought to be effective in encouraging physical activity among children, including monitoring, modeling, and increasing intrinsic value and availability (Lepeleere et al., 2013). In a qualitative study regarding parental role modeling with 52 minority and low-income adolescents, ages 10-14 years, adolescents reported that parents were involved in a variety of physical activities with their children including walking, cycling, and playing basketball but their involvement was infrequent (Wright et al., 2010). A study using data from the National Longitudinal Study of Adolescent Health indicated that parent-child communication and parental engagement were significantly associated with adolescents' moderate to vigorous physical activity. However, parental monitoring was not significantly associated with adolescent moderate to vigorous physical activity (Ornelas et al., 2007). Another longitudinal study with 879 parent and child (6-11 years old) dyads found that physical activity-related parenting practices, including general encouragement for physical activity and modeling, were associated with child physical activity (Liszewska et al., 2018).

Several studies that examined parenting practices and adolescent physical activity were completed outside of the United States. A cross-sectional study with 207 Belgium parents and children, ages 6-12 years, indicated that child physical activity may be higher when parents made sports equipment available at home ($\beta = 0.14$, $p = 0.06$) (Lepeleere et al., 2015). A study with Brazilian children, ages 14-17 years, found that current and previous (during childhood and adolescence) parent physical activity practices were associated with adolescent physical activity ($p < 0.001$) (Christofaro et al., 2018). Another study conducted in Mexico observed an association between adolescent positive perceptions of their parents' physical activity practices and higher physical activity hours/week of adolescents (Sánchez-Zamorano et al., 2019).

3.2.2. Screen Time Related Parenting Practices

Screen time parenting practices play an essential role in adolescent TV viewing, video games, and internet/computer use (Jago et al., 2013). A study with 160 parent-adolescent dyads showed that adolescents had fewer hours of screen time (TV viewing, video games, and internet/computer use) when their parents had rules and limits on screen time and when youth did not have screen-based media in their bedrooms (Ramirez et al., 2011). Another study used data from the Environmental Determinants of Obesity in Rotterdam’s School children (ENDORSE) project and found that a parent TV watching rule was negatively related to adolescents watching TV more than 2 hours per day. However, the relationship was not significant in the multivariable model, which was adjusted for all other significant variables related to individual level factors, social factors, and physical environmental factors (Hume et al., 2010). Another ENDORSE study with adolescents ages 12-15 years demonstrated that child TV viewing was positively associated with having a TV in the bedroom and parental modeling. Also, having a parental family TV viewing rule about duration and time was associated with watching fewer minutes of TV per day (Velde et al., 2011). Based on a study which used data from the Youth Media Campaign Longitudinal Survey (YMCLS), children ages 9-15 years with parents who always or very often had screen time limits were less likely to exceed 2 hours/day of screen time compared to those with parents who sometimes had screen time limits (Carlson et al., 2010). Another study which examined predictions of child media use with both a cross-sectional and longitudinal research design showed that adolescents aged 9-12 years spent less time watching TV, playing video games, and using a computer when their parents set limits on time for media use (Lee et al., 2009).

The associations between Latino adolescent screen time and physical activity and parenting practices have only been examined in a few studies. In a focus group study, increasing physical activity and decreasing screen time were two of the most important ways that Latino parents reported they could help their overweight adolescents manage their weight (Flores et al., 2012). A cross-sectional study with primarily Hispanic 4th-grade students indicated that children were 1.68 times and 1.42 times less likely to watch TV for 2 hours/day or less on weekdays and weekends, respectively, when they had parental TV rules (Springer et al., 2010).

4. Father's Role in Youth Energy Balance Related Behaviors

Previous studies have not directly and exclusively assessed paternal influences on child and adolescent diets and diet-related health outcomes (Freeman et al., 2012; Mcintosh et al., 2011; Stewart & Menning, 2009). For example, a cross-sectional study with 312 parents and children ages 9-11 or 13-15 years showed that fast food consumption among children was positively associated with father fast food intake (Mcintosh et al., 2011). A prospective study, using data from the Longitudinal Study of Australian Children (LSAC), examined the association between parent weight status and child (ages 8-9 years) weight status between 2004-2008 (Freeman et al., 2012). The study found that children who had overweight or obese fathers had an increased risk of becoming obese.

The role of the father in adolescent physical activity and screen time has not been examined extensively in the literature. In a qualitative study with 52 minority and low-income adolescents, ages 10-14 years, adolescents reported that mothers were more likely to role model physical activity for their adolescents (walking and riding a bike) compared to fathers (Wright et al., 2010). A cross-sectional study with 201 parent-child dyads showed that father involvement in physical activity was significantly related to youth leisure-time physical activity (Lam & McHale, 2015).

Limited research has examined the association between parent involvement in preparing meals and adolescent dietary quality. A cross-sectional study which used data from Project EAT 2010 and F-EAT found that adolescent fruit and vegetable, fast food, SSB, nutrient or fat intake were not associated with mother or father involvement in food preparation for the family (Berge et al., 2016).

Limited research has examined the influence of Latino father parenting practices on child diet and weight status (Parada et al., 2016; Penilla et al., 2017; Turner et al., 2014; Zhang et al., 2018). A cross-sectional study with 81 Mexican-origin fathers and children, aged 7-13 years who participated in the Entre Familia: Reflejos de Salud study showed that children consumed less fruit and vegetables when their fathers used feeding-related control more frequently ($\beta = -0.49$, SE = 0.25, $p = 0.05$), but children consumed more fruit and vegetables when their fathers used feeding-related reinforcement of healthy eating more frequently (Parada et al., 2016). Another study with 174 mother-father-child triads (8-10 years of age) demonstrated that father positive involvement, including monitoring and limiting child unhealthy food intake and encouraging the child to try new and healthy foods, was not associated with child BMI z-score, but father BMI was related to child BMI z-score (Penilla et al., 2017).

Father food involvement has been studied using qualitative methods as well as surveys to assess frequency of food work and associations with adolescent dietary intake. Interviews with mothers, fathers, and children showed that fathers were less involved in food work compared to women, and their involvement influenced adolescent dietary intake in a negative way. A qualitative study used data from 109 interviews with middle-class and upper-middle-class families (mothers, fathers, and adolescents) in San Francisco, California (Fielding-Singh, 2017). Findings showed that fathers did less food work, including buying, cooking, and dietary decision-making for the family compared to mothers. Also, fathers' involvement in food work increased adolescent consumption of fast and processed foods. Another study with diverse parents and adolescents showed that the proportion of fathers who reported they “usually” prepared food for the family was lower than mothers for all races/ethnicities (Berge et al., 2016). Hispanic/Latino fathers had the lowest proportion (29.4%) compared to other races/ethnicities.

A time use study examined adult male involvement in cooking, showing that involvement was less than among adult females, with male participation increased from 2003-2016 (Taillie, 2018). A study which used data from the American Time Use Survey (ATUS) showed that regardless of race/ethnicity, more women cooked at home compared to men in 2003 and 2016, but the number of men who cooked at home increased from 2003 to 2016 ((Taillie, 2018). The proportion of Hispanic men who cooked at home increased in 2016 (41.6%) compared to 2003 (31.2 %) ($p < 0.05$ for the trend). Also, the time spent cooking by Hispanic men increased between 2003 and 2016.

Several studies assessed father perspectives on food and activity-related behaviors of their children. In one qualitative study exclusively focused on Latino fathers ($n = 26$), fathers reported that they used eight major food and activity-related parenting practices including setting expectations and limits, role modeling, managing availability and accessibility, teaching and reasoning, monitoring, motivating, and doing things together to promote a healthy lifestyle for their adolescents (Zhang et al., 2018). Another qualitative study used data from the "What Fathers Want" study to examine father perceptions, beliefs, attitudes, and lived experiences of mealtime interactions with children and other family members (Harris et al., 2020). Findings from twenty-seven fathers with children (12 years or younger) showed that fathers valued mealtimes as a place to form strong social bonds with their children and other family members. Fathers also identified how their feeding practices differed from mothers. They reported facilitators (goals, inherited values) and challenges (distractors, food rejection) to build a positive environment during mealtimes with the help of other family members' connection and communication (Harris et al., 2020).

The fathers' role in promoting healthy behaviors at home was also examined from the perspective of Hispanic mothers. Nine focus groups were conducted with a total of 55 Hispanic mothers of preschool-aged children (Lora et al., 2017). Mothers indicated supportive father behaviors for healthy youth behaviors including preparing healthy meals, using healthier cooking methods, healthy food shopping with their children, and asking the child to participate in household chores and/or play sports. Unsupportive behaviors included bringing high-calorie foods, such as pizza, and sugary drinks into the home (Lora et al., 2017).

Interactions between father food parenting practices and supportive environmental factors such as family meals has only been examined to a limited extent. One cross-sectional study from Project EAT 2010 showed that frequency of family meals and food parenting practices, including fruit and vegetable availability and accessibility, fruit and vegetable modeling, and encouragement to healthy foods, were individually associated with high fruit and vegetable intake of adolescents. The association with adolescent fruit and vegetable intake was stronger when frequency of family meals (≥ 5 times/week) was combined with each favorable food parenting practice (Watts et al., 2017). Additional studies to examine interactions between father food parenting practices and family meals are warranted.

5. Interventions among Latino Families to Prevent Childhood Obesity

Reviews have indicated that many interventions have been conducted to prevent childhood obesity with varying levels of parent involvement (Al-Khudairy et al., 2017; Ells et al., 2018; Yavuz et al., 2015). Some have specifically targeted the food- and activity-related parenting practices of Latino parents (Barkin et al., 2012; Crespo et al., 2012; Otterbach et al., 2018; Sadeghi et al., 2017). However, relatively fewer interventions have focused primarily on Latino fathers and their influence on obesogenic behaviors of children (Johnson et al., 2021).

Latino family-based interventions have been implemented with both parents (mostly mothers) and children (pre-school through early adolescence) to promote healthy lifestyle behaviors and prevent obesity among children by improving families' knowledge of nutrition and physical activity (Barkin et al., 2012; Branscum & Sharma, 2011; Crespo et al., 2012; S. Gallo et al., 2020; Otterbach et al., 2018; Sadeghi et al., 2017; Tamayo et al., 2021). Findings from these studies generally showed an increase in healthy food selection among families and a decrease in BMI among children. For example, the Salud Con La Familia program was a culturally tailored, family-centered obesity prevention intervention for Latino-American parents and children (2-6 years) to improve family nutrition behaviors, increase weekly physical activity and decrease media use (Barkin et al., 2012). The intervention included 12 weekly 90-minute skill-building sessions. All sessions were taught in Spanish by the same trained facilitator. A randomized controlled trial (RCT) was conducted with 54 parent-child dyads in an intervention group and 52 dyads in a control group to examine the effect of the program on BMI in Latino-American preschool-aged children. A reduction in absolute BMI across the 3-month study period was observed among the intervention group with the strongest effect observed for obese children (Barkin et al., 2012).

Niños Sanos, Familia Sana (NSFS) was a 5-year multi-component, quasi-experimental intervention study with two years spent on planning and follow up evaluation and three years on intervention implementation (Sadeghi et al., 2017). NDFS was developed to decrease the BMI growth rate among Mexican-origin children ages 3-8 years. NDFS intervention consisted of nutrition and physical activity lessons for parents (delivered by trained nutrition educators), nutrition classes for children (delived by classroom teachers), physical activity for children (delivered by physical education teacher), and monthy fruit and vegetable voucher to use in the grocery stores. One year after the intervention was initiated, a reduction in the rate of BMI growth among boys was observed (Sadeghi et al., 2017).

Another multidisciplinary, culturally-adapted, pediatric weight management program for Latino families was the Vidas Activas y Familias Saludables (VALE) program (S. Gallo et al., 2020). The VALE program included 10 weeks of group-based lessons on nutrition and eating practices to teach families about diet, exercise and behavior modification. A pre-and post-test pilot study with sixty overweight/obese Latino children (4-9 years) was conducted to evaluate the feasibility of the VALE program. The study indicated that a total of 65% of the families were retained for the follow-up evaluation. All families reported that they were more confident about choosing healthier foods after the program (S. Gallo et al., 2020).

The Healthy Children, Healthy Families: Parents making a difference! (HCHF) program was developed for Hispanic parents with children ages 3-11 years to improve healthy lifestyle behaviors by increasing parent knowledge and skills regarding nutrition and physical activity (Otterbach et al., 2018). A pilot study using pre-post intervention data from 52 parents and children showed that frequency of positive food parenting practices was increased including encouraging balance and variety and making fruit available, while the frequency of making energy-dense snack foods available was decreased. Parent fruit, vegetable, low-fat dairy product intakes and frequency of physical activity were also increased (Otterbach et al., 2018).

The Aventuras para Niños (Aventuras) program, a 3-year randomized controlled community trial with 808 Latino parents and their elementary school children (kindergarten through 2nd grade) was developed to improve diet and physical activity behaviors of Latino children to prevent weight gain (Crespo et al., 2012). The program had four conditions including Home/Family environmental change (Family-only), Community-only environmental change (Community-only), Family-plus-Community-environmental change (Family+Community), and a no-treatment control condition. In the evaluation of the Aventuras program, parents reported increases in child daily fruit and vegetable intakes and physical activity and a decrease in frequency of watching TV when getting ready for school in the Family-only intervention group. Child diet and activity behaviors were mediated by increased parental monitoring, support, and reinforcement as well as mediated by decreased parental control and family TV viewing during dinner. However, improvements in child weight status were not observed as a result of Aventuras program.

6. Interventions among Latino Fathers to Prevent Childhood Obesity

Only a few interventions have focused solely on father's involvement in the treatment or prevention of childhood obesity (Morgan et al., 2017). Latino fathers were underrepresented in existing interventions that promoted a healthy lifestyle for families (T. O'Connor et al., 2018). Healthy Dads, Healthy Kids (HDHK), a nine-week group-based program, was developed in Australia to improve dietary intake, physical activity, and weight loss among mostly White fathers and to prevent obesity among their 5-12 year-old children by teaching healthy lifestyle behaviors. HDHK was the first intervention program specifically targeting fathers to prevent obesity. The program resulted in weight loss and behavioral change among fathers and behavioral change among children. The HDHK program was adapted for use in the U.S. among a sample of Hispanic/Latino families in Texas (T.M. O'Connor, Perez, et al., 2020). An initial qualitative study examined the perceptions of an expert panel (researchers involved in developing HDHK) and a Hispanic family panel (fathers, mothers, and children) on the cultural adaptation of the HDHK program for Hispanic families. In the study, a total of 44 Hispanic participants (22 fathers, 13 mothers, and 9 children) participated in focus groups, online surveys and/or interviews. Findings indicated that literacy level, cultural values and barriers to participation and engagement should be considered in the cultural adaptation of HDHK for Hispanic families (T. M. O'Connor, Perez, et al., 2020).

Niños Saludables program for Hispanic families, a feasibility study was conducted after adaptation of the HDHK program to the Papas Saludables. A RCT was conducted to test the feasibility of the adapted program among 36 low-income families (fathers with/without a mother and 1-3 children). In this pilot feasibility study, the program was considered feasible by coming close to or exceeding the five criteria/goals: (1) enrolling 90% (n = 36) of the participation goal in four months (goal was 40 participants); (2) retaining 75% of participants in the follow-up assessment (goal was 80%); (3) maintaining 72% of the participants in the 10 sessions (goal was ≥ 70%); 4) obtaining 100% ''excellent/good'' satisfaction ratings among the participants (goal was 80%); and 5) collecting anthropometric and behavioral data from 100% of the participants at baseline and 72% of participants at follow-up (goal was ≥ 75%) (T. M. O'Connor, Beltran, et al., 2020). In a qualitative study with Hispanic families (26 mothers, 26 fathers, and 45 children), fathers reported that the Papas Saludables, Niños Saludables program increased their connection and communication with their children and allowed them to spend more time with their children (Perez et al., 2021). Also, about half of the fathers reported that they would like to include mothers in the program to a greater extent. Fathers reported that home-based tasks, family commitments and work injuries prevented them from attending the program. Mothers reported increased involvement of fathers in meal preparation, grocery shopping, and other chores. Children reported that the best part of the program was spending more time with their fathers (Perez et al., 2021).

A Latino father-focused intervention (Padres Preparados, Jóvenes Saludables) that consisted of eight 2.5 hours sessions was designed to prevent obesity among Latino adolescents in the Minneapolis/St. Paul metropolitan area (Zhang et al., 2019). A pilot study was conducted to evaluate the feasibility of the program among thirteen parents. Feasibility goals included program acceptability and preliminary effectiveness related to behavioral outcomes (dietary intake, physical activity, and screen time, food- and activity-related parenting practices and parenting styles). Findings showed that the program was feasible based on 90% of participants reporting class sessions as interesting, helpful for parenting, and having a comfortable environment to share their opinions. In addition, three quarters of both fathers and adolescents attended most of the sessions, and preliminary positive behavioral changes were reported related to dietary intake, food-and activity-related parenting practices, and general parenting style (Zhang et al., 2019).

7. Possible Factors that Impact Childhood Obesity Interventions among Latino Families

Social, environmental, and intervention-related factors may impact participation in and/or effectiveness of low-income Latino family interventions to prevent childhood obesity. These factors include social determinants of health, parent-child communcation, and intervention dosage.

7.1. Social Determinants of Health in Obesity Prevention Interventions

Social Determinants of Health (SDoH) have been defined as conditions related to where people live, work, learn, worship, and age which impact health, functioning, and life quality and risks of individuals (The National Academies of Science, Engineering, Medicine, 2017). SDoH include education, income, employment, health systems and services, and physical and social environment (The National Academies of Science, Engineering, Medicine, 2017). SDoH may impact the efficacy of obesity prevention interventions among Latino populations. A review including 13 studies (primarily U.S.-based) which used rigorous systematic methods showed that strategies to address SDoH were incorporated in only about half of the family-based obesity prevention interventions among Hispanic children and families (Soltero et al., 2021). This review also indicated that culture, language, and familial contextual factors are the most common SDoH which were integrated in the interventions among Hispanic children and families.

Cultural values and beliefs (i.e., familism), being bicultural (balancing one's own culture and the dominant culture well), and community and social support are important resilience factors among Latino families (Bermudez & Mancini, 2013; L. C. Gallo et al., 2009). Familism is defined as a core value in the centrality of family. Familism that encompasses family connectedness and warmness, family involvement and support (Behnke et al., 2008; Bermudez & Mancini, 2013) can strengthen relationships and communication between parents and children. Thus, strong parent child communication and relationships can support positive parental involvement in adolescent healthy food and activity behaviors.

7.2. Parent-Child Communication

The amount and quality of parent-child communication may affect child and adolescent benefits from childhood obesity prevention programs because of associations with child and adolescent diet and activity behaviors and weight status. A meta-analysis where half of the sample was ethnically diverse showed positive effects of parent-child communication on child and adolescent diet (in 4 studies) and activity behaviors (in 6 studies) and weight status/overweight/obesity (in 96 studies) (Pinquart, 2014). Also, a cross sectional study with 308 parent/child (8-12 years) dyads (83% Caucasian) examined the association between parent- and adolescent-reported parent-child communication and child weight status (Lowe et al., 2020). This study found an inverse relationship between child-reported parent-child communication and child BMIz scores but did not find any association with parent-reported data.

Studies have indicated the importance of parent-child communication on health behaviors among the Latino population. For example, a systematic review of 15 intervention studies showed that parent-child communication interventions with parents whose adolescents were affected by sexually transmitted infections or human immunodeficiency virus, improved sexual health behaviors among Black/African American and Hispanic Latino youth (Sutton et al., 2014). A cross-sectional study with 1936 Hispanic adolescents (average age of 14) demonstrated that adolescents who have more frequent parent-child communication had lower use of cigarette, alcohol, and marijuana (Pokhrel et al., 2008). Also, a longitudinal study with 1467 Latino families determined that parental depressive symptoms decreased when their communication (closeness and openness) increased with their children (De Luca et al., 2018). However, associations among parent-child communication and food and activity parenting practices and adolescent food and activity behaviors among Latino families are understudied.

7.3. Dose Effects

Based on the NIH treatment fidelity framework, intervention dose consists of three parameters including length of contact sessions, number of contact sessions, and duration of treatment (Jaka et al., 2016). The association between intervention dose and childhood obesity prevention and treatment programs was examined in several systematic reviews. A systematic review and meta regression with 133 studies was conducted to assess the effect of intervention dose (i.e., duration, number of sessions, and length of session) in behavioral interventions to prevent and treat childhood obesity. This study did not find a clear relationship between intervention dose and weight-related outcomes of children and adolescents (Heerman et al., 2017). Another systematic review of 42 lifestyle-based weight loss trials indicated that children and adolescents who were exposed to 26 or more hours of contact in weight management interventions had a significant reduction in excessive weight after 6 to 12 months (E. A. O'Connor et al., 2017).

The literature that examined adequate intervention dose to improve Latino adolescent weight status was limited. A RCT with multiethnic parent/child (7-11 years) dyads showed that the percentage of overweight children was decreased greater to a greater extent from baseline to 12 months for children in a high dose intervention (32 sessions of enhanced social facilitation maintenance over 4 months) compared to those who in a low dose intervention (16 sessions of enhanced social facilitation maintenance over 4 months) and control (weight management education condition) groups (Wilfley et al., 2017). Another RCT with primarily Hispanic parents (96.6% of mothers) and preschool children demonstrated that child BMI-z scores were significantly lower for those who had a higher intervention dose [median number (16-21) of sessions or calls] compared to a low intervention dose [median or more (1-15) number of sessions or calls] after a one-year intervention (Heerman et al., 2020). However, the association between intervention dose and Latino adolescent food and activity behaviors is understudied.

8. Summary

The prevalence of overweight and obesity was disproportionately high among Latino children in the U.S (Fryar et al., 2020; Ogden et al., 2020). Energy balance related behaviors including poor dietary intakes (Overcash & Reicks, 2021; Thomson et al., 2019), low frequency of physical activity (Arredondo et al., 2016; Evenson et al., 2019) and high frequency of screen time (Silfee et al., 2017; Yang et al., 2019) were shown to be critical behavioral determinants of overweight and obesity among Latino fathers and adolescents (Rennie et al., 2005). Latino child and adolescent EBRBs were positively related to parenting practices in previous studies (Ayala et al., 2007; Flores et al., 2012; Santiago-Torres et al., 2014; Springer et al., 2010; Tschann et al., 2015) . Involvement of Latino men in cooking significantly increased between 2003-2016 (Taillie, 2018). However, studies examining the effect of Latino father parenting practices on adolescent EBRBs are limited.

Several Latino family-based interventions have been conducted with the involvement of both parents (mostly mothers) and children (pre-school through early adolescence) to improve child EBRBs and prevent childhood overweight and obesity (Barkin et al., 2012; S. Gallo et al., 2020; T. M. O'Connor, Beltran, et al., 2020; Otterbach et al., 2018; Sadeghi et al., 2017; Tschann et al., 2015; Zhang et al., 2019). However, food- and activity-related parenting practices were included as determinants of youth behaviors in a limited number of interventions that focused on promoting healthy lifestyle behaviors and preventing childhood obesity among Latino children and adolescents (Barkin et al., 2012; Otterbach et al., 2018; Sadeghi et al., 2017). In these interventions, Latino fathers were underrepresented. Increasing father representation in healthy lifestyle interventions may increase the benefits of intervention among Latino adolescents in terms of healthy diet and activity behaviors based on familism, which is a core value among the Latino population. Recognizing and incorporating positive social determinants of health including familism, culture, and language, positive parent-child communication, and adequacy of intervention dose are also essential factors that may increase the efficacy of healthy lifestyle interventions among Latino families. Therefore, a father-focused, community based, culturally and linguistically appropriate weight-related healthy lifestyle intervention focusing on paternal food and activity parenting practices was conducted to improve Latino adolescent EBRBs and weight status.

9. Research objectives, research questions, and hypotheses

Objective 1 (Chapter 2):

The first objective is to determine whether family meals, father meal/food involvement and father food parenting practices separately or in combination are associated with adolescent dietary intakes.

Research Questions 1: Are adolescent dietary intakes associated with father meal/food involvement?

Research Questions 2: Are adolescent dietary intakes associated with family meals?

Research Questions 3: Are adolescent dietary intakes associated with father food parenting practices?

Research Questions 4: Are there interactive effects of family meals, father meal/food involvement and father food parenting practices on adolescent dietary intakes?

Primary Hypothesis: Adolescent dietary intakes will be greater with more frequent father meal/food involvement and family meals and positive father food parenting practices compared to less frequent father meal/food involvement and family meals and father food parenting practices.

Objective 2 (Chapter 3):

The second objective is to determine whether father and adolescent EBRBs and weight status differ between treatment and delayed-treatment control groups from pre- to post-intervention and between intervention doses (low vs. high).

Research Questions 1: Do sociodemographic characteristics (father and adolescent) differ between treatment and delayed-treatment control groups at baseline?

Research Questions 2: Do youth EBRBs (dietary intake, physical activity, and screen time) and BMI percentile differ between treatment and delayed-treatment control groups at baseline and post intervention?

Research Questions 3: Are father and adolescent EBRBs and BMI improved in the treatment group compared to the delayed-treatment control group from pre- to post-intervention?

Research question 4: Do father and adolescent EBRBs and weight status differ by intervention dose from pre- to post-intervention?

Primary Hypothesis: Father and adolescent EBRBs will be improved in the treatment group compared to the delayed-treatment control group based on pre- and post-intervention assessment. Also, the high intervention dose group will improve EBRB and weight status more than the low dose intervention group.

Objective 3 (Chapter 4):

The third objective is to determine whether paternal parenting practices (father and adolescent reported) differ between treatment and delayed-treatment control groups from pre- to post-intervention and to identify modifiers (father and adolescent) that affect paternal parenting practices.

Research Questions 1: Do sociodemographic characteristics (father and adolescent) differ between treatment and delayed-treatment control groups at baseline?

Research Questions 2: Are paternal parenting practices (father and adolescent-reported) improved in the treatment group compared to the delayed-treatment control group from pre- to post-intervention?

Research question 3: Are father food/physical activity/screen time responsibilities and father food/meal involvement modifiers for father-reported paternal parenting practices?

Research question 4: Are family meal and father food/meal involvement modifiers for adolescent-reported paternal parenting practices?

Primary Hypothesis: Paternal parenting practices (father- and adolescent-reported) will be mproved in the treatment group compared to the delayed-treatment control group based on pre- and post-intervention assessment. Also, paternal parenting practices will be more frequent when fathers have more frequent father food/physical activity/screen time responsibilities and father food/meal involvement and adolescents have more frequent meals with their family.

Preliminary directed acyclic graphs (DAGs) were prepared to illustrate potential pathways to identify the appropriate covariates to include in statistical models based on parent and adolescent sociodemographic characteristics. Appendix A shows the DAGs for each of Chapters 2-4. In addition to DAGs, a data driven method was primarily used to examine and identify covariates in the statistical models.

Chapter 2. Adolescent-Reported Latino Fathers' Food Parenting Practices and Family Meal Frequency Are Associated with Better Adolescent Dietary Intake

Overview

Most studies of food-related parenting practices, parental meal involvement, and adolescent dietary intake have focused on maternal influences; studies of paternal influences, particularly among marginalized groups, are lacking. This study examined lower-income, Latino fathers' food parenting practices and involvement in planning meals, buying/preparing foods, and family meal frequency, separately and in combination, to identify relationships with adolescent food intake. Baseline data were used from Latino adolescents (10–14 years, n = 191, 49% boys) participating with their fathers in a community-based overweight/obesity prevention intervention. Fathers reported sociodemographic characteristics. Adolescents reported frequency of fathers' food parenting practices, fathers' food/meal involvement, and family meals and participated in 24 h dietary recalls. The analysis included regression models using GLM (generalized linear mixed model) and PLM (post GLM processing) procedures. Most fathers were married, employed full-time, and had annual incomes below USD 50,000. Favorable fathers' food parenting practices were associated with adolescent intake of more fruit and vegetables and fewer sugar-sweetened beverages, sweets/salty snacks, and less fast food ($p < 0.05$ or $p < 0.01$). No independent effects of family meal frequency or fathers' food/meal involvement were observed on adolescent dietary outcomes. Additional analyses showed favorable food parenting practices in combination with frequent family meals were associated with adolescents having a higher intake of fruit ($p = 0.011$). Latino fathers can have an important positive influence on adolescent dietary intake.

Keywords. Latino fathers; early adolescents' consumption; fruit and vegetables; sweets/salty snacks; sugar-sweetened beverages; fast food; fathers' food parenting practices; family meals

1. Introduction

Latino family strengths that can positively influence health outcomes include protective cultural values and beliefs, such as familism (Bermudez & Mancini, 2013; L. C. Gallo et al., 2009). Familism is the core belief in the centrality of the family, which underlies the concepts of family connectedness, family involvement, and support (Behnke et al., 2008). Other protective factors are community and social support, including resources that address food security and healthy eating. Protective family strengths can contribute to strong relationships between parents and children, thus supporting positive parental involvement in adolescent food choices.

Studies have generally shown that poor eating habits were associated with excess weight gain and obesity among children and adolescents (Poorolajal et al., 2020; Rennie et al., 2005). According to recent studies, Mexican-American and other Hispanic children had lower fruit and vegetable intakes (Kim et al., 2014; Merlo et al., 2020; National Cancer Institute, 2019), and higher sugar-sweetened beverage (SSB) (Rosinger et al., 2017), sweets/salty snacks (Dunford & Popkin, 2018), and fast food (Vikraman et al., 2015) intakes than recommended by the Dietary Guidelines for Americans (DGAs) (Banfield et al., 2016) and other expert groups (World Health Organization, 2012, 2015). Current research shows that Hispanic children and adolescents had the highest obesity rates compared to other ethnic/racial groups, with about half of all Hispanic children and adolescents classified in the overweight or obese categories based on nationally representative data (Hales et al., 2017; Ogden et al., 2020; Skinner et al., 2018). Residing in urban enclaves (Zenk et al., 2017) and low-income households (Rogers et al., 2015; Weaver et al., 2019) was associated with obesity among multiethnic children and adolescents. Protective factors based on Latino family strengths can interact with risk factors to address health disparities among children and adolescents in urban, low-income households (Behnke et al., 2008).

Both maternal and paternal caregivers have an important role in preventing childhood overweight and obesity through the formation of healthy food- and activity-related behaviors among youth (Lindsay et al., 2006; Yee et al., 2017). Several reviews have identified a variety of food and activity parenting practices that influence adolescents' food and activity behaviors, including setting expectations, role modeling, and managing availability (Birch & Davison, 2001; Vaughn et al., 2016). Yet, studies have primarily focused on mothers when examining parental influence on adolescents' diets and diet-related outcomes (Yee et al., 2017), with few studies addressing the influence of fathers (Davison et al., 2016; Freeman et al., 2012; Morgan et al., 2017; T. O'Connor et al., 2018; Stewart & Menning, 2009). The existing evidence base suggests that child and adolescent behaviors are influenced by their fathers' food- and activity-related parenting practices (Litchford et al., 2020; Morgan & Young, 2017; Rahill et al., 2020). Positive associations have been observed between fathers' and children's body weight and food intake (Freeman et al., 2012; Hall et al., 2011). In a cross-sectional sample of Canadian parents of children (5–12 years), relationships among food parenting practices were similar between mothers and fathers for some children's eating behaviors but differentially associated with behaviors regarding food and satiety responsiveness (De-Jongh González et al., 2021). For example, paternal restriction for weight practices, practices to accommodate the child, and use of covert control were associated with higher child food responsiveness, while only maternal restriction for weight practices were associated with higher food responsiveness.

Research among Latino families suggests that fathers play an important role in improving their children's eating behaviors through food parenting practices and buying and preparing foods, and participating in meals (T. O'Connor et al., 2018; Parada et al., 2016; Zhang et al., 2018). A focus group study identified eight primary food and activity parenting practices reported by Latino fathers (n = 26) related to improving their children's healthy lifestyles (Zhang et al., 2018). In another focus group study, Hispanic mothers reported that fathers had behaviors that supported healthy youth behaviors, including preparing healthy meals, using healthier cooking methods, shopping for healthy food with their children, and asking the child to participate in household chores and/or play sports (Lora et al., 2017). Family meals have consistently been shown to positively influence the dietary behaviors of school-aged children and adolescents (Scaglioni et al., 2018). Studies suggested that having meals as a family played an important role in the formation of healthy eating habits among youth (Hammons & Fiese, 2011; Neumark-Sztainer et al., 2003; Scaglioni et al., 2018). However, limited and inconsistent data were available on the relationship between family meal frequency and Latino children's food behaviors and diet quality (Andaya et al., 2011; Santiago-Torres et al., 2014).

Environmental factors including fathers' food parenting practices, fathers' food/meal involvement, and family meals operate within the reciprocal determinism construct of Social Cognitive Theory to influence adolescents' dietary behaviors (Bandura & Cliffs, 1986; McAlister et al., 2008). In addition, Vaughn et al. (Vaughn et al., 2016) identified structure as one of the three fundamental constructs of food parenting practices. Within the structure construct, subconstructs included food parenting practices such as rules and limits (parents' expectations), modeling, food availability, and meal and snack routines such as food preparation and having meals with family. More frequent family meals or fathers' food/meal involvement may provide greater opportunities for fathers to communicate expectations, model healthy food intake, and influence the availability of healthy foods (Scaglioni et al., 2018). Studies have separately examined the impact of family meals and food parenting practices on the food behaviors of children in the general population (Birch & Davison, 2001; Hammons & Fiese, 2011; Neumark-Sztainer et al., 2003; Scaglioni et al., 2018; Vaughn et al., 2016; Yee et al., 2017). However, interactions between paternal food parenting practices and supportive environmental factors such as family meals have only been examined to a limited extent (Watts et al., 2017).

The existing literature indicates an examination of associations among Latino fathers' food parenting practices (i.e., setting expectations/limits, role modeling, making foods available), fathers' food/meal involvement (planning meals, buying and preparing foods with the adolescent), frequency of family meals and adolescent dietary behaviors is warranted. Therefore, the purpose of this study was to test the hypothesis that separately or in combination, favorable Latino fathers' food parenting practices, fathers' food/meal involvement, and frequent family meals are associated with greater adolescent consumption of fruit and vegetables and lower consumption of sweets/salty snacks, sugary drinks, and fast food.

2. Materials and Methods

2.1. Study Design

This cross-sectional study used baseline survey data from a convenience sample of participants in a community-based intervention project (Padres Preparados, Jóvenes Saludables-Prepared Parents, Healthy Youth) at six community sites in the Minneapolis/St. Paul metropolitan area (Zhang et al., 2019). The randomized controlled intervention trial (identifier: NCT03641521) aimed to prevent overweight and obesity among Latino adolescents (10–14 years) by improving fathers' food- and physical activity-parenting practices and youth energy balance-related behaviors. Social media, flyers, and announcements at community service centers and churches were used to recruit participants between September 2017 and February 2020. Fathers and adolescents provided consent and assent to participate in the study, respectively. Consent and assent forms explained all procedures involving educational and data collection sessions that fathers and adolescents were asked to complete in relation to the study objectives. Fathers and adolescents received separate cash compensation (USD 35 for fathers and USD 25 for adolescents) for their participation.

Baseline data were collected prior to randomization of participants into intervention and delayed-treatment control groups. The intervention group attended 8-weekly educational sessions about nutrition, physical activity, and positive food and physical activity parenting practices. The 2.5 h educational sessions were conducted in-person at churches or community centers, with trained bilingual facilitators leading the interactive sessions. Evaluation data were collected in the same settings by trained research assistants at baseline, post, and 3 months after the intervention group educational sessions. The delayed-treatment control group attended the same educational sessions after the 3-month data collection session. The data collection sessions lasted about 1 h per father/adolescent dyad including questionnaires, height and weight measurements, and dietary recall interviews. The study protocol was approved by the University of Minnesota Institutional Review Board (project identification code: 1511S80707).

2.2. Study Participants

Participants were Latino fathers or male caregivers with an adolescent (10–14 years) (n = 191 dyads). Eligibility criteria for fathers/caregivers were identifying as Latino, speaking Spanish, and having meals at least three times a week with their adolescent. Eligibility criteria for adolescents included being the child of a Latino father/caregiver and being 10-14 years of age. The intervention was intended to prevent overweight among those who were categorized as normal weight at baseline, prevent obesity among those categorized as overweight, and prevent severe obesity among those categorized as obese. At baseline, eligible fathers completed a self-administered survey in Spanish while eligible adolescents completed a self-administered survey in English and 24 h dietary recall interviews.

2.3. Sociodemographic and Household Characteristics of Participants

Fathers reported sociodemographic characteristics (age, education, employment, marital status, language spoken at home, and number of years in the US) and household characteristics (income, food security, and number of children in the home) (Appendix C). Adolescents reported their own birthdate and sex.

Food security was measured by a combination of two questions from the USDA Food Security Survey Module (Hager et al., 2010): “Within the past 12 months, we worried about whether our food would run out before we got money to buy more” and “Within the past 12 months, the food we bought just didn’t last and we didn’t have money to get more”. Response options for both questions were often true, sometimes true, and never true. If fathers responded “often” or “sometimes true” to one of the two questions, they were classified as food insecure. Prior research determined that these two questions had 78% sensitivity, 96% specificity, and convergent validity regarding the identification of food insecurity (Hager et al., 2010).

Language spoken at home was categorized as exclusively or primarily Spanish = 0, equally Spanish and English = 1, and more English than Spanish or only English = 2. Years in the US were classified according to four categories: <10 years = 0, ≥ 10–< 20 years = 1, ≥ 20–< 30 years = 2, and ≥ 30 years = 3.

2.4. Outcome Measures

2.4.1. Adolescent Dietary Intake

To estimate dietary intake, 24 h dietary recall interviews were conducted using Nutrition Data System for Research software (NDSR; Nutrition Coordinating Center, University of Minnesota). The first recall was conducted in person during the baseline data collection session, with two additional recalls completed by phone within the next 1–2 weeks. The majority of adolescents (77%) completed at least two dietary recalls, with 53% completing three recalls. Recall interviews were balanced to reflect the distribution of weekdays and weekend days. Adolescents were asked to report all foods, beverages, and water they consumed in the last 24 h. A Food Amounts Booklet, which showed illustrations of foods or abstract shapes and figures in different sizes, was provided to assist in estimating amounts consumed. Intakes were averaged across the number of recalls per adolescent and reported as servings per day. Fruit and vegetable intakes were calculated separately using the NDSR fruit category total (excluding juice) and vegetable category total (excluding fried vegetables, fried potatoes, and white potatoes). SSB intake was calculated based on reported intake of beverages categorized by the NDSR software as sugar-sweetened beverages, which included sweetened soft drinks, fruit drinks, tea, coffee, coffee substitute, and water. Sweets/salty snack intake was calculated using foods from several NDSR categories, including chips and other salty snacks, meat and vegetable-based snacks, ready-to-eat cereals, grain-based desserts, dairy desserts, candies, sugars, jams, syrups, and sweet sauces. Intake of fast food type foods was calculated using foods from several NDSR categories, including fried vegetables, fried potatoes, and fried chicken, fish, and shellfish (commercial entrée and fast food).

2.4.2. Adolescent Anthropometric Measurements

Adolescents' body weight and height were measured separately twice in a private space using a digital scale (BWB-800 Scale, Tanita, IL, USA) and a stadiometer by a trained research assistant according to standardized procedures of the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2017). BMI percentiles were generated by a SAS program for the 2000 CDC Growth Charts and categorized as underweight (<5th percentile), normal weight (5th–

<85th percentile), overweight (85th–<95th percentile), and obese (≥95th percentile) (Centers for Disease Control and Prevention, 2016).

2.4.3. Fathers' Food Parenting Practices

Adolescents reported the perceived frequency of fathers' food parenting practices (setting expectations/limits, role modeling, and making foods available at home) for intake of fruit, vegetables, SSBs, sweets/salty snacks, and fast food (Appendix D). High and low levels or frequencies for each parenting practice were created based on median values.

Adolescent-reported food parenting practice items and scales developed for this study were adapted from existing scales (Matthews-Ewald et al., 2015; Pinard et al., 2014; Singh et al., 2012) and showed internal consistency for all scales based on Cronbach α coefficients >0.7 in a preliminary study (Zhang et al., 2020). Adequate criterion validity was demonstrated for 19 of the 21 parenting practice measures based on the adolescent report. Criterion validity was indicated by significantly higher adolescent-reported consumption of fruit and vegetables; lower consumption of SSBs, sweets/salty snacks, and fast foods; greater weekly physical activity hours; and fewer daily screen time hours among adolescents who reported high vs. low levels/frequencies of supportive parenting practices. However, father-reported parenting practice items and scales only showed criterion validity for 3 of the 21 parenting practice measures. These results indicated greater consistency between perceived frequency of paternal parenting practices and adolescent behaviors when adolescents reported parenting practice frequency vs. fathers. The percentage agreement between adolescent- and father-reported dichotomized responses varied from 49% to 68% for paternal expectations/limits, 51% to 70% for modeling, and 52% to 70% for availability practices. In general, adolescents reported lower frequencies of supportive food parenting practices than fathers. Adolescent-reported food parenting practices data were used in this study instead of father-reported data based on these preliminary testing results (Zhang et al. 2020).

Setting expectations/limits. Adolescents' perceptions of father expectations for fruit and vegetable intake were measured separately for fruits and vegetables by asking, "How many times in a day do you think your father wants you to eat [fruits, vegetables]?" Response options were 0 times or I don't know, 1 time, 2 times, and 3 times or more. Adolescents' perceptions of father limits for intake of sweets/salty snacks were assessed by asking, "How often does your father allow you to [drink SSBs, eat sweets/salty snacks, eat fast food]?" Response options were no [SSBs, sweets/salty snacks, fast food] are allowed, < 1 time/week, 1–3 times/week, 4–6 times/week, and one or more times/day, as often as I want, and I don't know.

Role modeling. To evaluate adolescents' perception of father role modeling of fruit and vegetable intake, adolescents were asked to report separately how many times in a week (1) "you see your father [eat fruit, vegetables, drink SSBs, eat sweets/salty snacks, eat fast food]?" and (2) "your father eats [fruit, vegetables, SSBs, sweets/salty snacks, fast food] with you?" Response options for each question were almost never or never, <1 time/week, 1–3 times/week, 4–6 times/week, and once a day or more. Responses to the two questions for each dietary behavior were coded from 1–5, summed and averaged to create a modeling score.

Making foods available at home. Adolescents' perceptions of the frequency of father practices regarding home food availability/accessibility were assessed with three questions for each dietary behavior. Frequency of making fruit and vegetables available at home was measured by asking adolescents: "How often your father (1) buys (fruits, vegetables) (2) prepares (fruits, vegetables) for you to eat, and (3) makes a variety of (fruits, vegetables) available for you." The frequency of making SSBs, sweets/salty snacks, and fast food available at home was determined by asking adolescents three questions: "How often does your father (1) buy (SSBs, sweets/salty snacks, fast food) for you to eat, (2) prepare (SSBs, sweets/salty snacks, fast food) for you to eat, and (3) give you money to buy (SSBs, sweets/salty snacks, fast food)?" Response options for each question were almost never or never, not often, sometimes, often, and almost always or always. The responses to the three questions for each dietary behavior were coded from 1–5, summed and averaged to create an availability score.

2.4.4. Family Meals and Fathers' Food/Meal Involvement

Frequency of family meals was assessed by asking adolescents: "During the past 7 days, how many times did you eat a meal with all or most of your family?" Response options included never, 1 to 2 times, 3 to 4 times, 5 to 6 times, 7 times, and more than 7 times (Fulkerson et al., 2006). Two frequency levels of family meals were created based on median values.

Fathers' food/meal involvement was examined by asking adolescents three questions: "How often does your father plan meals together with you?" "How often does your father buy foods together with you?" and "How often does your father prepare foods together with you?" Five response options for each question (coded from 1–5) were almost never or never, not often, sometimes, often, and almost always or always. Responses of the three questions were averaged, and two levels of fathers' food/meal involvement were created based on median values.

2.5. Statistical Analysis

All analyses were conducted using SAS 9.4 (Cary, NC, USA, 2002–2012). See Appendix B for SAS codes used for data analysis in Chapter 2. Descriptive statistics were performed to report results regarding adolescent and father sociodemographic characteristics, fathers' food/meal involvement, family meals, and adolescent dietary intake. Cut-off points for fathers' parenting practices, fathers' food/meal involvement, and family meals were identified based on median analysis. The normality of adolescent dietary intake variables was assessed by visual examination of the histogram and Kolmogorov–Smirnov test.

Outliers for adolescent dietary intake data were examined using histograms and the interquartile range (IQR) formula. Intake data for a particular food group were removed from three adolescents based on values above (Q3 + 1.5 × IQR) and from one adolescent based on data entry error (a researcher entered an overestimation of fruit intake).

Adolescent dietary intake variables were not normally distributed; therefore, a square root transformation was used to approximate normality. For ease of interpretation of the results, non-transformed least-square means were presented with the p-values based on models including transformed variables.

Multiple linear regression models were used to examine adolescent intake (dependent variables) and fathers' food/meal involvement and family meals variables alone and fathers' food parenting practice variables alone (independent variables). Models were adjusted for adolescent age and sex and other sociodemographic father and/or adolescent characteristics based on results of preliminary comparison testing. Unstandardized coefficients represented the change in mean daily servings of adolescent dietary intake as a function of the independent variables.

Another set of regression models of adolescent dietary intake included fathers' food/meal involvement, family meals, fathers' food parenting practices, and their interactions. Models were examined using GLM (generalized linear mixed model) procedures adjusted for adolescent age and sex and sociodemographic variables based on preliminary comparison testing. For models with interactions (identified with a p-value < 0.10), the simple effects of each fathers' food parenting practice within each fathers' food/meal involvement and family meals category were calculated using slice statements and PLM (post GLM processing) procedures with Bonferroni corrections for multiple comparisons. Results of the models were presented as adjusted means and 95% CI. A p-value <0.05 was considered statistically significant.

3. Results

After screening for eligibility (n = 277) and accounting for those not attending baseline data collection sessions (n = 86), data from a total of 191 father/adolescent dyads were available for analysis for this study. Enrollment was evenly divided for boys and girls and approximately evenly divided for ages 10–11 years and 12–14 years (Table 2.1). One child was 8 years old during screening but turned 9 during the intervention, 2 others were 14 years old during screening but turned 15 during the intervention. Slightly more than half of the fathers were 41 years or older (56%), with 92% living with a spouse or partner. The distribution of fathers' educational attainment showed that 20% had completed some college or more, 43% had a high school diploma or GED (General Education Development test that shows high school academic knowledge), and 37% had not completed high school. Approximately 75% of the fathers were employed full-time. The majority of the fathers reported yearly household income of ≤USD 49,999 (84%). The majority reported being food secure (63%) while 37% reported being food insecure. Most reported speaking exclusively or primarily Spanish at home (84%).

Nearly half of the adolescents (47%) reported having family meals ≥7 times a week vs. ≤6 times a week (Table 2.1). About half (49%) reported that their father was involved often or always vs. never to sometimes in planning meals, buying, and preparing foods with them. The majority of adolescents (58%) were classified in the overweight or obese category.

Table 2.1. Adolescent/father dyad sociodemographic characteristics and adolescent perceptions of family meals, father food/meal involvement, and adolescent dietary intake (n= 191)[a].

Participants' Characteristics		**n (%)[ab] or mean ± SD**
Adolescent demographic characteristics		
Sex		
	Male	92 (49)
	Female	96 (51)
Age		
	9- ≤11 years	93 (49)
	≥12 years	96 (51)
Father demographic characteristics		
Age		
	20 - ≤40 years	84 (44)
	≥41 years	105 (56)
Education		
	Middle school or lower	70 (37)
	GED or high school	80 (43)
	Some college or higher	37 (20)
Employment		
	Self-employed	27 (15)
	Unemployed	7 (4)
	Part-time employed	12 (6)
	Full-time employed	136 (75)
Marital status		
	Single	14 (8)
	Married or with partner	172 (92)
Household income		
	≤ $24,999	73 (40)
	$25,000- ≤$49,999	80 (44)
	$50,00- ≤$99,999	29 (16)
Language spoken at home		
	Exclusive or primarily Spanish	158 (84)
	Equally Spanish and English	27 (14)

	More English than Spanish or only English	3 (2)
Food security[c]		
	Food secure	120 (63)
	Food insecure	71 (37)
Number of children in the home		2.6 ± 1.2
Number of years in the US		19.2 ± 6.5
Family meals[d]		
	Less often	100 (53)
	More often	90 (47)
Father food/meal involvement[e]		
	Less often	96 (51)
	More often	94 (49)
Adolescent intake[f]		
	Fruit, servings/day	1.1 ± 1.3
	Vegetable, servings/day	1.5 ± 1.2
	SSB, servings/day	0.5 ± 0.7
	Sweets/salty snacks, servings/day	1.7 ± 1.4
	Fast food, servings/day	0.4 ± 0.8
Adolescent BMI group		
	Underweight: <5th percentile	2 (1)
	Normal weight: 5th–<85th percentile	74 (41)
	Overweight: 85th–<95th percentile	46 (26)
	Obese: ≥95th percentile	58 (32)

[a]All data were reported by adolescents except for father demographic characteristics
[b]Some percentages may not add up to 100 due to rounding.
[c]Food security was determined by combining responses to two questions from the USDA Food Security Module about the food eaten in the participant's household and whether they were able to afford the food they needed.
[d]Frequency responses for family meals questions were never, 1 to 2 times, 3 to 4 times, 5 to 6 times, 7 times, and more than 7 times in a week and categorized as less often (≤ 5-6 times/week) and more often (≥ 7 times/week).
[e]Frequency responses for three father food/meal involvement (father involvement in planning, buying, and preparing foods with their adolescent) questions were almost never or never = 1, not often = 2, sometimes = 3, often = 4, and almost always or always = 5). Responses were averaged and categorized as less often (≤3) and more often (>3).
[f]Intake based on adolescent 24-hour dietary recalls using NDSR software.

3.1. Sociodemographic Differences in Adolescent Dietary Intake

SSB intake among adolescents with fathers who participated in financial assistance programs (mean = 0.3 serving/day, SD = 0.4) was lower compared to those with fathers who did not participate (mean = 0.5, SD = 0.7, p = 0.008). Fast food intake by adolescents with a single father (mean = 0.9 serving/day, SD = 1.0) was higher than those with a married father (mean = 0.4, SD = 0.8, p = 0.020). No other differences were observed by the remaining fathers' or households' demographic characteristics (data not shown).

3.2. Associations among Family Meals, Fathers' Food/Meal Involvement, Fathers' Food Parenting Practices, and Adolescent Dietary Intake

Based on adjusted linear regression models, no significant associations were observed among the frequency of family meals, fathers' food/meal involvement, and adolescent intakes of fruit, vegetables, SSBs, sweets/salty snacks, and fast food (data not shown).

Adjusted models indicated that adolescent fruit intake was higher when fathers made fruits available at home more often ($\beta = 0.45$, $p = 0.011$) (Table 2.2). Adolescent vegetable intake was higher when fathers modeled intake of vegetables more often and made vegetables available at home more often ($\beta = 0.59$, $p = 0.002$ and $\beta = 0.41$, $p = 0.021$, respectively).

Adolescent SSB intake was lower when fathers set lower limits for SSB intake and fathers made SSBs available at home less often ($\beta = -0.19$, $p = 0.025$ and $\beta = -0.17$, $p = 0.037$, respectively) (Table 2.3). Adolescent intake of sweets/salty snacks was lower when fathers modeled intake of sweets/salty snacks less often ($\beta = -0.93$, $p = 0.001$) and when fathers made sweets/salty snacks available at home less often ($\beta = -0.61$, $p = 0.013$). Adolescent fast food intake was lower when fathers set lower limits for fast food intake ($\beta = -0.37$, $p = 0.015$).

Table 2.2. Adjusted associations between adolescent-reported fruit and vegetable intake and fathers' food parenting practices (n = 191)[a].

Fruit Parenting Practices	**Unstandardized Regression Coefficients (95% CI) for Fruit Intake [b]**	**Vegetable Parenting Practices**	**Unstandardized Regression Coefficients (95% CI) for Vegetable Intake [b]**
Setting Expectations [c]		Setting Expectations [c]	
Low intake	Ref.	Low intake	Ref.
High intake	0.25 (−0.18, 0.68)	High intake	0.13 (−0.32, 0.58)
Role modeling [d]		Role modeling [d]	
Less often	Ref.	Less often	Ref.
More often	0.18 (−0.21, 0.56)	More often	0.59 (0.23, 0.95) **
Making available at home [e]		Making available at home [e]	
Less often	Ref.	Less often	Ref.
More often	0.45 (0.07, 0.82) *	More often	0.41 (0.05, 0.78) *

[a] Between-group comparisons were conducted using multiple linear regression analyses, * *p*-value < 0.05, ** *p*-value < 0.01. [b] All models were adjusted for adolescent age and sex. [c] Setting expectations for fruit and vegetable intake was based on one item each assessing how frequently fathers wanted their adolescents to eat (fruit, vegetables) in a day: 0 times, 1 time, 2 times, 3 times or more, and I don't know (I don't know option was treated as missing). Expected intake levels were low intake ≤2 times/day and high intake ≥3 times/day. A high intake level was considered favorable. [d] Role modeling was based on the average of two items, each assessing how many times adolescents saw their father eat these foods and how many times their father ate these foods with them: almost never or never, <1 time/week, 1–3 times/week, 4–6 times/week, and once a day or more. Fruit and vegetable modeling levels were less often (≤1–3 times/week) and more often (≥4–6 times/week). Modeling intake of fruits and vegetables more often were considered favorable. [e] Making fruit and vegetables available at home was based on the average of three items, each assessing frequency of fathers buying, preparing, and making sure adolescents have different kinds: almost never or never = 1, not often = 2, sometimes = 3, often = 4, and almost always or always = 5. Fruit availability levels were less often (<3.6) and more often (≥3.6). Vegetable availability levels were less often (<3.3) and more often (≥3.3). Making fruits and vegetables available at home more often was considered favorable.

Table 2.3. Adjusted associations between adolescent-reported sweets/salty snack, SSB, and fast food intakes and fathers' food parenting practices (n = 191)[a].

SSB [b] Parenting Practices	**Unstandardized Regression Coefficients (95% CI) for SSB Intake [c]**	**Sweets/Salty Snacks Parenting Practices**	**Unstandardized Regression Coefficients (95% CI) for Sweets/Salty Snack Intake [c]**	**Fast Food Parenting Practices**	**Unstandardized Regression Coefficients (95% CI) for Fast Food Intake [c]**
Setting Limits [d]		Setting Limits [d]		Setting Limits [d]	
Low intake	−0.19 (−0.40, 0.03) *	Low intake	−0.33 (−0.91, 0.26)	Low intake	−0.37 (−0.65, −0.10) *
High intake	Ref.	High intake	Ref.	High intake	Ref.
Role modeling [e]		Role modeling [e]		Role modeling [e]	
Less often	−0.00 (−0.21, 0.20)	Less often	−0.93 (−1.45, −0.42) **	Less often	−0.10 (−0.38, 0.19)
More often	Ref.	More often	Ref.	More often	Ref.
Making available at home [f]		Making available at home [f]		Making available at home [f]	
Less often	−0.17 (−0.38, 0.04) *	Less often	−0.61 (−1.05, −0.18) *	Less often	−0.13 (−0.39, 0.12)
More often	Ref.	More often	Ref.	More often	Ref.

[a] Between-group comparisons were conducted using multiple linear regression analyses, * *p*-value < 0.05, ** *p*-value < 0.01. [b] SSB = Sugar-sweetened beverages. [c] All models were adjusted for adolescent age and sex. Models with adolescent SSB intake and SSB parenting practices were also adjusted for household participation in financial assistance programs; models with adolescent sweets/salty snack intake and sweets/snack parenting practices, and fast food intake and fast food parenting practices were also adjusted for fathers' marital status. [d] Setting limits for SSBs, sweets/salty snacks, and fast food intakes were based on one item assessing how frequently fathers allowed their adolescent to [drink SSBs, eat sweets/salty snacks, eat fast food] with response options: no [SSBs, sweets/salty snacks, fast food] are allowed, <1 time/week, 1–3 times/week, 4–6 times/week, and one or more times/day, as often as I want, and I don't know (I don't know was treated as missing). Expected intake levels for SSBs and sweets/salty snack intake were low intake (≤1–3 times/week) and high intake (≥4–6 times/week). Expected intake levels for fast food intake were low intake (less than 1 time/week) and high intake (≥1–3 times/week). A low expected intake level for SSBs, sweets/salty snacks and fast food was considered favorable. [e] Role modeling was based on the average of two items, each assessing how many times adolescents saw their father eat these foods and how many times their father ate these foods with them with response options: almost never or never, <1 time/week, 1–3 times/week, 4–6 times/week, and once a day or more for SSBs, sweets/salty snacks. Levels of role modeling for SSBs, sweets/salty snacks, and fast food were less often (<1 time/week) and more often (≥1–3 times/week). Modeling intake of SSBs, sweets/salty snacks, and fast food less often were considered favorable. [f] Making sweets/salty snacks, SSBs, and fast food available at home was based on the average of three items assessing frequency of fathers buying, preparing, and giving adolescents money to buy with response options: almost never or never = 1, not often = 2, sometimes = 3, often = 4, and almost always or always = 5. Levels of availability were less often (<2) and more often (≥2). Making SSBs, sweets/salty snacks, and fast food available less often was considered favorable.

3.3. Interactive Associations of Fathers' Food/Meal Involvement, Family Meals, and Fathers' Food Parenting Practices on Adolescent Dietary Intake

A notable interaction was observed based on the regression model with adolescent fruit intake, family meal frequency and father fruit expectations ($p < 0.10$). Adolescent fruit intake was significantly higher when fathers set higher expectations for fruit intake and family meals were more frequent vs. less frequent (1.2 fruit servings/day, CI = [0.80, 1.57] vs. 0.5 fruit servings/day, CI = [0.24, 0.85], $p = 0.011$).

An interaction was also observed for sweets/salty snacks intake, fathers' food/meal involvement, and fathers making sweets/salty snacks available at home ($p < 0.10$). Adolescent intake of sweets/salty snacks was significantly lower when fathers were involved less often in planning meals, buying and preparing foods with the adolescent (unfavorable) and when fathers made sweets/salty snacks available at home less vs. more often (favorable) (0.9 sweets/salty snack servings/day, CI = [0.57, 1.22] vs. 1.9 sweets/salty snack servings/day, Cl = [1.43, 2.44], $p = 0.001$).

An interaction was observed with adolescent SSB intake, fathers' food/meal involvement, and father SSB modeling ($p < 0.10$). Adolescent SSB intake was significantly lower when fathers modeled intake of SSBs more often (unfavorable) and when fathers were involved less vs. more often in planning meals and buying and preparing foods with the adolescent (unfavorable) (0.1 SSB servings/day, CI = [0.02, 0.25] vs. 0.4 SSB servings/day, CI = [0.21, 0.59]. $p = 0.017$). Interactions from the remaining models examined did not yield $p < 0.10$.

4. Discussion

This cross-sectional study examined the influence of Latino fathers' food parenting practices, family meals, and fathers' food/meal involvement on adolescent fruit, vegetable, SSB, sweets/salty snack, and fast food consumption separately and in combination. When examined separately, Latino fathers' food parenting practices were associated with higher healthy food intake and lower unhealthy food intake by adolescents, similar to the general parenting practice literature (Litchford et al., 2020; Loth et al., 2016; Watts et al., 2017). However, Latino fathers' food/meal involvement and family meal frequency were not independently associated with adolescent food intake, which was unexpected. When interactions were examined, a limited number of associations were observed among adolescent dietary intake and combinations of family meal frequency, fathers' food/meal involvement and fathers' food parenting practices.

Parents may encourage healthy dietary behaviors among adolescents by providing healthy foods at home and being positive role models by eating foods such as fruits and vegetables with their adolescent. Previous studies involving predominantly mothers showed that parental modeling and home food availability were associated with youth dietary intake (Couch et al., 2014; De Bourdeaudhuij et al., 2008; Fleary & Ettienne, 2019; Granner et al., 2004; Loth et al., 2016). The current study lends continued support to those findings by also showing that father modeling and making foods available predicted adolescents' dietary consumption. Latino fathers' modeling and making foods available may have been associated with adolescent consumption in part because Latino fathers have increased their level of involvement in food preparation at home over time (Taillie, 2018). Taillie et al. (2018) (Taillie, 2018) showed in a U.S. nationally representative sample that from 2003 to 2016, the proportion of Hispanic fathers who cooked at home increased from 31.2% to 41.6%, and so did time spent cooking. In the current study, about half of the adolescents reported that their fathers were often or always involved in planning, buying, and preparing foods with them.

The current findings showed that adolescent fast food intake was lower when adolescents perceived that their fathers set limits for fast food intake for them. In contrast, Latino mothers reported that fathers had unsupportive food behaviors for children, including bringing high-calorie foods (e.g., pizza) and sugary drinks into the home (Lora et al., 2017). NHANES 2011–2016 data showed that Hispanic/Latino men worked more outside the home and were more likely to eat meals away from home compared to women (Overcash & Reicks, 2021). Findings from the current study indicated that as reported by adolescents, Latino fathers may have recognized the need to limit fast food intake for their adolescents, while other studies indicate that time constraints and environmental conditions may not always support favorable paternal parenting practices. However, the youth in the current study were interested in enrolling in a father/adolescent nutrition and physical activity health intervention, and therefore may not have had similar perceptions regarding their fathers' limits on fast food intake as a general Latino adolescent population.

The frequency of meals as a family has generally been related to adolescents' food choices (Hammons & Fiese, 2011; Scaglioni et al., 2018; Watts et al., 2018) with some evidence indicating that it may also be related to dietary behaviors of Latino adolescents (Andaya et al., 2011; Ortega-Avila et al., 2019). The findings from the current study did not show an independent association between the frequency of family meals and adolescents' dietary intake. Similarly, a previous study involving urban Hispanic adolescents (10–14 years) did not show an association between family meal frequency and youth Healthy Eating Index (HEI) scores (Santiago-Torres et al., 2014). However, the frequency of family meals while watching TV was associated with lower HEI scores (Santiago-Torres et al., 2014), indicating that other habits in conjunction with family meals may exert an influence on youth food choices and diet quality. Other contextual factors, such as TV viewing during family meals, were not examined in the current study.

The present study found that Latino adolescents had higher fruit intake when the combination of adolescent perceptions of fathers setting higher expectations for fruit intake and frequent family meals were considered. The cultural value of family connectedness among Latino families, which promotes the frequency of family meals, may have contributed to opportunities where fathers could engage in favorable parenting practices. The findings from the current study are further supported by a study with urban adolescents (including ~34% Hispanic adolescents), which showed a strong association between greater fruit and vegetable intake and frequent family meals (≥5 times/week) in combination with favorable food parenting practices (Watts et al., 2017).

The results from the current study indicated that Latino adolescent consumption of sweets/salty snacks was lower when adolescents perceived that their fathers modeled intake of sweets/salty snacks less often and made sweets/salty snacks available at home less often. These findings are consistent with a previous study showing that adolescent intake of sweets/salty snacks was lower when parents had favorable modeling practices (Loth et al., 2016) and another study indicating that less frequent home snack availability was associated with lower snack intake among children (Pearson et al., 2011). Snacking constitutes about one-third of the daily energy intake among US children and adolescents, with desserts, salty snacks, and SSBs as the major sources of calories from snacks (Piernas & Popkin, 2010). According to the findings from dietary recalls of eight nationally representative surveys from 1977 to 2014, average energy intake from snacks among Mexican-American children aged 2–18 significantly increased from 205 to 453 kcals per snacking occasion (Dunford & Popkin, 2018). Nationally representative data from 1977 to 2012 also showed that average energy intake from snacks per Hispanic adult significantly increased from 167 to 418 kcals per day (Dunford & Popkin, 2017). Based on adolescent perceptions from the current study, Latino fathers' engagement in parenting practices that lower adolescent sweets/salty snack intake may be an important intervention target to decrease intake of energy-dense, nutrient-poor foods consumed as snacks.

The current study also showed that adolescent intake of sweets/salty snacks was lower when adolescents perceived that fathers made snacks available at home less often but were less often involved in planning meals, buying, and preparing foods. The extent of fathers' involvement in the meal planning/food preparation process was shown to have increased over time (Taillie, 2018) but it still might be related to traditional Latino gender roles, which view mothers as being responsible for cooking meals while fathers support their families financially (Lam et al., 2012). A qualitative study showed that Latino fathers reported doing less food work, including buying foods, cooking, and dietary decision-making for the family compared to mothers (Fielding-Singh, 2017). Another study used data from two linked population-based studies with diverse parents and adolescents and showed that the proportion of fathers who reported they "usually" prepared food for the family was lower than mothers for all races/ethnicities (Berge et al., 2016). However, the findings from the current study showed that fathers can still improve their children's dietary intake by not making these foods available at home regardless of which parent is most often involved in the meal planning/food preparation process.

The strengths of this study include its large population-based sample of Latino adolescents and their fathers or male caregivers, the comprehensive examination of adolescent dietary intake, and ability to examine associations with multiple fathers' food parenting practices in conjunction with family meal frequency and fathers' food/meal involvement. Another strength was the use of adolescent-reported paternal parenting practice frequency, which was shown to have better criterion validity with adolescent behaviors than father report in a preliminary study (Zhang et al., 2020). This study had several limitations, which should be considered when interpreting the results. Errors in adolescent dietary intake data may have resulted from poor recall or social desirability leading to over-reporting fruit and vegetable intakes and under-reporting intake of sweets/salty snacks, SSBs, and fast food. Additionally, the findings may not be generalizable to the broader Latino population in the US because study participants were recruited from a limited geographical area, and most were from low-income families. Furthermore, two study sites were community centers that regularly offered other health and nutrition classes; thus, the fathers and youth who agreed to participate in the study might have enrolled due to their interest in nutrition and health, which makes them different from the general population. Monetary incentives may also have influenced decisions to enroll in the study. Finally, data on adolescent perceptions of mothers' parenting practices and food/meal involvement were not collected; therefore, these findings could not be shared or integrated into the discussion.

5. Conclusions

The current study addressed a gap in the literature by examining how Latino fathers' parenting practices, food/meal involvement, and family meals were separately and in combination related to dietary intake among Latino adolescents. Understanding how fathers' parenting practices influence adolescent intake may be improved if other contextual factors such as eating as a family are also considered. These findings emphasize the importance of including fathers in behavioral and family-based research to prevent overweight and obesity among adolescents. Interventions intended to improve adolescent diet and health may become more effective by including a focus on fathers' parenting practices and family meals.

Chapter 3. Padres Preparados, Jóvenes Saludables: Intervention Impact and Dose Effects of a Randomized Controlled Trial on Latino Father and Adolescent Energy Balance-Related Behaviors

Overview

Background: Studies have shown associations among food and activity behaviors and body weight of Latino fathers and adolescents. However, few Latino father-focused interventions have been designed to improve energy balance-related behaviors (EBRBs) and weight status among early adolescents. Thus, this efficacy study aims to evaluate the Padres Preparados, Jóvenes Saludables (Padres) youth obesity prevention program and dose for positive changes in EBRBs (fruit, vegetable, SSB, sweet/salty snack, and fast food consumption, physical activity, and screen time) and weight status among low-income Latino fathers and adolescents (10-14 years).

Methods: A two-arm (treatment versus delayed-treatment control group) randomized controlled trial was conducted to evaluate the efficacy of 8 weekly experiential learning sessions (2.5 hours each) based on social cognitive theory. The sessions included food preparation, parenting skills, nutrition, and physical activity. The program was delivered to father-adolescent dyads (mothers were encouraged to attend) in trusted community-based settings in a Midwest metropolitan area. Surveys and measurements were completed by families to assess changes in food and activity behaviors at baseline and post-intervention. Adolescents also completed 24-hour dietary recall interviews at baseline and post-intervention. Intervention and dose effects were assessed using mixed models adjusted for covariates.

Results: Data from 103 fathers and 110 adolescents who completed data collection procedures were used. Reductions from baseline to post-intervention for fathers' intake of SSBs, sweet/salty snacks, and fast food were observed in the intervention group but not in the control group. Intervention fathers also had lower odds of high post sweet/salty snack intake compared to control fathers. Significant father intervention dose effects were shown for fathers' consumption of SSBs, sweet/salty snacks, and fast food. No significant differences were observed for changes in adolescents' EBRBs or BMI percentile between treatment and control groups. Significant father/adolescent intervention dose effects were found for adolescent sweet/salty snacks intake. Father/adolescent and mother intervention dose effects were observed for adolescent fast food intake and BMI percentile.

Conclusions: The Padres program led to improvement in some father EBRBs and intervention dose effects on adolescent and father behaviors. Additional Latino family focused interventions are needed to examine intervention and dose effects on EBRBs among Latino adolescents.

Trial registration: The Padres Preparados, Jóvenes Saludables study is registered with the U.S. National Library of Medicine, ClinicalTrials.gov Identifier: NCT03469752 (19/03/2018).

Keywords. child obesity prevention, community-based intervention, randomized control trial, intervention, Latino adolescents, Latino fathers, energy balance-related behaviors

1. Background

Childhood obesity is a major public health concern. U.S. nationally representative data from 2015-2018 indicate the prevalence of obesity among Mexican American children (6-11 years) and adolescents (12-19 years) is 28.2% and 30.6%, respectively (Ogden et al., 2020). Childhood obesity is a health risk factor that can affect adult obesity, diabetes, metabolic disorders, and heart disease (Gordon-Larsen et al., 2010; World Health Organization and World Obesity, 2018). In addition, overweight/obese children can experience lower self-esteem, a higher likelihood of being bullied, lower school attendance levels and performance, and fewer job prospects and lower-paid employment as an adult compared to children with a BMI below the 85th percentile (World Health Organization and World Obesity, 2018). Individual, socioeconomic, and environmetal factors that increase the risk of childhood obesity include calorie dense, nutrient poor food choices, sedentariness, low caregiver education, household poverty, lack of access to physical activity resources, and living in a food desert (Hruby & Hu, 2015).

The behavioral determinants of excessive weight gain and obesity for children and adolescents include energy balance-related behaviors (EBRBs), namely high intake of energy-dense foods, low levels of physical activity, and frequent screen time (Poorolajal et al., 2020; Rennie et al., 2005). Mexican American and other Hispanic children, like many Americans, under consume fruits and vegetables (Kim et al., 2014; Merlo et al., 2020) and have excessive intakes of sugar-sweetened beverages (SSBs) (Rosinger et al., 2017), sweet/salty snacks (Dunford & Popkin, 2018), and fast food (Vikraman et al., 2015) compared to Dietary Guidelines for Americans (DGAs) recommendations (Banfield et al., 2016; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). Mexican American and other Hispanic children also have lower levels of physical activity and higher levels of screen time than U.S. national recommendations(National Physical Activity Plan Alliance, 2018; U.S. Department of Health and Human Services, 2018; Ways to Enhance Children's Activity and Nutrition (WE CAN), 2013; Yang et al., 2019). National data also show that US Hispanic/Latino adults have unhealthy dietary behaviors (Overcash & Reicks, 2021) that do not meet DGA recommendations. Only about half (51.1%) of U.S.

Hispanic/Latino men and one third of Hispanic/Latino women (31.3%) have adequate levels of moderate to vigorous physical activity per week (Arredondo et al., 2016) based on U.S. national recommendations (U.S. Department of Health and Human Services, 2018).

Family resilience, which refers to the ability to meet challenges to effective functioning, has four domains related to the health and wellbeing of Latino families, including individual factors, family strengths, cultural values, and community support (Bermudez & Mancini, 2013). Familism is a well-studied cultural value that has been identified as a protective factor for Latino families because of its association with family cohesion, functioning, and communication (Avalos et al., 2020; Bermudez & Mancini, 2013). Parents (including fathers and other male caregivers) can play a crucial role in preventing obesity through the development of healthy food- and activity-related behaviors among adolescents (Lindsay et al., 2006). Thus, focusing on the protective factors such as familism and family resilience in obesity prevention interventions with Latino families can foster positive parental involvement in EBRBs by both mothers and fathers.

Yet, most studies primarily focus on mothers when examining parental influence on adolescent's diet with little attention on the role of the father (Davison et al., 2016). Qualitative studies with Latino mothers (Davis et al., 2016; Lora et al., 2017), fathers (Yavuz et al., 2018), and both mothers and fathers (De Grubb et al., 2018; Turner et al., 2014) indicate that participants perceive mothers as having the primary responsibility for their children's dietary behaviors, which may influence the level of fathers' involvement. A review of qualitative and cross-sectional studies indicated that Latino fathers are more engaged in children's physical activity related behaviors than dietary behaviors (T. O'Connor et al., 2018).

Latino fathers are underrepresented in existing obesity prevention interventions that promote a healthy lifestyle for Latino families (Ash et al., 2017). Several studies indicate child and adolescent EBRBs are influenced by father food- and activity-related parenting practices (Davison et al., 2003; Lloyd et al., 2014). Positive associations are observed between fathers' and children's body weight, food intake, physical activity, and screen time (Freeman et al., 2012; Hall et al., 2011; Neshteruk et al., 2017). Many interventions have been conducted to prevent childhood obesity with varying levels of parent involvement (Al-Khudairy et al., 2017; Ells et al., 2018; Yavuz et al., 2015). Some have targeted the food- and activity-related parenting practices of Latino parents (Barkin et al., 2012; Otterbach et al., 2018; Sadeghi et al., 2017). Fewer interventions overall have focused primarily on fathers and their influence on the obesogenic behaviors of children and adolescents (Morgan et al., 2017).

Intervention dose is commonly defined by three parameters - length of sessions, number of sessions, and intervention duration, which are related to participant exposure to program content and skill building (Jaka et al., 2016). A systematic review of 42 lifestyle interventions to decrease excessive weight with parents and children showed significant reductions in children's weight status when participants were exposed to 26 or more hours of intervention contact (E. A. O'Connor et al., 2017), whereas another systematic review with 133 studies did not demonstrate clear associations between intervention dose and children's weight-related outcomes (Heerman et al., 2020). Limited studies are available to determine the adequacy of intervention dose or duration needed to support childhood obesity prevention programs for underrepresented communities (Heerman et al., 2017, 2020). Existing obesity prevention programs may not be able to maximize dose if programs are perceived as being too lengthy for underserved families and too costly for community implementing organizations. Relationships between intervention dose and weight-related outcomes need to be evaluated among programs involving Latino parents and adolescents.

The Padres Preparados, Jóvenes Saludables (Padres) program was developed and implemented from 2017-2020 to address the lack of childhood obesity prevention interventions focused on Latino fathers in low-income families. The Padres program was adapted from an existing successful community-based parenting skills education program to prevent substance use among Latino parents and adolescents (Allen et al., 2012). Community partners and Latino parents (Allen et al., 2012) had requested additional education programs to address obesity prevention among Latino early adolescents. The format, length, session structure, and content of the Padres program were designed based on Latino fathers' feedback related to their beliefs, parenting experiences, and program preferences provided in father advisory board meetings and focus group discussions

(Zhang et al., 2018). Consistent with the principles of community-based participatory research (CBPR) (Arroyo-Johnson et al., 2015), community partners were engaged with researchers in all steps of the program design and implementation process. The Padres program curriculum was based on social cognitive theory (Bandura & Cliffs, 1986; McAlister et al., 2008) because health and lifestyle behaviors are influenced by personal, social, and environmental factors (Bandura & Cliffs, 1986; McAlister et al., 2008). For low-income families, these factors may include availability of community resources, family culture, education, social norms, employment, and chronic life stressors (Ganter et al., 2015). The purpose of the current study is to assess whether Latino father and adolescent EBRBs, father BMI, and adolescent BMI percentile differed from baseline to post-intervention. This study also assesses intervention dose effect on fathers' and adolescents' EBRBs and weight status outcomes.

2. Methods

2.1. Study Design and Sample

Padres Preparados, Jóvenes Saludables - Prepared Parents, Healthy Youth, was a community-based intervention project implemented in-person at four locations in the Minneapolis/St. Paul metropolitan area between September 2017 and December 2019 (Zhang et al., 2019). The randomized controlled intervention trial aimed to prevent overweight and obesity among Latino adolescents (10-14 years) by improving individual, social, physical, and environmental factors related to fathers' and adolescents' EBRBs.

Flyers, announcements, and social media were used to recruit participants at community service centers and churches. Participants were Latino fathers or male caregivers with an adolescent (10-14 years). Eligibility criteria for fathers/caregivers were identifying as Latino, speaking Spanish, and having meals at least three times a week with their adolescent. While fathers and adolescents were the primary research participants, mothers were encouraged to attend sessions and complete data collection procedures. Fathers and mothers provided consent and adolescents provided assent to participate in the study. Fathers and adolescents received separate cash compensation for their participation. The study protocol was approved by the University of Minnesota.

Institutional Review Board and retrospectively registered at ClinicalTrials.gov: Identifier NCT03469752).

Self-administered surveys were completed in-person by fathers in Spanish (Appendix C) and by youth in English (Appendix D) at baseline and post-data collection (one week after eight sessions) with height and weight measured for all participants. In addition, 24-hour dietary recall interviews were conducted with youth at baseline and post-data collection to determine intervention effectiveness.

Following baseline data collection, father/adolescent dyads were randomized to an intervention or delayed-treatment control group. The study statistician used SAS to generate separate randomization schedules for each site following block randomization procedures. Random assignments were printed on colored paper slips and placed in sequentially numbered opaque envelopes to be distributed to enrolled families by the project coordinator. Incorrect assignments were made for several dyads based on misinterpretation of the group assignment by participants. For those who were incorrectly assigned, the group assignment for analysis was based on whether they attended the intervention or delayed-treatment control group sessions.

Father and youth dyads assigned to the intervention condition participated in the program immediately. Father and youth dyads assigned to the delayed-treatment control condition participated in the program three months after the post-data collection.

2.2. Study Intervention

The Padres program curriculum consisted of eight in-person, 2.5-hour weekly group sessions based on a conceptual model described in Figure 3.1. Parents and adolescents participated in skill-building activities together and separately in parent only, youth only, or parent/youth joint activities (Appendix F, Table S1). Each session included food preparation, eating a meal together, parenting skills education, nutrition/physical activity education (together and separately), and physical activity (together). Participants prepared culturally tailored, simple recipes to support the nutrition concepts included in the sessions. Group physical activities were those that could easily be done indoors or outdoors regardless of time and resource constraints. Education for parents focused on parenting skills related to parent-child interactions and food- and activity-related parenting practices. Education for youth focused on EBRBs and building strong family communication and connections. Parent and youth joint activities involved explanations of basic nutrition and physical activity concepts and hands-on practice/discussion based on their experiences. The intervention highlighted healthy eating and physical activity and its association with overall health instead of weight loss (Appendix F, Table S2). Discussion guide handouts and take-home activity sheets were provided at each session.

Parent intervention group sessions were delivered in Spanish by two trained bilingual facilitators who were parents themselves (one male and one female). Facilitators were Extension educators, community partner staff members, or participants in previous Extension parenting classes. Youth intervention group sessions were taught in English by two trained community partner staff members or graduate or undergraduate research assistants.

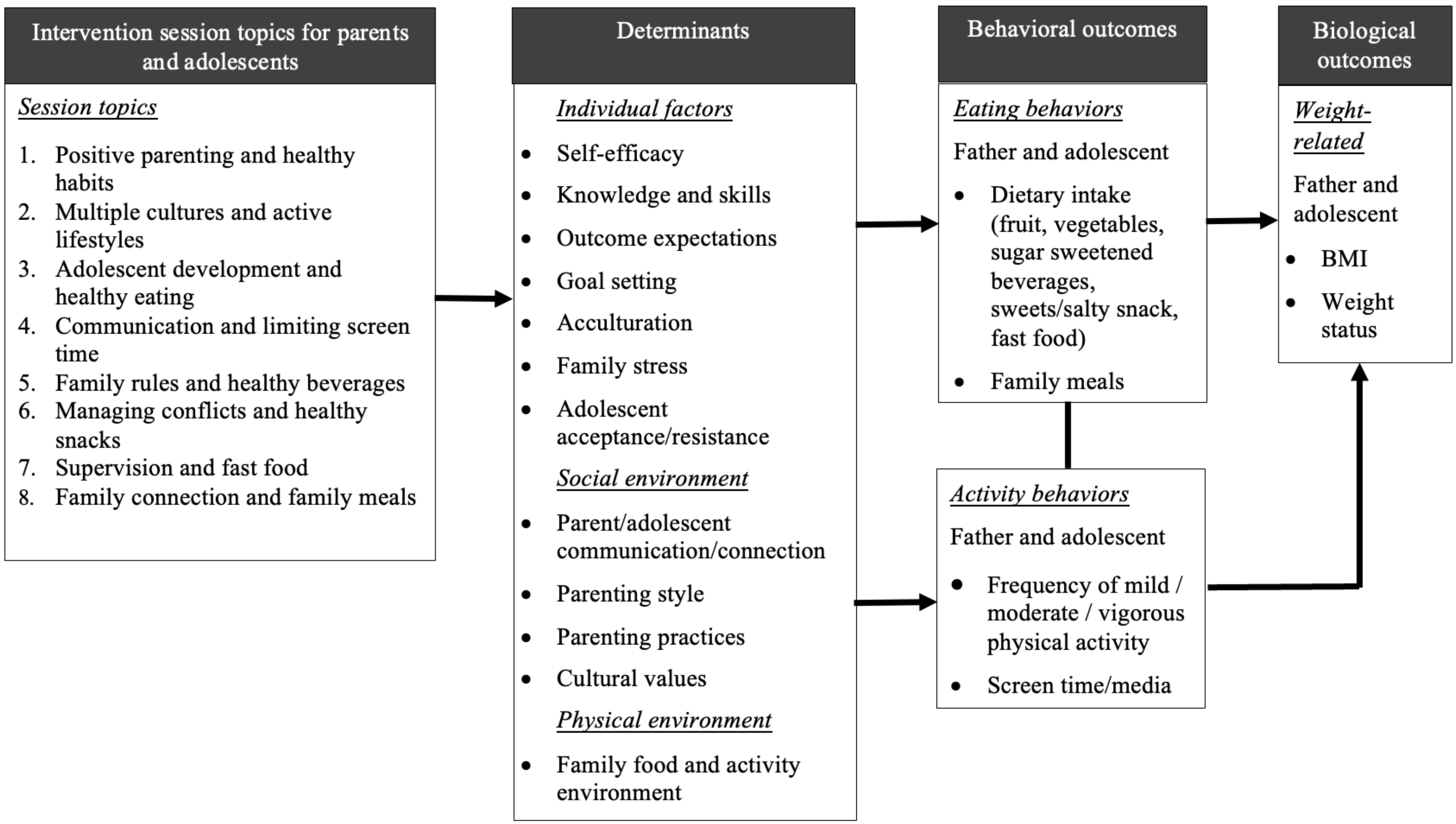


Figure 3.1. Padres Preparados, Jóvenes Saludables Program Conceptual Model.

2.3. Sociodemographic Characteristics

Fathers completed surveys to provide information about their age, years in the U.S., education, employment status, marital status, family monthly income, and language spoken at home. Adolescents reported their birthdates and sex.

Adolescent's age was calculated by subtracting birth date from the date of baseline data collection and then dividing by 365 per year. Education was classified as middle school or lower, general education development test that shows high school academic knowledge (GED) or high school, and some college or higher. Employment was collapsed into four categories: self-employed, unemployed, part-time employed, and full-time employed. Marital status was classified as single, married, or with a partner.

Food security was assessed by asking fathers the following questions from the USDA Food Security Module (Hager et al., 2010) "Within the past 12 months, we worried about whether our food would run out before we got money to buy more" and "Within the past 12 months, the food we bought just didn't last and we didn't have money to get more." Response options were often true, sometimes true, never true. If fathers responded often or sometimes true to one of the two questions, they were classified as food insecure.

The question that assessed language spoken at home had five response options as "Spanish only, more Spanish than English, almost equal amount of Spanish and English, more English than Spanish, and English only." Language spoken at home was categorized and coded as exclusively or primarily Spanish = 0, equally Spanish and English = 1, and more English than Spanish or only English = 2. The years in the U.S. variable was classified and coded into four categories: <10 years = 0, ≥ 10 - < 20 years = 1, ≥ 20 - < 30 years = 2, and ≥ 30 years = 3.

2.4. Measurements

Behavioral outcomes for fathers and adolescents were assessed based on baseline and post-intervention comparisons of dietary intake, physical activity, and screen time.

2.4.1. Anthropometric Measurements

Fathers' and adolescents' body weight and height were measured separately twice by trained research staff in a private space using a digital scale (BWB-800 Scale, Tanita) and a stadiometer. Measurements were completed using standardized procedures of the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2017). Fathers' body mass index (BMI) was calculated using weight (kg) divided by height squared (cm^2). Adolescent BMI percentiles for age and sex were generated by a SAS program based on the 2000 CDC Growth Charts (Centers for Disease Control and Prevention, 2016).

2.4.2. Father Energy Balance-Related Behaviors

Food Intake

Fathers' food intakes including fruit, vegetables, sugar-sweetened beverages (SSBs), sweets/salty snacks, and fast food, were measured using an adapted food behavior checklist (Townsend et al., 2003). The food behavior checklist showed internal consistency ($r = 0.80$, $p < 0.05$) in a study with low-income nutrition education program participants (Townsend et al., 2003). To assess fathers' fruit/vegetable consumption, one question each was used separately about fruit and vegetable intake, "How many servings of fruits (vegetables) do you eat each day?" with blank lines for participants to write in numbers of servings. To examine fathers' SSB consumption, two questions were used: "Do you drink fruit drinks, sports drinks, or punch?" and "Do you drink regular soda?". To assess consumption of sweet/salty snacks, two questions were used: "Do you eat candy, ice cream, or other sweets or desserts, (chips, puffs, or other salty snacks)?”. Fast food intake was assessed by asking fathers one question: "Do you eat fast foods from fast food restaurants such as Pizza Hut, McDonald's, or Taco Bell?" Response options for questions regarding SSBs, sweets/salty snacks and fast food were no = 1, yes sometimes = 2, yes often = 3, and yes always = 4. Responses to the two questions for both SSBs and sweets/salty snack intakes were summed and averaged to create a score. Frequencies of father SSB, sweet/salty snack, and fast food intakes were created at two levels: low (< 2) and high (≥2).

Physical Activity

Fathers' physical activity level was assessed using the Godin-Shephard Leisure-Time Physical Activity Questionnaire (Godin, 2011; Godin & Shephard, 1985). An initial question was open-ended: "How many times on average do you do the following kinds of exercise for more than 15 minutes during your free time in a week?" with a blank line to write a number based on times per week for each category: strenuous exercise, moderate exercise, and mild exercise. A validation study showed adequate correlations between questionnaire results and percentile VO_2 max and percentile body fat, and acceptable test-retest reliability (Godin & Shephard, 1985).

Screen Time

Fathers' sedentary behaviors were assessed using two media use questions from the Project EAT survey (Utter et al., 2003). The questions were "In your free time on an average weekday, how many hours do you spend doing the following activities?" and "In your free time on an average weekend day, how many hours do you spend doing the following activities?" Each question included four activities: "(1) watching TV/DVD/Videos, (2) using a computer (not for work), (3) playing electronic games while sitting, and (4) using smartphones or tablets" with response options for each activity: 0 hours, 0.5 hours, 1 hour, 2 hours, 3 hours, 4 hours, and 5+ hours. To calculate fathers' hours of total screen time per day, a weighted sum of weekday and weekend days was divided by seven days (Utter et al., 2003). Screen time was top coded for fathers who reported >10 hours of screen time per day. This cut-off point was determined because of the distribution of participants' responses and responses indicating unreasonable reporting and/or multi-tasking.

2.4.3. Adolescent Energy Balance-Related Behaviors

Dietary Intake

In-person and phone 24-hour dietary recall interviews using Nutrition Data System for Research software (NDSR) (Nutrition Coordinating Center, University of Minnesota) were conducted to estimate adolescent dietary intake. NDSR 24-hour dietary recall interviews showed sufficient accuracy and validity in two studies with fourth- and third-grade children (Baxter et al., 2009; Lytle et al., 1993). The goal in the current study was for each adolescent to have one recall in person and two recall interviews over the phone within the next 1-2 weeks. The majority of adolescents had at least two dietary recall interviews (77%) with 53% completing three recalls. Recall interview days were selected to balance the distribution of weekdays and weekend days for participants.

For the recall interviews, adolescents were asked to report all foods, beverages, and water that they consumed in the last 24 hours. A Food Amounts Booklet, which showed illustrations of foods or abstract shapes and figures in different sizes, was provided to assist in estimating amounts consumed. Intakes were averaged across the number of recalls per adolescent and servings per day were determined for five food groups. Fruit and vegetable intakes were calculated separately using the NDSR fruit category total and vegetable category total (excluding fried vegetables and fried potatoes). Intake of SSBs was calculated based on the NDSR beverage category including sweetened soft drinks, fruit drinks, tea, coffee, coffee substitute, and water. Sweets/salty snack intake was calculated using foods from several NDSR categories, including chips and other salty snacks, meat and vegetable-based snacks, ready-to-eat cereals, grain-based desserts, dairy desserts, candies, sugars, jams, syrups, and sweet sauces. Intake of fast food servings was calculated using foods from several NDSR categories, including fried vegetables, fried potatoes, and fried chicken, fish, and shellfish (commercial entrée and fast food).

Physical Activity and Screen Time

Adolescent physical activity level was assessed by a question, "In a usual week, how many hours do you spend doing the following activities" in three categories [(1) vigorous exercise, (2) moderate exercise, (3) mild exercise] (Godin & Shephard, 1985; Utter et al., 2003). Moderate to vigorous activity questions showed adequate reliability (test-retest r= 0.73) among diverse adolescents in a Project EAT study (Thul et al., 2015). Each category included response options "none, less than 30 minutes, 30 minutes-2 hours, 2.5-4 hours, 4.5-6 hours, and 6+ hours" with specific examples for activities in each category. To estimate adolescents' physical activity hours per week, response options were coded as follows: none = 0, less than 30 minutes – 0.3, 30 minutes-2 hours

= 1.3, 2.5-4 hours = 3.3, 4.5-6 hours = 5.3, and 6+ hours = 8. To create a score regarding total leisure time spent being physical active in a usual week, adolescents' coded responses in the three categories were summed. Adolescents' screen time was assessed in the same manner as fathers.

2.5. Data Analysis

All fathers who had both baseline and post data were included in the analysis of the fathers' food and activity behavioral outcomes. For analyzing the adolescent food and activity behavioral outcomes, data were used from adolescents with both baseline and post data and attended at least one educational session. See Appendix E for SAS codes used for data analysis in Chapter 3.

Baseline comparisons for father and adolescent demographic and household characteristics between intervention and delayed-treatment control groups were performed using independent two-sample t-tests for normally distributed continuous variables, and Chi-square and Fisher's exact tests for categorical variables. Means and standard deviations were reported for continuous variables, and count and percentages were reported for categorical variables.

Baseline comparisons of father fruit and vegetable intake, physical activity, screen time, and BMI outcomes and adolescent EBRBs and BMI percentile measures (dietary intake, physical activity, and screen time) in the intervention versus delayed-treatment control groups were assessed using both a hypothesis test for no difference in means (t-tests) and a hypothesis test for no difference in distributions (Wilcoxon ranked-sum tests) for continuous variables and Chi-square and Fisher exact tests for categorical variables. Chi-square tests were used to identify baseline differences in father SSB, sweets/salty snack, and fast food intake outcomes between intervention and delayed-treatment control groups.

2.5.1. Fathers' Energy Balance-Related Behaviors and BMI Outcome Models

Paired and two sample t-tests and linear regression models adjusted for adolescent age and sex were used to test for mean changes from baseline- to post-intervention and differences in mean change in father fruit and vegetable intake, physical activity, screen time, and BMI between and within intervention and delayed-treatment control groups. The normality of residual errors was tested for linear regression models using the Shapiro-Wilk test for normality.

Father intervention dose was categorized as delayed-treatment control (no intervention), low father dose (intervention group fathers attending 1-6 sessions), and high father dose (intervention group fathers attending 7-8 sessions). Mother attendance was categorized as delayed-treatment control (no mother attendance), low mother dose (intervention group mothers attending 1-6 sessions), and high mother dose (intervention group mothers attending 7-8 sessions). Father intervention dose/mother attendance was categorized as delayed-treatment control (no mother attendance), low father dose (no mother attendance), high father dose and low mother dose, and high father dose and high mother dose.

Mixed models were used to measure baseline-post differences in mean change in father fruit and vegetable intake, physical activity, screen time, and BMI between and within intervention and delayed-treatment control groups. These models were adjusted for adolescent sex and age and included a random intercept for the site to account for clustering within sites. Additional mixed models were used for each of the following father fruit and vegetable intake, physical activity, screen time, and BMI outcome: intention to treat sensitivity models, models that adjusted for intervention dose, and models to compare father fruit and vegetable intake, physical activity, screen time, and BMI outcome changes between intervention dose groups. Also, mixed models to compare father fruit and vegetable intake, physical activity, screen time, and BMI outcome changes between mother attendance levels were performed.

For father SSB, sweets/salty snack, and fast food intake outcomes, McNemar's Chi-square tests were used to identify significant differences in proportion with a baseline-post change from low to high vs. a change from high to low among those with any change**,** stratified by intervention and delayed-treatment control groups. Generalized Linear Mixed Models (GLMM) for logistic regression of binary post outcomes were used to assess father SSB, sweets/salty snack and fast food intake adjusted for adolescent age and sex with a random intercept for site to account for clustering of families within sites. GLMM models were used in models with father intervention dose comparisons in addition to intervention group comparisons. GLMM Models estimated odds of high intake for each of these outcomes.

2.5.2. Adolescents' Energy Balance-Related Behaviors and BMI Percentile Outcome Models

Paired and two sample t-tests and linear regression models adjusted for adolescent age and sex were used to test for mean changes from baseline to post-intervention and differences in mean change in adolescent EBRBs and BMI-percentile between and within intervention and delayed-treatment control groups. The normality of residual errors was tested for linear regression models using the Shapiro-Wilk test for normality.

Intervention dose was categorized as delayed-treatment control (no intervention), low father/adolescent dose (intervention group with either fathers or adolescents attending 1-6 sessions), and high father/adolescent dose (intervention group with both fathers and adolescents attending 7-8 sessions). Mother attendance was categorized as delayed-treatment control (no mother attendance), low mother dose (intervention group mothers attending 1-6 sessions), and high mother dose (intervention group mothers attending 7-8 sessions). Intervention dose/mother attendance was categorized as delayed-treatment control (no mother attendance), low father/adolescent dose (no mother attendance), high father/adolescent dose and low mother dose, and high father/adolescent dose and high mother dose.

Mixed models were used to evaluate baseline-post difference in mean change in adolescent EBRBs and BMI percentile between and within intervention and delayed-treatment control groups adjusted for adolescent sex and age and included a random intercept for the site to account for clustering within sites. Additional mixed models were used for each of the following EBRB and BMI percentile outcome: intention to treat sensitivity models, models that adjusted for intervention dose, and models that compared EBRB and BMI percentile outcome changes between intervention dose groups. Mixed models to compare EBRB and BMI percentile outcome changes between mother attendance levels were performed.

Data analysis was conducted using SAS software version 9.4 (Cary, NC, USA, 2002–2012) with statistical significance defined as $P < 0.05$.

3. Results

A total of 303 father-adolescent dyads expressed interest in participating in the study (Figure 3.2). Of those, 266 were screened for eligibility via a telephone interview, and 234 were identified as eligible. Data were not available from 54 father-adolescent dyads who did not attend the baseline data collection session and 20 dyads who did not complete the data collection procedures. Baseline data collection sessions were completed by 160 father/adolescent dyads. Total of 103 fathers and 110 adolescents completed both baseline and post data collection resulting in a retention rate of 64% for fathers and 69% for adolescents. Those who did not complete post-data collection withdrew from the study because of relocation or scheduling conflicts or were lost to follow up (unable to contact).

A sample size calculation showed that a sample of 96 father-youth dyads would be needed in each group (intervention and delayed-treatment control groups) after accounting for 20% attrition from the randomized n = 120 dyads in each group. This sample size was needed for observation of a 0.5 SD effect size for intake of SSBs (a decrease of 0.21 servings) with 93% power to detect this change as significant. Restrictions on in-person interactions because of the COVID-19 pandemic in March 2020 resulted in an inability to continue to implement the program in person and a smaller sample size.

Demographic characteristics for fathers who completed baseline and post-data collection and fathers who only completed baseline data collection were similar except for baseline father BMI and adolescent sex. Mean BMI for fathers who completed baseline and post-data collection was 29.9 vs. 28.5 for fathers who only completed baseline data collection ($p = 0.024$). Baseline adolescent sex ($p = 0.029$) was significantly different between fathers who completed both baseline and post-data collections vs. fathers who only completed baseline data collection

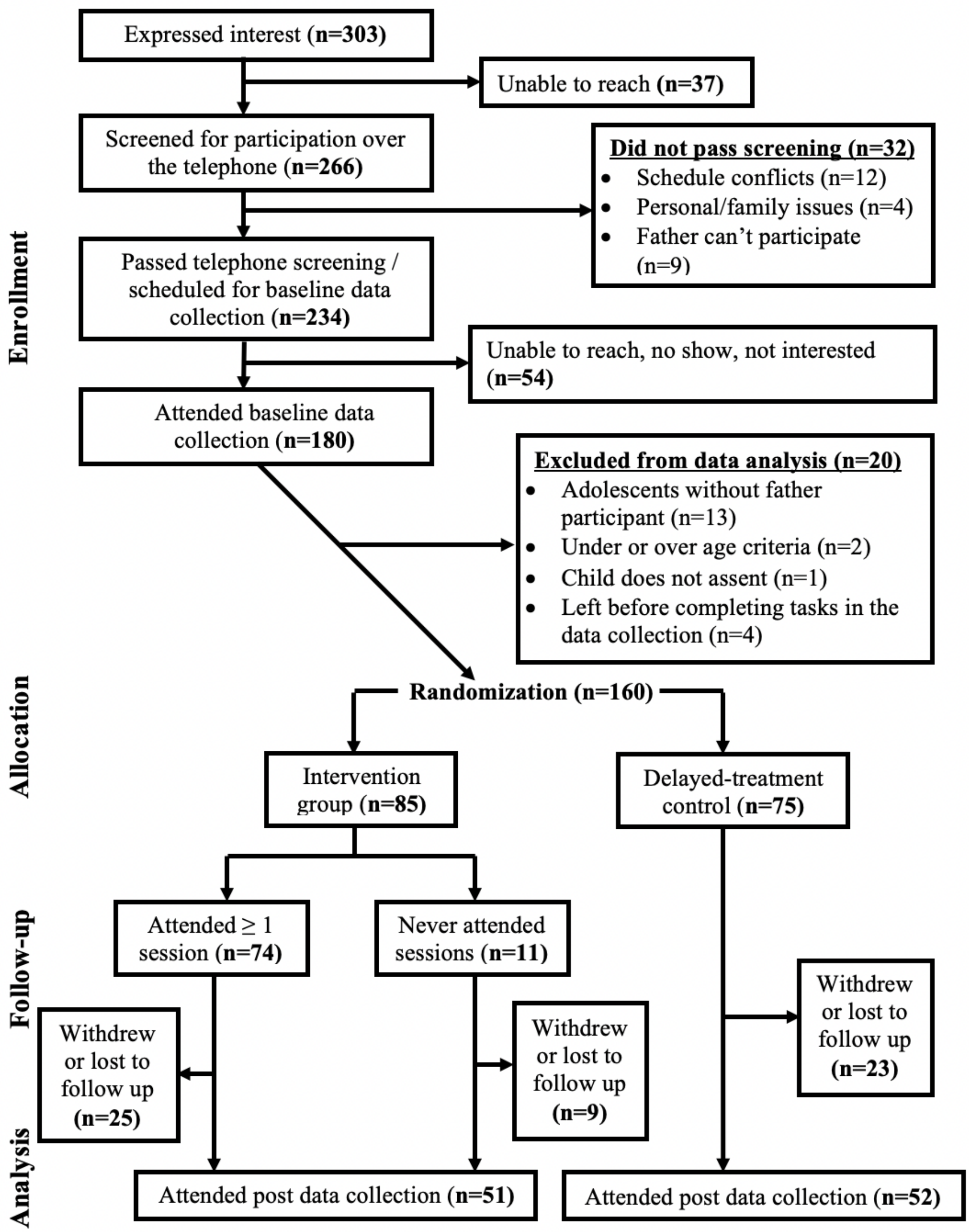


Figure 3.2. CONSORT diagram.

A total of 103 fathers attended both baseline and post-data collection sessions. Of those, 51 were in the intervention group and 52 were in the delayed-treatment control group. Demographic characteristics of fathers in the intervention and delayed-treatment control groups were similar at baseline (Table 3.1). Overall, the mean father age was 42.1 years. Most fathers (86%) reported a yearly household income of ≤ $49,999, and most (79%) completed high school or had less than high school education. Approximately 75% of the fathers were employed full-time, and 86% were married. Most fathers reported speaking exclusively or primarily Spanish at home (83%) and having lived in the U.S. for more than 10 years (97%).

Table 3.1.Father demographic characteristics.

Father characteristics	All n = 103	Intervention n = 51	Control n = 52	p-value
Age, mean (SD[1])	42.1 (7.4)	43.3 (7.2)	40.9 (7.5)	0.106[2]
Annual income, n (%)				0.145[3]
< $25000	40 (40.4)	25 (50.0)	15 (30.6)	
$25000 - < $50000	45 (45.5)	19 (38.0)	26 (53.1)	
≥$50000	14 (14.1)	6 (12.0)	8 (16.3)	
Marital status, n (%)				0.518[4]
Married	86 (86.0)	45 (90.0)	41 (82.0)	
Living with partner	6 (6.0)	2 (4.0)	4 (8.0)	
Single /widowed /divorced/separated	8 (8.0)	3 (6.0)	5 (10.0)	
Education, n (%)				0.221[3]
Middle school or less	37 (36.6)	22 (43.1)	15 (30.0)	
High school grad or GED[1]	42 (41.6)	17 (33.3)	25 (50.0)	
College (any) or technical school	22 (21.8)	12 (23.5)	10 (20.0)	
Employment, n (%)				0.387[4]
Self-employed	12 (12.1)	7 (14.0)	5 (10.2)	
Unemployed / homemaker	5 (5.1)	3 (6.0)	2 (4.1)	
Part time employment	8 (8.1)	6 (12.0)	2 (4.1)	
Full time employment	74 (74.8)	34 (68.0)	40 (81.6)	
Years in US, n (%)				0.736[4]
< 10	3 (3.0)	1 (2.0)	2 (4.0)	
10 - < 20	57 (57.0)	31 (62.0)	26 (52.0)	
20 - <30	35 (35.0)	16 (32.0)	19 (38.0)	
≥ 30	5 (5.0)	2 (4.0)	3 (6.0)	
Language, n (%)				0.786[4]
More Spanish than English	85 (83.3)	41 (80.4)	44 (86.3)	
Equal Spanish and English	15 (14.7)	9 (17.7)	6 (11.8)	
More English than Spanish	2 (2.0)	1 (1.9)	1 (1.9)	
Father BMI[1], mean (SD)	29.91 (3.68)	29.84 (3.93)	29.98 (3.45)	0.847[2]

[1]SD = standard deviation, GED = general education development, BMI = body mass index; [2]Two sample t-test; [3]Chi-square test; [4] Fisher’s exact test. *p*-value < 0.05.

Baseline and post data were available from 110 adolescents who attended baseline data collection sessions and 103 who attended post data collection with their fathers. Seven youth attended post-data collection sessions with their mothers only. Of the 110 adolescents, 54 were in the intervention group and 56 were in the delayed-treatment control group (demographic data not shown). The mean age of adolescents was 11.5 years (± 1.5). The mean age of adolescents was significantly different between the intervention (11.9 years ± 1.6) and delayed-treatment control (11.2 years ± 1.4) groups ($p = 0.034$). The majority of adolescents were male (59%) with 41% female. No difference in the proportion of adolescents by sex was observed between the intervention and delayed-treatment control groups ($p = 0.262$). Mean BMI percentile of all adolescents was 78.6 (± 23.9). No differences in the adolescents' mean BMI percentiles were observed between the intervention and delayed-treatment control groups.

3.1. Father Outcomes Between Groups

Father EBRBs and mean BMI were similar at baseline between intervention and delayed-treatment control groups (Appendix F, Table S3). Significant positive changes were observed from baseline to post-intervention for father SSB, sweets/salty snack, and fast food intakes in the intervention group based on McNemar’s Chi-square tests ($p = 0.029$ for SSBs, $p = 0.003$ for sweets/salty snacks, and $p = 0.058$ for fast food) (Table 2). Also, the odds of higher sweets/salty snack intake were lower for intervention fathers than delayed-treatment control fathers in the adjusted GLMM models (OR = 0.22 [0.07, 0.68], $p = 0.010$) (Table 3.2).

No mean changes were observed for fruit or vegetable intake, physical activity, or screen time from baseline to post-intervention between father intervention and delayed-treatment control groups in the adjusted mixed models (Table 3.3).

Table 3.2. Results of McNemar's tests and GLMM models for FATHER dietary outcomes.

		Baseline-post change[1] and McNemar's Chi-square test for groups							Generalized Linear Mixed Model logistic regression[2]	
		Delayed-treatment control group change			Intervention group change				OR[3] (95% CI[3]) for indicated post outcome category	
	n in model	No baseline-post change n (%)	High to low n (%)[4]	Low to high n (%)[4]	No baseline-post change n (%)	High to low n (%)[4]	Low to high n (%)[4]	n in model	Intervention group	Delayed-treatment control group
SSB[3] intake	103	39 (75.0)	5 (38.5)	8 (61.5)	34 (66.7)	13 (76.5)*	4 (23.5)*	103	0.40 (0.15, 1.05)	Ref
Sweets & salty snack intake	103	44 (84.6)	3 (37.5)	5 (62.5)	35 (68.6)	14 (87.5)*	2 (12.5)*	103	0.22 (0.07, 0.68)*	Ref
Fast food intake	103	47 (90.3)	2 (40.0)	3 (60.0)	41 (80.4)	8 (80.0)*	2 (20.0)*	103	0.31 (0.08, 1.21)	Ref

[1]More positive (i.e. healthier) direction of change is high to low for intervention and delayed-intervention control groups' changes; [2] Generalized mixed models controlled by adolescent age and sex. Models were estimating odds of high intake; [3] OR = odds ratio, CI = confidence interval, SSB = sugar sweetened beverage; [4]Percent calculated out of N with any change; * indicates significant changes between groups. *p*-value < 0.05

Table 3.3. Unadjusted and adjusted differences for changes in FATHER dietary and physical activity outcomes.

		Unadjusted mean change from baseline to post and differences in mean change between groups[2]			Estimate (SE[1]) and p-value for fixed effects from mixed model with random intercept for site and random intercept for adolescent nested within site[3]		
Post – baseline change in	**n in model[4]**	**Delayed-treatment control change Mean (SD[1])**	**Intervention change Mean (SD)**	**n in model[4]**	**Group**	**Time**	**Group*time**
Fruit, servings	84	0.40 (1.05)	0.24 (1.32)	103	-0.21 (0.23)	0.19 (0.18)	0.15 (0.25)
Vegetable, servings	86	0.22 (1.25)	0.40 (1.15)	103	-0.13 (0.22)	0.37 (0.18)	-0.19 (0.25)
Physical activity (times/weekly)	95	0.32 (4.12)	0.60 (4.66)	103	-1.41 (0.87)	0.65 (0.64)	-0.08 (0.91)
Screentime[5] (hours/daily)	102	0.70 (2.65)	0.52 (2.39)	103	0.15 (0.47)	0.56 (0.36)	0.14 (0.50)
BMI[1]	87	-0.06 (1.19)	1.04 (5.59)	103	-0.06 (0.86)	1.11 (0.60)	-0.99 (0.86)

[1] SE = standard error, SD = standard deviation, BMI = body mass index; [2] p-value for two sample t-test of null hypothesis of no difference in mean change between intervention and delayed-treatment control were not significant were not statistically significant. *p*-value < 0.05; [3] p-value for Mixed model estimates for difference in mean adolescent EBRB change between intervention and delayed-treatment control were not statistically significant. All of the adjusted models controlled by adolescent age and sex. *p*-value < 0.05; [4] In the unadjusted models, participants with both baseline and post included whereas in the mixed models, participants with baseline only, post only or both included; [5]Screen time hours calculated for those with at least 6 of 8 screen time items.

3.2. Adolescent Baseline-to-Post Intervention Mean Changes Between Groups

Adolescent EBRBs and BMI percentile were similar at baseline between intervention and delayed-treatment control groups (Appendix F, Table S4). No adolescent EBRB outcomes had significant baseline-to-post intervention mean change between intervention and delayed-treatment control groups in the unadjusted two-sample t-test and adjusted mixed models (Table 3.4).

Table 3.4. Unadjusted and adjusted differences for changes in ADOLESCENT dietary and physical activity outcomes.

		Unadjusted mean change from baseline to post and differences in mean change between groups[2]			**Estimate (SE[1]) for fixed effects from mixed model with random intercept for site and random intercept for adolescent nested within site**[3]		
Post – baseline change in EBRB[1] and BMI[1]	**n in model[4]**	**Intervention change mean (SD[1])**	**Delayed-treatment control change mean (SD)**	**n in model[4]**	**Group**	**Time**	**Group*time**
Fruit servings	104	-0.07 (1.90)	0.20 (1.34)	110	-0.39 (0.26)	-0.09 (0.22)	0.29 (0.32)
Vegetable servings	105	0.04 (2.06)	-0.03 (1.74)	110	-0.30 (0.26)	0.001 (0.26)	0.004 (0.37)
SSB[1] servings	105	-0.05 (0.94)	-0.01 (0.81)	110	0.03 (0.13)	-0.04 (0.12)	0.039 (0.17)
Sweets/salty snacks	103	-0.02 (1.78)	-0.29 (1.97)	110	0.11 (0.28)	0.04 (0.26)	-0.28 (0.37)
Fast food servings	105	0.09 (1.27)	0.02 (0.99)	110	-0.23 (0.16)	0.09 (0.15)	-0.05 (0.22)
Physical activity hrs/day	106	0.02 (0.56)	0.20 (0.60)	110	-0.07 (0.11)	0.02 (0.08)	0.19 (0.11)
Screen time[5] hrs/day	106	-0.06 (2.56)	0.14 (3.09)	110	-0.81 (0.56)	-0.05 (0.39)	0.16 (0.55)
BMI percentile	104	-1.88 (3.83)	-0.82 (4.26)	110	-8.14 (4.43)	-1.85 (0.55)	1.01 (0.80)

[1] SE = standard error, SD = standard deviation, EBRB = energy balance related behaviors, BMI = body mass index, SSB = sugar sweetened beverage; [2] p-value for two sample t-test of null hypothesis of no difference in mean change between intervention and delayed-treatment control were not statistically significant, *p*-value < 0.05; [3] p-value for mixed model estimates for difference in mean adolescent EBRB change between intervention and delayed-treatment control groups were not statistically significant, *p*-value < 0.05; [4] In the unadjusted models, participants with both baseline and post included whereas in the mixed models, anyone with baseline only, post only, or both included; [5] Screen time hours calculated for those with at least 6 of 8 screen time items.

3.3. Mixed Models to Evaluate Father Outcomes by Father Intervention Dose and Mother Attendance

Father intervention dose was only significant for the SSB, sweets/salty snack, and fast food intake models (Table 3.5). Odds of higher post SSB intake were significantly lower for the low father dose group (intervention group fathers attending 1-6 sessions) than for delayed-treatment control fathers (OR = 0.20 [0.06, 0.72], p = 0.014). Odds of higher post-intervention sweets/salty snack intake, and fast food intake were all significantly lower for the high father dose group than for the delayed-treatment control group fathers (sweets/salty snack intake: OR = 0.17 [0.05, 0.62], p = 0.008; fast food intake: OR = 0.19 [0.04, 0.90], p = 0.036).

Table 3.5. GLMM for logistic regression with father intervention dose for FATHER post outcomes.

		Generalized Linear Mixed Model logistic regression[1] with father intervention dose[2]	
Father post outcome modeled	**n**	**OR[3] (95% CI[3])**	**p-value[4]**
SSB[2] intake	103		
Low father dose vs delayed-treatment control		0.20 (0.06, 0.72)	**0.014**
High father dose vs delayed-treatment control		0.64 (0.21, 1.91)	0.420
Sweets/salty snack intake	103		
Low father dose vs delayed-treatment control		0.45 (0.10, 1.95)	0.281
High father dose vs delayed-treatment control		0.17 (0.05, 0.62)	**0.008**
Fast food intake	103		
Low father dose vs delayed-treatment control		2.37 (0.24, 23.40)	0.457
High father dose vs delayed-treatment control		0.19 (0.04, 0.90)	**0.036**

[1] Generalized mixed models adjusted for adolescent age and sex. Models were estimating odds of high intake; [2] Father intervention dose was categorized as delayed-treatment control (no intervention), low father dose (attendance at 1-6 sessions by fathers), and high father dose (attendance at 7-8 sessions by fathers); [3] OR = odds ratio, CI = confidence interval, SSB = sugar sweetened beverage; [3]p values for indicated post outcome categories, p-value < 0.05.

No significant findings were observed in the models with mother attendance to evaluate father energy balance related behaviors and BMI outcomes (data not shown).

3.4. Mixed Models to Evaluate Adolescent Outcomes by Father/Adolescent Intervention Dose and Mother Attendance

In the mixed model for daily *servings of sweet and salty snack intakes by adolescents*, a significant interaction was observed between intervention dose and time (p = 0.090 for interaction term) (Table 3.6). The adjusted mean increase in adolescent sweets/salty snacks intake in the low father/adolescent dose group was significantly different from the adjusted mean decrease for the high father/adolescent dose group (p = 0.039).

A significant interaction was observed between intervention dose and time (p = 0.037 for interaction term) in the mixed model for daily *servings of fast food by adolescents* (Table 6). The high father/adolescent dose group had a significant adjusted mean increase in daily fast food servings (p = 0.035). The adjusted mean increase in daily fast food servings in the high father/adolescent dose group was significantly different from the adjusted mean decrease in the low father/adolescent dose group (p = 0.011).

A significant difference in mean *servings of fast food per day* among adolescents was observed between groups in the model with intervention dose/mother attendance (p = 0.019 for interaction term) (Table 3.6). A significant mean increase in fast food servings/day was observed in the group with a high father/adolescent dose and high mother dose (p = 0.006). This mean increase was significantly greater than the small baseline-to-post intervention mean increase in the delayed-treatment control group (p = 0.019) and significantly different from the baseline-to-post intervention mean decrease in the low father/adolescent dose group (p = 0.002).

A marginally significant difference in *mean BMI percentile* among adolescents was observed between groups in the model with intervention dose/mother attendance (p = 0.053 for interaction term) (Table 3.6). All intervention groups had a mean decrease in BMI percentile, but the mean decrease was only significant in the high father/adolescent dose and high mother dose group (p< 0.001). The mean BMI percentile decrease in this group was significantly greater than mean BMI percentile decreases in the low father/adolescent dose group ($p = 0.049$) and high father/adolescent dose and low mother dose group, ($p = 0.018$), and delayed-treatment control group ($p = 0.008$).

Table 3 6. Mixed models for ADOLESCENT outcomes between intervention dose groups and intervention dose/mother attendance.

		Baseline-post-intervention change	**Baseline-post-intervention change**	
Adolescent EBRB outcome (NDSR servings/day) and model effects		**By intervention dose[1] and intervention dose + mother attendance levels[2]**	**Difference between intervention dose groups**	
	n in models[3]	**LS[4] mean (SE)**	**LS[4] mean (SE)**	**p-value[5]**
Sweet and salty snack intake	110			
Father/adolescent intervention dose groups				
Control		-0.24 (0.26)		0.356
Low father/adolescent dose		0.70 (0.41)		0.089
High father/adolescent dose		-0.40 (0.33)		0.233
Father/adolescent intervention dose group comparisons				
High father/adolescent dose vs. Control			-0.16 (0.42)	0.706
Low father/adolescent dose vs. Control			0.94 (0.48)	**0.054**
High father/adolescent dose vs. Low father/adolescent dose			-1.10 (0.53)	**0.039**
Fast food intake	110			
Father/adolescent intervention/mother attendance dose groups				
Control		0.04 (0.15)		0.804
Low father/adolescent dose		-0.38 (0.23)		0.111
High father/adolescent dose		0.42 (0.20)		**0.035**
High father/adolescent dose + low mother dose		0.10 (0.26)		0.700
High father/adolescent dose + high mother dose		0.82 (0.29)		**0.006**
Father/adolescent intervention/mother attendance dose group comparisons				
High father/adolescent dose vs. Control			0.38 (0.25)	0.125
Low father/adolescent dose vs. Control			-0.41 (0.28)	0.140

High father/adolescent dose vs. Low father/adolescent dose			0.79 (0.30)	**0.011**
High father/adolescent dose + low mother dose vs. Control			0.06 (0.30)	0.832
High father/adolescent dose + high mother dose vs. Control			0.78 (0.33)	**0.019**
High father/adolescent dose + high mother dose vs. Low father/adolescent dose			1.19 (0.37)	**0.002**
High father/adolescent dose + high mother dose vs. High father/adolescent dose + low mother dose			0.71 (0.39)	0.069
High father/adolescent dose + low mother dose vs. Low father/adolescent dose			0.48 (0.35)	0.174
Mean Adolescent BMI[4] percentile	110			
Father/adolescent intervention/mother attendance dose groups				
Control		-0.84 (0.56)		0.138
Low father/adolescent dose		-1.40 (0.85)		0.100
High father/adolescent dose + low mother dose		-0.69 (0.94)		0.462
High father/adolescent dose + high mother dose		-4.14 (1.08)		**< 0.001**
Father/adolescent intervention/mother attendance dose group comparisons				
Low father/adolescent dose vs. Control			-0.57 (1.02)	0.579
High father/adolescent dose + low mother dose vs. Control			0.15 (1.09)	0.892
High father/adolescent dose + high mother dose vs. Control			-3.30 (1.22)	**0.008**
High father/adolescent dose + high mother dose vs. Low father/adolescent dose			-2.73 (1.37)	**0.049**
High father/adolescent dose + high mother dose vs. High father/adolescent dose + low mother dose			-3.45 (1.43)	**0.018**
High father/adolescent dose + low mother dose vs. Low father/adolescent dose			0.71 (1.26)	0.573

[1] Intervention dose was categorized as delayed-treatment control (no intervention), low father/adolescent dose (attendance at 1-6 sessions by either child or father), and high father/adolescent dose (attendance at 7-8 sessions by both child and father). [2]Mother attendance was categorized as delayed-treatment control (no mother attendance), low mother dose (intervention – mother attendance at 1-6 sessions), and high mother dose (intervention - mother attendance at 7-8 sessions). Intervention dose/mother attendance was categorized as delayed-treatment control (no mother attendance), low father/adolescent dose (no mother attendance), high father/adolescent dose + low mother dose, and high father/adolescent dose + high mother dose. [3] In the mixed models, participants with baseline only, post only, or both were used. [4]LS = least squares, BMI = body mass index, [5] p-value for test of LS mean change = 0 for difference between intervention dose groups. *p*-value < 0.05.

4. Discussion

This study examined whether fathers' and adolescents' EBRBs and weight status were improved after they completed the Padres program. The program showed reductions in consumption of SSBs, sweet/salty snacks, and fast food by fathers. No change in adolescent EBRBs and BMI percentiles were observed between the intervention and delayed-treatment control groups. Intervention dose effects were observed for some father and adolescent behaviors.

The current study found that adolescents in the high intervention dose group and participating with both parents had significantly greater reductions in BMI percentile compared to all other intervention dose groups and the delayed-treatment control group. These findings were aligned with findings from two randomized controlled trials involving parent/child dyads (Heerman et al., 2020; Wilfley et al., 2017). In the first trial, multiethnic parent/child (7-11 years) dyads in the high dose intervention (32 sessions of enhanced social facilitation maintenance over 4 months) showed a greater reduction in child percentage overweight from baseline than those in the low dose intervention (16 sessions of enhanced social facilitation maintenance over 4 months) and control (weight management education condition) groups (Wilfley et al., 2017). In the second trial (12 weekly- 90 minutes face-to-face sessions + 9 monthly 45 minutes) with primarily Hispanic parents (96.6% of mothers) and preschool children, a higher intervention dose [median number (16-21) of sessions or calls] was related to significantly lower BMI z scores compared to a low intervention dose [median or more (1-15) number of sessions or calls] after a one-year intervention (Heerman et al., 2020). The current study with a potential of 20 contact hours also showed that the intervention dose was related to the BMI percentile of adolescents, even though the other studies (Heerman et al., 2020; Wilfley et al., 2017) were more intensive in duration and exposure. Overall, a combination of a family-focused approach that includes both fathers and mothers and high intervention dose may improve adolescents' diet and weight-related outcomes in community-based obesity prevention programs. In support of this suggested approach, a review of strategies to improve Latino fathers' engagement in childhood obesity-related programs encouraged a focus on socio-cultural values, such as collectivism, familism, and parents’ unique gender roles (T. O’Connor et al., 2018).

Calories consumed from snacks increased among Hispanic adults in the US between 1977-2012 with desserts and sweets, SSBs, and salty snacks ranked as the first, third and fifth highest sources of snacks (kilocalories per capita per day), respectively, according to the findings from dietary recalls of eight nationally representative surveys (Dunford & Popkin, 2017). Many sweets and salty snacks were shown to be nutrient poor and energy dense because of their high sugar, sodium, and/or solid fat contents (Hess et al., 2016; Hess & Slavin, 2018; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020), with consumption associated with poor nutrition and weight gain (Bellisle, 2014). In the current study, the intervention had a beneficial effect on lowering fathers' sweet/salty snack intake from baseline to post-intervention, consistent with the evaluation of a family-based intervention (Familias Unidas for Health and Wellness (FUHW), where 12% of parents were fathers (Prado et al., 2020). The FUHW intervention promoted healthy eating and activity strategies in overweight Hispanic adolescents and their parents and resulted in a reduction in added sugar intake among Hispanic parents (Prado et al., 2020). To our knowledge, the Padres program is the only intervention reported in the literature showing a reduction in sweets/salty snack consumption exclusively among Latino fathers. This study addressed a gap in the literature by involving Latino fathers as the primary research participants in an intervention program to improve EBRBs for fathers and adolescents.

The Padres program showed no intervention effect on Latino adolescent EBRBs and BMI percentile and on other father EBRBs and BMI. Limited resources may have constrained access to healthy foods and physical activity opportunities needed to implement intervention strategies. Structural inequities in food access and affordability, can impact healthy eating behaviors for people of color in the U.S. (Conrad, 2020). Based on the Hispanic Community Children's Health/Study of Latino Youth (HCHS/SOL) between 2012-2014, 42% of Hispanic/Latino youth (ages 8-16) lived in food-insecure households, and 10% lived in a severe food-insecure household where family members experienced hunger (Potochnick et al., 2019). In the current study, 39% of fathers reported that they were food insecure, and about 86% reported annual incomes less than $50,000. Thus, limited resources may have constrained the ability to make healthy food and activity behavior changes among Latino families in the current study.

A possible explanation for lack of significant changes in adolescent EBRBs after participation in the Padres program may be the lack of time to practice improved behaviors prior to post-intervention data collection. Adolescent post-intervention measurements (diet, physical activity and weight status) were completed one week after the final session with additional 24-hour dietary recalls conducted 2-3 weeks after the final session. Because dietary intake can vary substantially from day to day, short-term success in making positive dietary changes regarding fat, fiber, fruit and vegetables, and sodium was defined as consistent change for several weeks or months, while long-term success was defined as change for 6 months to 1 or more years (Kumanyika et al., 2000). Thus, measuring dietary and activity behaviors soon after the final session may not adequately document potential short- or long-term success. Three months of follow-up data after completing the intervention in the current study were not included in the analysis because of the limited number of families participating in the 3-month data collection sessions. Changing living situations and other life events pose ongoing challenges to research in community-based settings.

There were several limitations of this study. First, the study findings may not be generalizable to the broader Latino population because participants of the Padres program were from one geographic location (Minneapolis/St. Paul metropolitan area), represented several Latin American countries, and most were from low-income households. Second, most of the data including EBRBs were self-reported by fathers and adolescents. Participants might overreport healthy behaviors and underreport unhealthy behaviors due to poor recall or social desirability. In-person program delivery was discontinued in March 2020 because of the COVID-19 pandemic, resulting in a smaller sample size than planned for according to the sample size calculations and limited power to detect significant changes. Third, incorrect randomization assignments were made for several dyads, however, for these dyads, the group assignment for analysis was based on whether they attended the intervention or delayed-treatment control group sessions. Finally, some of the fathers and adolescents who participated in the study might have enrolled because of their interest in nutrition and wellbeing, which would make them different from the general population.

5. Conclusions

A community-based, culturally, and linguistically appropriate intervention focused exclusively on low-income, urban Latino fathers/male caregivers and their adolescents showed some improvements in desired outcomes for fathers. No intervention effects were observed for EBRBs among adolescents. Intervention dose showed beneficial effects on fathers' dietary intake and adolescents' weight status outcomes. However, some of the intervention dose effects on adolescents' dietary outcomes were inconsistent. Educational approaches may have a limited capacity to change individual level behavior when societal level health disparities continue to adversely impact Latino/Hispanic families. Evaluation of intervention outcomes should occur after additional time to practice improved behaviors. Efforts to maximize both mother and father attendance and program exposure are warranted. Therefore, family-focused intervention research with a larger sample size and dose that considers the strengths (i.e. familism) and limitations of low-income Latino/Hispanic families is required to further examine intervention and dose effects on EBRBs among Latino fathers and adolescents.

Chapter 4. Padres Preparados, Jóvenes Saludables: Intervention and Modifier Effects of a Randomized Controlled Trial on Latino Father- and Adolescent-Reported Paternal Food and Activity Parenting Practices

Overview

Background: Parenting practices were associated with children's food- and activity-related behaviors and weight status in previous studies, which were conducted primarily with mothers. A limited number of interventions have been conducted to improve parenting practices among Latino fathers and adolescents. Thus, the Padres Preparados Jóvenes Saludables (Padres) program was designed based on principles of community-based participatory research and social cognitive theory to prevent overweight and obesity among Latino adolescents (10-14 years) by improving paternal parenting practices. The purpose of this study is to evaluate improvements in father- and adolescent-reported paternal parenting practices after attending the Padres program.

Methods: Baseline and post survey data from father/adolescent dyads were used from a two-arm (intervention vs. delayed-treatment control group) randomized controlled trial. The Padres program consisted of eight weekly, 2.5-hour experiential learning sessions focusing on food preparation, parenting practices, nutrition, and physical activity. The program was implemented with father/adolescent dyads (mothers were encouraged to attend) in four locations in the Minneapolis/St.Paul area. McNemar's tests and Generalized Linear Mixed Models were used to evaluate intervention effects and possible modifiers.

Results: Baseline-post data were available from 96 fathers and 110 adolescents. In the intervention group, improvements in father-reported frequency of fruit role modeling and fast food availability were observed. Significant positive intervention effects were found on the basis of adolescent reports on paternal allowance of adolescent screen time and frequency of fruit role modeling. While fathers and adolescents agreed on the improvements in frequency of paternal fruit role modeling, discrepancies were observed in results regarding other improvements. Paternal food responsibility and family meal frequency were identified as modifiers for food parenting practices.

Conclusion: Only a small number of paternal parenting practices were reported to be improved after the intervention by Latino fathers and adolescents. The lack of significant findings may be associated with the limited sample size, low family socioeconomic status, and possible ceiling effects of baseline paternal parenting practices.

Trial registration: The Padres Preparados, Jóvenes Saludables study is registered with the U.S. National Library of Medicine, ClinicalTrials.gov Identifier: NCT03469752 (19/03/2018).

Keywords. Latino fathers and adolescents, paternal food and activity parenting practices, randomized control trial, community-based intervention, Latino adolescents' energy balance-related behaviors (EBRBs)

1. Introduction

Many children and adolescents in the U.S., including Mexican American and other Hispanic children, have poor dietary behaviors (Dunford & Popkin, 2018; Kim et al., 2014; Vikraman et al., 2015), low levels of physical activity, and frequent screen time (National Physical Activity Plan Alliance, 2018; Yang et al., 2019). Parenting practices, which influence these health behaviors, have been defined as intentional or unintentional behaviors/actions by parents to shape their child's attitudes, behaviors, or beliefs (Vaughn et al., 2016). Previous studies have highlighted the positive influence of parenting practices on children's and adolescents' dietary behaviors (Yee et al., 2017), physical activity, and screen time (Hutchens & Lee, 2018; Ramirez et al., 2011; Xu et al., 2015). Several studies based on cross-sectional surveys and focus group interviews showed that Latino parents can play a positive role in improving children's food- and activity-related behaviors (Ayala et al., 2007; Flores et al., 2012; LeCroy et al., 2019; Parada et al., 2016; Santiago-Torres et al., 2014; Springer et al., 2010; Zhang et al., 2018) and weight status (Penilla et al., 2017; Tschann et al., 2015). Improvements were related to using food and activity parenting practices such as setting expectations for healthy behaviors and limits for unhealthy behaviors, role modeling, and making healthy foods available at home. These studies have primarily focused on Latino mothers and their children, with little research that has assessed paternal influences through parenting practices on children's and adolescents' food- and activity-related behaviors and health outcomes.

Associations among Hispanic/Latino fathers' parenting practices and children's diet and diet-related outcomes, which are usually examined in family-focused studies, are limited and inconsistent in the literature (Parada et al., 2016; Penilla et al., 2017; Zhang et al., 2018). A cross-sectional study with 81 Mexican-origin fathers and children, aged 7-13 years who participated in the Entre Familia: Reflejos de Salud study showed that children consumed more fruit and vegetables when their father's used feeding-related reinforcement of healthy eating more frequently (Parada et al., 2016). This study also showed no association between setting limits and children's intake of high-fat snacks and sugar-sweetened beverages. Another study with 174 mother-father-child triads (8-10 years of age) demonstrated that a father's healthy BMI was related to a child's healthy

BMI z-score, but not father's positive involvement, which included monitoring and limiting child's unhealthy food intake and encouraging the child to try new and healthy foods (Penilla et al., 2017).

Limited literature was available to examine the influence of Latino father parenting practices on adolescent screen time and physical activity (Flores et al., 2012; Springer et al., 2010; Zhang et al., 2018), with most studies involving both mothers and fathers (Flores et al., 2012; Springer et al., 2010). In a focus group study, Latino parents reported that being better role models by increasing physical activity and decreasing screen time, and providing physical activity opportunities for their children were two parenting practices to help overweight children have healthier weight (Flores et al., 2012). A cross-sectional study with primarily Hispanic 4^{th}-grade students indicated that children were 1.68 times and 1.42 times less likely to watch TV for 2 hours/day or more on weekdays and weekends, respectively, when they had parental TV rules (Springer et al., 2010).

Having fathers present and involved may enhance their ability to engage in influential parenting practices that improve youth behaviors including setting expectations, modeling, and managing availability. In a qualitative study, Hispanic mothers identified father behaviors that supported healthy youth behaviors, including preparing healthy meals, using healthier cooking methods, shopping for healthy foods with their child, and asking the child to participate in household chores and/or play sports (Lora et al., 2017). A nationally representative survey showed that 41.6% of Hispanic men were involved in food preparation and cooking at home in 2016, which was a significant increase from 2003 (31.2%) (Taillie, 2018). A cross-sectional study showed that Latino children who had family meals without TV or rarely watching TV at least four times per week were more likely to consume fruits and vegetables and less likely to consume soda and chips compared to those who had family meals less often (Andaya et al., 2011). Thus, family meals and fathers' involvement in preparing meals might provide Latino fathers an opportunity to apply food- and activity-related parenting practices to improve children's food and activity behaviors.

Several interventions have been conducted to prevent childhood obesity among Latino children with parent involvement (primarily with pre-school and elementary school-aged youth and female caregivers) (Barkin et al., 2012; S. Gallo et al., 2020; T. M. O'Connor, Beltran, et al., 2020; Otterbach et al., 2018; Sadeghi et al., 2017; Tschann et al., 2015; Zhang et al., 2019) but only a few specifically targeted food- and activity-related parenting practices (T. M. O'Connor, Beltran, et al., 2020; Otterbach et al., 2018; Zhang et al., 2019). For example, a pilot intervention called Niños Activos y Sanos: Healthy & Active Children was conducted with 52 parents (95% female) and children (3-11 years) (Otterbach et al., 2018). Pre-post results indicated that the frequency of positive food parenting practices was increased including encouraging balance and variety and making fruit available, while the frequency of making energy-dense snacks and fast foods available was decreased. A limited number of interventions focused primarily on paternal parenting practices regarding obesogenic behaviors of Latino adolescents (T. M. O'Connor, Beltran, et al., 2020; Zhang et al., 2019). Therefore, public health interventions focused on paternal parenting practices to promote healthy lifestyles among Latino youth need to be implemented and evaluated to determine effectiveness.

The primary goal of the Padres Preparados, Jóvenes Saludables (Padres) program was to prevent unhealthy weight gain among Latino children in low-income households by increasing the frequency of healthy paternal food and physical activity parenting practices. The Padres program was adapted from a previous successful community-based parenting skills education program that aimed to prevent substance use among Latino parents and adolescents (Allen et al., 2012). Latino fathers' perspectives regarding parenting experiences and program preferences were gathered in father advisory board meetings and focus group discussions and used in the development of the program (Zhang et al., 2018). The Padres program was based on the principles of community-based participatory research (Arroyo-Johnson et al., 2015) with community partners collaborating with researchers in all steps of the Padres program design and implementation processes. Social cognitive theory was used as a theoretical framework for the Padres program curriculum (Bandura & Cliffs, 1986; McAlister et al., 2008). This theory emphasizes the dynamic interactions between adolescents' personal factors, diet and activity-related behaviors, and environment structured by food- and activity-related paternal parenting practices (setting expectations, role modeling, and availability at home) (Bandura & Cliffs, 1986; McAlister et al., 2008). The purpose of the current study was to evaluate whether the frequency of food- and activity-related paternal parenting practices (father- and adolescent-reported) differed from baseline to post-intervention between intervention and control groups. This study also assessed modifier effects on the frequency of father- and adolescent-reported food- and activity-related paternal parenting practices.

2. Methodology

2.1. Study Design and Sample

This study used baseline and post survey data from the Padres Preparados, Jóvenes Saludables (Prepared Parents, Healthy Youth) trial, which was a community-based intervention project (Zhang et al., 2019). The randomized controlled intervention trial (identifier: NCT03641521) aimed to prevent overweight and obesity among Latino adolescents (10–14 years) by improving the frequency of fathers' food- and activity-related parenting practices and adolescents' energy balance-related behaviors (EBRBs). Primary outcomes including father and adolescent EBRBs were reported elsewhere (Baltaci et al., 2021). This paper reports on secondary outcomes including father- and adolescent-reported frequency of paternal food- and activity-related parenting practices.

Father/adolescent dyads were randomized to either an intervention or delayed-treatment control group. The Padres program details were described elsewhere (Baltaci et al., 2021). In brief, the program was implemented in-person at four locations in the Minneapolis/St. Paul metropolitan area between September 2017 and December 2019. In-person implementation was discontinued in March 2020 because of COVID-19 pandemic restrictions regarding contact with participants. Latino fathers or male caregivers (hereafter referred to as fathers) of adolescents 10-14 years who identified as Latino, spoke Spanish, and had meals at least three times a week with their adolescents were eligible for the study. Families were recruited by using social media, flyers, and announcements at community service centers and churches. Fathers and adolescents completed surveys in-person (Appendix C for father survey, Appendix D for adolescent survey) at baseline and one week after the intervention group participated in eight weekly intervention sessions. The study protocol was approved by the University of Minnesota Institutional Review Board (project identification code: 1511S80707).

2.2. Sociodemographic characteristics

Fathers completed surveys regarding their age, years in the US, education, employment status, marital status, family monthly income, and language spoken at home. Education was classified as middle school or lower, GED or high school, and some college or higher. Employment was collapsed into four categories: self-employed, unemployed, employed part-time, and employed full-time. Marital status was classified as single or married/living with a partner.

Adolescents reported their birthdates and sex. Adolescents' age was calculated by subtracting birth date from the date of baseline data collection divided by 365.

2.3. Anthropometric Measurements

Adolescents' and fathers' body weight and height were measured separately twice in a private space using a digital scale (BWB-800 Scale, Tanita) and a stadiometer by a trained research assistant according to standardized procedures of the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2017). Two or three measures of both weight and height were averaged to obtain mean weight and height. Fathers' body mass index (BMI) was calculated using weight (kg) divided by height squared (m^2). Adolescents' BMI percentiles were generated by a SAS program for the 2000 CDC Growth Charts (Centers for Disease Control and Prevention, 2016).

2.4. Father/Adolescent Communication

The quality of fathers' communication with their adolescents was examined regarding three subscales based on father report: openness (11 items), satisfaction (4 items), and communication problems (5 items) (Barnes & Olson, 1985). Example questions were 'I organize my thoughts before talking to my child (openness)", "it is easy for me to express my true feelings to my child (satisfaction)," and "it is difficult for my son/daughter to talk with me (communication problems)." Response options were almost never or never = 1, once in a while = 2, about half of the time = 3, very often =4, almost always/always = 5. Coded responses were averaged, and two levels of father/adolescent communication were created for each subscale.

2.5. Paternal Food/Physical Activity/Screen Time Responsibilities and Food/Meal Involvement

The frequency that fathers perceived they were responsible for adolescent food intake (5 items), physical activity (1 item), and screen time (1 item) was examined using father-reported data. Questions assessed the frequency of the father's perceived responsibility for planning, buying, preparing/cooking foods for meals, deciding and controlling what the child eats, organizing the child's physical activity, and controlling the child's screen time. Response options were almost never or never = 1, rarely = 2, half of time = 3, most of time = 4, and almost always or always = 5. Two categories of father food responsibility were created to reflect low (< 4) and high (≥ 4) frequency. Two categories of father physical activity and screen time responsibilities were created separately to reflect low (≤ 3) and high (≥4) frequency.

Paternal food/meal involvement was examined by asking fathers and adolescents questions about the frequency of fathers 1) planning meals, 2) buying foods, and 3) preparing foods together with their adolescent. Five response options for each question were almost never or never, less than one time in a week, 1-3 times in a week, 4-6 times in a week, and once a day or more. Two categories of paternal food/meal involvement were created to reflect low (< 3 times/week) and high (≥ 3 times/week) frequency.

2.6. Family Meals

The frequency of family meals was assessed by asking adolescents: "During the past seven days, how many times did you eat a meal with all or most of your family?" Response options were never, 1 to 2 times, 3 to 4 times, 5 to 6 times, 7 times, and more than 7 times (Fulkerson et al., 2006). Two categories of family meal frequency were created to reflect low (< 3 times/week) and high (≥ 3 times/week) frequency.

2.7. Paternal Parenting Practices

The level or frequency of three paternal parenting practices was examined for each EBRB (intake of fruit, vegetable, sugar-sweetened beverages, fast-food, sweets/salty snacks, and physical activity and screen time) using father- and adolescent-reported data collected via separate questionnaires. High and low levels or frequencies for each parenting practice were created based on median values.

Paternal parenting practices included setting expectations, role modeling, and availability/accessibility. Parenting practices questions were developed based on validated scales (Matthews-Ewald et al., 2015; Pinard et al., 2014; Singh et al., 2012) and findings from focus groups with Latino fathers (Zhang et al., 2018). Paternal parenting practice items and scales showed adequate criterion validity in a preliminary study and internal consistency for all scales based on Cronbach α coefficients > 0.7 (Zhang et al., 2020).

2.7.1. Setting Expectations/Limits

Fathers' and adolescents' perceptions of paternal expectations/limits for each EBRB were measured by asking fathers and adolescents one question per EBRB. Setting expectations for fruit and vegetable intake were assessed by asking how many cups (for fathers)/times (for adolescents) fathers wanted their adolescents to eat (fruit, vegetables) in a day: 0 cups/times, 1 cup/time, 2 cups/times, 3 cups/times or more. Setting limits for intakes of SSBs, sweets/salty snacks, and fast food were assessed by asking how often fathers allowed their adolescents to drink/eat (SSBs, sweets/salty snacks, fast-food) in a week: not allowed, less than once in a week, 1-3 times in a week, 4-6 times in a week, once a day or more, and as often as he or she wants. Setting expectations for physical activity and limits for screen time were assessed by asking how much fathers wanted/allowed their adolescent to be physically active/have screen time in a day: 0 minutes / not allowed 30 minutes or less, 30 minutes to one hour, 1 hour to 2 hours, 2 hours or more, as much as he or she wants. Adolescent questions also had an I don't know option, which was coded as missing in the data analysis. Responses were coded and used to create two frequency levels regarding paternal expectations/limits for each EBRB.

2.7.2. Role Modeling

To evaluate fathers' and adolescents' perceptions of paternal role-modeling, fathers and adolescents were asked two questions for each EBRB. Role modeling for fruit and vegetable intakes were assessed by asking how many times fathers were seen by adolescents eating/having (fruit, vegetable, sugar-sweetened beverages, fast-food, sweets/salty snacks, and physical activity and screen time) and how many times fathers ate/engaged in (fruit, vegetable, sugar-sweetened beverages, fast-food, sweets/salty snacks, and physical activity and screen time) with adolescents: almost never or never = 1, <1 time/week = 2, 1–3 times/week = 3, 4–6 times/week = 4, and once a day or more = 5. Responses to the two questions were coded, summed, and averaged to create a modeling score for each EBRB.

2.7.3. Home Availability

Fathers' and adolescents' perceptions of the frequency of paternal parenting practices regarding home availability were assessed by asking fathers and adolescents three questions for each EBRB, except for screen time which was assessed with one question. Response options for all questions were almost never or never = 1, rarely = 2, sometimes = 3, often = 4, and almost always or always = 5. Making fruit and vegetables available at home was assessed separately by frequency of fathers buying, preparing, and making sure adolescents had different kinds. Making SSBs, sweets/salty snacks, and fast food available at home was assessed separately by the frequency of fathers buying, preparing, and giving money to their adolescents to buy these foods. Making physical activity available was assessed by the frequency of fathers taking their adolescent to a place he/she can be physically active, sending their adolescent outside to be physically active when the weather is nice, and making opportunities available for their adolescent to be physically active. Making screen time available was assessed by the frequency of fathers making screen time opportunities available to their adolescents. The responses to the three questions for each EBRB except for screen time were coded, summed, and averaged to create an availability score.

2.8. Data Analysis

Initial sample size and power calculations were completed on the basis of the expected primary outcomes of the Padres program, which included father and adolescent EBRBs as explained elsewhere (Baltaci et al., 2021). Post-hoc power calculations were completed using Nquery sample size software to determine power available to detect the observed between group differences in father- and adolescent-reported parenting practice outcomes as significant at alpha = 0.05 using study sample size in each group (Appendix G, Tables S1 and S2).

All fathers with adolescents who had both baseline and post data and attended at least one educational session if they were in the intervention group were included in the analysis of the frequency of father-reported parenting practices. All adolescents who attended at least one educational session if they were in the intervention group were included in the analysis of the frequency of adolescent-reported parenting practices. See Appendix H for SAS codes used for data analysis in Chapter 4.

Descriptive statistics for baseline sociodemographic characteristics (father, adolescent, and household characteristics) for intervention and delayed-treatment control groups were assessed using independent two-sample t-tests for normally distributed continuous variables and Chi-square and Fisher's exact tests for categorical variables.

Cutoff points for paternal parenting practices reported by fathers and adolescents and covariates (father-reported father-adolescent communication, paternal food/physical activity/screen time responsibilities, and paternal food/meal involvement and adolescent-reported family meal and paternal food/meal involvement) were identified based on median analysis. Chi-square tests were used to identify baseline differences in frequency of paternal parenting practices and covariates between intervention and delayed-treatment control groups for fathers and adolescents. For father- and adolescent-reported paternal parenting practices and father-reported father-adolescent communication outcomes, McNemar's Chi-square tests were used to identify significant differences in proportions with a baseline-post change from low to high vs. high to low among those with any change**,** stratified by intervention and delayed-treatment control groups.

Generalized Linear Mixed Models (GLMM) for logistic regression of binary post outcomes were used to assess father- and adolescent-reported parenting practices and father/adolescent communication outcomes adjusted for baseline level of outcome, intervention group, adolescent age and sex with a random intercept for site to account for clustering of families within sites. Father-reported GLMM models were also adjusted for father age and relevant baseline paternal food/physical activity/screen time responsibilities and food/meal involvement covariates (potential modifiers). Adolescent-reported GLMM models were also adjusted for family meals and paternal food/meal involvement for frequency of food parenting practices.

All analysis was performed using SAS software version 9.4 (Cary, NC, USA, 2002–2012) with statistical significance defined as $P < .05$.

3. Results

A total of 303 father-adolescent dyads expressed interest in participating in the study (Figure 4.1). Of those, 266 were screened for eligibility over the telephone, and 234 were identified as eligible. Of the 234 dyads, 54 did not attend the baseline data collection session, and 20 dyads did not complete the data collection procedures. Baseline data collection sessions were completed by 160 father/adolescent dyads and 96 father/adolescent dyads completed both baseline and post data collection. The retention rate was 60% for father/adolescent dyads. Reasons for not completing post-data collection were withdrawal from the study because of relocation, scheduling conflicts or loss to follow up (unable to contact).

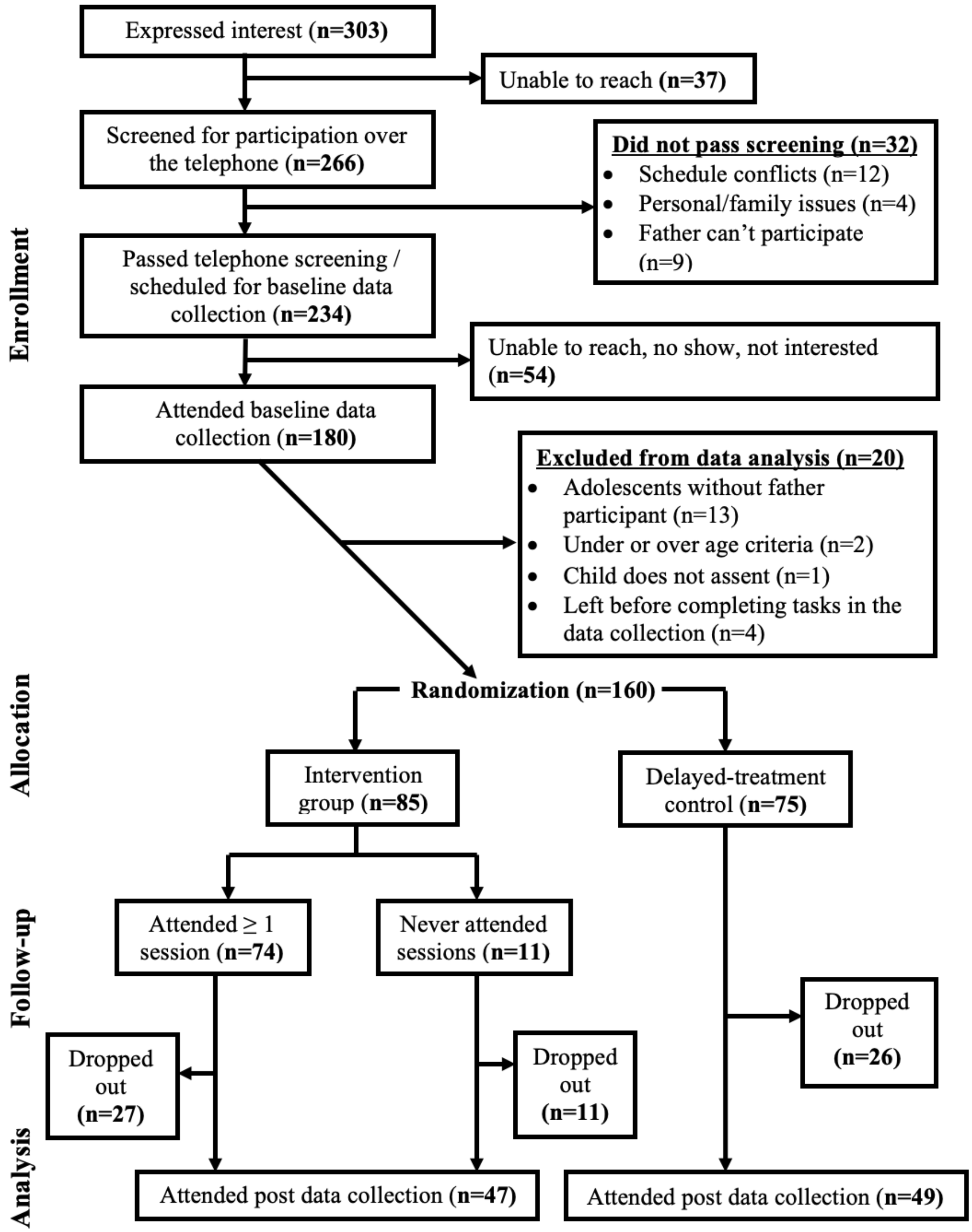


Figure 4.1. CONSORT diagram (baseline father/adolescent pairs).

Baseline and post data were available from 96 fathers who attended baseline and post data collection sessions with their adolescent and intervention fathers who attended at least one intervention session. Of the 96 fathers, 47 were in the intervention group, and 49 were in the delayed-treatment control group. Demographic characteristics of fathers in the intervention and delayed-treatment control groups were similar at baseline (Table 4.1). Overall, the mean father age was 41.9 years. Most (87%) fathers reported a yearly household income of ≤ $49,999; 79% reported completing high school or less. Most fathers were employed full-time (75%) and married (87%). Most fathers reported speaking exclusively or primarily Spanish at home (84%) and having lived in the U.S. for more than 10 years (97%). The mean BMI of all fathers was 29.9 (± 3.7).

Table 4.1. Baseline father demographic characteristics (n=96).

Father demographics	All n = 96	Intervention n = 47	Delayed treatment control n = 49	p-value
Age, mean (SD)	41.9 (7.3)	43.1 (6.9)	40.8 (7.5)	0.127[a]
Annual income, n (%),				0.199[b]
< $25,000	36 (39.1)	22 (47.8)	14 (30.4)	
$25,000 - < $50,000	44 (47.8)	18 (39.1)	26 (56.5)	
≥$50,000	12 (13.0)	6 (13.0)	6 (13.0)	
Marital status, n (%)				0.472[c]
Married	81 (87.1)	42 (91.3)	39 (83.0)	
Living with partner	6 (6.5)	2 (4.4)	4 (8.5)	
Single/widowed/divorced/separated	6 (6.5)	2 (4.4)	4 (8.5)	
Education, n (%)				0.341[b]
Middle school or less	33 (35.1)	19 (40.4)	14 (29.8)	
HS grad or GRE	41 (43.6)	17 (36.2)	24 (51.1)	
College (any) or technical school	20 (21.3)	11 (23.4)	9 (19.2)	
Employment, n (%)				0.456[c]
Self-employed	11 (11.8)	6 (13.0)	5 (10.6)	
Unemployed / homemaker	4 (4.3)	2 (4.4)	2 (4.3)	
Part-time employment	8 (8.6)	6 (13.0)	2 (4.3)	
Full-time employment	70 (75.3)	32 (69.6)	38 (80.9)	
Years in the US, n (%)				0.925[c]
< 10	3 (3.2)	1 (2.2)	2 (4.3)	
10 - < 20	54 (58.1)	28 (60.9)	26 (55.3)	
20 - <30	32 (34.4)	15 (32.6)	17 (36.2)	
≥ 30	4 (4.3)	2 (4.4)	2 (4.3)	
Language, n (%)				0.885[c]
More Spanish than English	80 (84.2)	39 (83.0)	41 (85.4)	
Equal Spanish and English	13 (13.7)	7 (14.9)	6 (12.5)	
More English than Spanish	2 (2.1)	1 (2.1)	1 (2.1)	
BMI, mean (SD)	29.9 (3.7)	29.6 (3.9)	30.1 (3.5)	0.536[a]

[a]Two sample t-test; [b]Chi-square test; [c]Fisher's exact test.

Baseline and post data were available from 110 adolescents who attended baseline data collection sessions with their fathers and intervention group adolescents who attended at least one intervention session. Ninety-six adolescents attended post data collections with their fathers while 14 adolescents attended post-data collection session with their mothers only. Of the 110 adolescents, 54 were in the intervention group, and 56 were in the delayed-treatment control group. The mean age of adolescents was 11.5

years (± 1.5), with a significant difference between the intervention (11.8 years ± 1.6) and delayed-treatment control (11.2 years ± 1.5) groups ($p = 0.035$). The majority of adolescents were male (56%) with 44% female. The mean BMI percentile of all adolescents was 78.6 (± 23.9). No differences in adolescents' sex or mean BMI percentiles were observed between the intervention and delayed-treatment control groups.

Father-reported frequency of baseline paternal parenting practices were similar across treatment groups for most practices with the exception of paternal fruit and vegetable modeling (Appendix I, Table S1). More fathers reported a lower frequency of paternal fruit modeling ($p = 0.049$) and fewer fathers reported a lower frequency of paternal vegetable modeling ($p = 0.020$) in the intervention versus the delayed-treatment control group. Also, fewer fathers reported a lower frequency of father-adolescent communication problems ($p = 0.042$) in the intervention than the delayed-treatment control group. Adolescent-reported frequency of baseline paternal parenting practices were similar between intervention and delayed-treatment control groups (Appendix I, Table S2).

No significant differences were observed in baseline father-reported paternal food/physical activity/screen time responsibility and paternal food/meal involvement between intervention and delayed-treatment control groups. Adolescent-reported frequency of family meals and paternal food/meal involvement also did not differ between groups (Appendix I, Table S3).

3.1. Father-reported paternal parenting practices and father-adolescent communication outcomes

From baseline to post intervention, greater frequency of paternal fruit role modeling ($p = 0.012$) and lower frequency of making fast food available at home ($p = 0.034$) were observed in the intervention group based on McNemar’s Chi-square and father-reported frequency of paternal parenting practices (Table 4.2). In addition, a marginally lower allowance for adolescent sweets/salty snack intake ($p = 0.059$), and lower frequency of SSB modeling ($p = 0.071$) and screen time modeling ($p = 0.058$) were observed in the intervention group. A significantly greater expected amount of adolescent vegetable intake ($p = 0.033$) and lower SSB modeling frequency ($p = 0.002$) from baseline to post measures were observed in the delayed-treatment control group based on McNemar's Chi-square.

Two significant and one marginal difference in post paternal parenting practices were observed between groups in the adjusted GLMM models (Table 4.3). First, the odds of higher post fruit modeling frequency was significantly higher for intervention than delayed-treatment control group (OR = 3.43 [1.03, 11.40], p = 0.045). Second, the odds of lower frequency of post fast food availability at home was significantly higher for intervention than delayed-treatment control group (OR = 5.38 [1.38, 21.0], p = 0.016). The odds of a higher amount of post expected adolescent vegetable intake was marginally lower for intervention than delayed-treatment control group (OR = 0.31 [0.09, 1.08], p = 0.065).

No significant changes from baseline to post intervention were observed in the father-adolescent communication subscales in either the intervention or delayed-treatment control group (Table 4.2). Also, no significant differences in any post father/adolescent communication subscales were observed between intervention and delayed-treatment control groups (Table 4.3).

Table 4.2. Results of McNemar's test for father-reported paternal parenting practices and father/adolescent communication outcomes.

			Baseline-post change[a] and McNemar's Chi-square test for intervention and delayed-treatment control group					
			Delayed-treatment control group change			Intervention group change		
Father-reported paternal parenting practices	**Levels**	**n in model**	**No baseline-post change n (%)**	**High to low n (%)[b]**	**Low to high n (%)[b]**	**No baseline-post change n (%)**	**High to low n (%)[b]**	**Low to high n (%)[b]**
Paternal expectation/limit								
Fruit, cups/day	Low intake (≤ 1 cup/day), high intake (≥ 2 cups/day)	95	37 (75.5)	3 (25.0)	9 (75.0)	30 (65.2)	6 (37.5)	10 (62.5)
Vegetables, cups/day	Low intake (≤ 1 cup/day), high intake (≥ 2 cups/day)	90	32 (69.6)	3 (21.4)*	11 (78.6)*	33 (75.0)	7 (63.6)	4 (36.4)
SSB[c], times/week	Low intake (≤ 1–3 times/week), high intake (≥ 4–6 times/week)	90	39 (83.0)	5 (62.5)	3 (37.5)	32 (74.4)	8 (72.7)	3 (27.3)
Sweets & salty snacks, times/week	Low intake (≤ 1–3 times/week), high intake (≥ 4–6 times/week)	93	38 (79.2)	8 (80.0)[†]	2 (20.0)[†]	38 (84.4)	6 (85.7)[†]	1 (14.3)[†]
Fast food, times/week	Low intake (≤ less than 1 time/week), high intake (≥1–3 times/week)	91	35 (74.5)	5 (41.7)	7 (58.3)	33 (75.0)	6 (54.5)	5 (45.5)
Physical activity, hours/day	Less hours (≤ 30 minutes to 1 hour), more hours (≥1 hour to 2 hours)	89	29 (63.0)	11 (64.7)	6 (35.3)	19 (44.2)	13 (54.2)	11 (45.8)
Screen time, hours/day	Less hours (≤1 hour to 2 hours), More hours (≥ 2 hours or more)	90	39 (83.0)	5 (62.5)	3 (37.5)	31 (72.1)	7 (58.3)	5 (41.7)
Paternal role modeling								
Fruit, times/week	Less often (≤ 3), more often (> 3)	81	33 (80.5)	4 (50.0)	4 (50.0)	21 (52.5)	4 (21.1)*	15 (78.9)*
Vegetables, times/week	Less often (≤ 3), more often (> 3)	90	31 (70.5)	3 (23.1)[†]	10 (76.9)[†]	32 (69.6)	7 (50.0)	7 (50.0)

SSB[c], times/week	Less often (≤ 2), more often (> 2)	93	35 (72.9)	12 (92.3)*	1 (7.7)*	30 (66.7)	11 (73.3)†	4 (26.7)†
Sweets & salty snacks, times/week	Less often (≤ 2) more often (> 2)	95	40 (83.3)	2 (25.0)	6 (75.0)	38 (80.9)	4 (44.4)	5 (55.6)
Fast food, times/week	Less often (≤ 2), more often (> 2)	92	38 (79.2)	6 (60.0)	4 (40.0)	34 (77.3)	7 (70.0)	3 (30.0)
Physical activity, times/week	Less often (≤ 3), more often (> 3)	92	38 (84.4)	4 (57.1)	3 (42.9)	35 (74.5)	5 (41.7)	7 (58.3)
Screen time, times/week	Less often (≤ 3), more often (> 3)	93	33 (70.2)	6 (42.9)	8 (57.1)	36 (78.3)	8 (80.0)†	2 (20.0)†
Availability at home								
Fruit	Less often (< 4), more often (≥ 4)	95	37 (77.1)	5 (45.5)	6 (54.5)	31 (66.0)	5 (31.3)	11 (68.7)
Vegetables	Less often (< 4), more often (≥ 4)	95	34 (70.8)	5 (35.7)	9 (64.3)	34 (72.3)	8 (61.5)	5 (38.5)
SSB[c]	Less often (≤ 2), more often (> 2)	95	36 (73.5)	7 (53.8)	6 (46.2)	35 (76.1)	7 (63.6)	4 (36.4)
Sweets & salty snacks	Less often (≤ 2), more often (> 2)	96	31 (63.3)	8 (44.4)	10 (55.6)	37 (78.7)	7 (70.0)	3 (30.0)
Fast food	Less often (≤ 2), more often (> 2)	96	37 (75.5)	3 (25.0)†	9 (75.0)†	39 (83.0)	7 (87.5)*	1 (12.5)*
Physical activity	Less often (< 4), more often (≥ 4)	93	39 (84.8)	1 (14.3)†	6 (85.7)†	27 (57.4)	8 (40.0)	12 (60.0)
Screen time	Less often (< 3), more often (≥ 3)	94	36 (75.0)	4 (33.3)	8 (66.7)	31 (67.4)	7 (46.7)	8 (53.3)
Father/adolescent communication								
Openness	Low (< 4), high (≥ 4)	95	33 (68.8)	10 (66.7)	5 (33.3)	37 (78.7)	5 (50.0)	5 (50.0)
Satisfaction	Low (< 4), high (≥ 4)	95	33 (68.8)	6 (40.0)	9 (60.0)	29 (61.7)	6 (33.3)	12 (66.7)
Problems	Low (< 2), high (≥ 2)	93	33 (71.7)	5 (38.5)	8 (61.5)	32 (68.1)	10 (66.7)	5 (33.3)

[a]Positive (i.e., favorable) direction of change was "low to high" for fruit, vegetables, and physical activity, and father/adolescent communication openness and satisfaction. Positive (i.e., favorable) direction of change was "high to low" for SSBs, sweets/salty snacks, fast food, and screen time and father/adolescent communication problems; [b]High- and low-cut points for each outcome are based on baseline item medians in the study dataset. Percent calculated out of N with any change; [c]SSB = sugar-sweetened beverage; † Indicates marginal changes between and within the groups. *p*-value < 0.10; * Indicates significant changes between and within the groups. *p*-value < 0.05

Table 4.3. Results of GLMM models for father-reported paternal parenting practices and father/adolescent communication outcomes.

	Generalized Linear Mixed Model logistic regression[1]	
	ORᵇ (95% CIᵇ) for indicated POST outcome category	
Father-reported paternal parenting practices	**Levels**	**Intervention group**
Paternal expectation/limit		
Fruit, cups/day (n=92)	Low intake (≤ 1 time/day)	Ref
	high intake (≥ 2 times/day)	0.49 (0.14, 1.68)
Vegetables, cups/day (n=87)	Low intake (≤ 1 time/day)	Ref
	High intake (≥ 2 times/day)	0.31 (0.09, 1.08)[†]
SSB[b], times/week (n=87)	Low intake (≤ 1–3 times/week)	1.40 (0.26, 7.65)
	High intake (≥ 4–6 times/week)	Ref
Sweets & salty snacks, times/week (n=90)	Low intake (≤ 1–3 times/week)	1.35 (0.06, 29.4)
	High intake (≥ 4–6 times/week)	Ref
Fast food, times/week (n=88)	Low intake (≤less than 1 time/week)	1.44 (0.46, 4.46)
	High intake (≥1–3 times/week)	Ref
Physical activity, hours/day (n=87)	Less hours (≤ 30 minutes to 1 hour)	Ref
	More hours (≥1 hour to 2 hours)	1.23 (0.49, 3.12)
Screen time, hours/day (n=88)	Less hours (≤1 hour to 2 hours)	0.72 (0.18, 2.79)
	More hours (≥ 2 hours or more)	Ref
Paternal role modeling		
Fruit, times/week (n=78)	Less often (≤ 3)	Ref
	More often (> 3).	3.43 (1.03, 11.40)*
Vegetables, times/week (n=87)	Less often (≤ 3)	Ref
	More often (> 3).	1.12 (0.39, 3.25)
SSB[b], times/week (n=90)	Less often (≤ 2)	1.33 (0.41, 4.31)
	More often (> 2).	Ref
Sweets & salty snacks, times/week (n=92)	Less often (≤ 2)	1.35 (0.40, 4.59)
	More often (> 2).	Ref
Fast food, times/week (n=90)	Less often (≤ 2)	1.72 (0.42, 7.04)
	More often (> 2)	Ref
Physical activity, times/week (n=90)	Less often (≤ 3)	Ref
	More often (> 3)	1.63 (0.51, 5.18)
Screen time, times/week (n=90)	Less often (≤ 3)	2.63 (0.82, 8.40)
	More often (> 3)	Ref
Availability at home		
Fruit (n=92)	Less often (< 4)	Ref
	More often (≥ 4)	1.61 (0.50, 5.16)
Vegetables (n=92)	Less often (< 4)	Ref
	More often (≥ 4)	1.65 (0.53, 5.13)
SSB[b] (n=92)	Less often (≤ 2)	1.59 (0.51, 4.93)
	More often (> 2)	Ref

Sweets & salty snacks (n=93)	Less often (≤ 2)	1.15 (0.35, 3.82)
	More often (> 2)	Ref
Fast food (n=93)	Less often (≤ 2)	5.38 (1.38, 21.0)*
	More often (> 2)	Ref
Physical activity (n=91)	Less often (< 4)	Ref
	More often (≥ 4)	1.08 (0.39, 2.96)
Screen time (n=91)	Less often (< 3)	1.38 (0.43, 4.46)
	More often (≥ 3)	Ref
Father/adolescent communication		
Openness (n=95)	Low (< 4)	Ref
	High (≥ 4)	2.07 (0.70, 6.14)
Satisfaction (n=95)	Low (< 4)	Ref
	High (≥ 4)	0.96 (0.39, 2.41)
Problems (n=95)	Low (< 2)	1.44 (0.54, 3.85)
	High (≥ 2)	Ref

[a]Generalized mixed models controlled by adolescent age and sex, father age, and relevant baseline covariates. Models were estimating odds of high intake for favorable outcomes (fruit, vegetable, physical activity, and communication openness and satisfaction) and odds of low intake for unhealthy outcomes (SSB, sweets/salty snack, fast food, screen time, and communication problems); [b]OR = odds ratio, CI = confidence interval, SSB = sugar-sweetened beverage; †Indicates marginal changes between and within the groups. *p*-value < 0.10; *Indicates significant changes between and within the groups. *p*-value < 0.05.

3.2. Adolescent-reported paternal parenting practices outcomes

Adolescents in the intervention group reported that fewer fathers made physical activity opportunities available (p = 0.039) from baseline to post intervention based on McNemar's Chi-square (Table 4.4). Positive marginal changes were reported by adolescents in the intervention group regarding the expected adolescent fruit intake frequency (p = 0.059), allowance for adolescent screen time (p = 0.059), and frequency of SSB modeling (p = 0.052) from baseline to post intervention based on McNemar's Chi-square tests. A significantly lower frequency of making physical activity opportunities available (p = 0.032) by fathers from baseline to post measures was reported by adolescents in the delayed-treatment control group based on McNemar's Chi-square.

In the adolescent-reported adjusted paternal parenting practice GLMM models, differences were observed in the post expected fruit intake frequency and screen time and post fruit modeling frequency between groups (Table 4.5). The odds of higher post expected adolescent fruit intake frequency were marginally higher for intervention fathers than delayed-treatment control fathers (OR = 3.05 [1.00, 9.32], p = 0.051). The odds of lower post allowance on adolescent screen time were significantly higher for intervention fathers than delayed-treatment control fathers (OR = 6.16 [1.07, 35.52], p = 0.042). The odds of higher post fruit modeling frequency were significantly higher for intervention fathers than delayed-treatment control fathers (OR = 2.67 [1.04, 6.89], p = 0.042).

Table 4.4. Results of McNemar's test for adolescent-reported paternal parenting practices outcomes.

			Baseline-post change[a] and McNemar's Chi-square test for intervention and delayed-treatment control group					
			Delayed-treatment control group change			Intervention group change		
Adolescent-reported paternal parenting practices	**Levels**	**n in model**	**No baseline-post change n (%)**	**High to low levels n (%)[b]**	**Low to high levels n (%)[b]**	**No baseline-post change n (%)**	**High to low levels n (%)[b]**	**Low to high levels n (%)[b]**
Paternal expectation/limit								
Fruit, times/day	Low intake (≤ 2 times/day), high intake (≥ 3 times/day or more)	77	25 (45.4)	5 (38.5)	8 (61.5)	21 (53.9)	5 (27.8)†	13 (72.2)†
Vegetables, times/day	Low intake (≤ 2 times/day), high intake (≥ 3 times/day or more)	81	31 (79.5)	4 (50.0)	4 (50.0)	24 (57.1)	6 (33.3)	12 (66.7)
SSB[c], times/week	Low intake (≤ 1–3 times/week), high intake (≥ 4–6 times/week)	86	37 (82.2)	4 (50.0)	4 (50.0)	34 (82.9)	3 (42.9)	4 (57.1)
Sweets & salty snacks, times/week	Low intake (≤ 1–3 times/week), high intake (≥ 4–6 times/week)	84	39 (86.7)	3 (54.5)	3 (45.5)	32 (82.1)	5 (71.4)	2 (28.6)
Fast food, times/week	Low intake (≤ less than 1 time/week), high intake (≥ 1–3 times/week)	89	29 (63.0)	6 (35.3)	11 (64.7)	32 (74.4)	5 (45.5)	6 (54.5)
Physical activity, hours/day	Less hours (< 30 minutes to 1 hour), more hours (≥ 1 hour to 2 hours)	80	26 (72.2)	4 (40.0)	6 (60.0)	24 (54.5)	13 (65.0)	7 (35.0)
Screen time, hours/day	Less hours (≤ 1 hour to 2 hours), more hours (≥ 2 hours or more)	74	31 (81.6)	1 (14.3)†	6 (85.7)†	29 (80.6)	6 (85.7)†	1 (14.3)†

Paternal role modeling								
Fruit, times/week	Less often (< 3), more often (≥ 3)	102	37 (74.0)	9 (69.2)	4 (30.8)	33 (63.5)	8 (42.1)	11 (57.9)
Vegetables, times/week	Less often (< 3), more often (≥ 3)	105	42 (80.8)	4 (40.0)	6 (60.0)	40 (75.5)	6 (46.2)	7 (53.8)
SSB[c], times/week	Less often (≤ 2), more often (> 2)	105	38 (71.7)	9 (60.0)	6 (40.0)	39 (75.0)	10 (76.9)[†]	3 (23.1)[†]
Sweets & salty snacks, times/week	Less often (≤ 1.5), more often (> 1.5)	105	32 (59.3)	9 (40.9)	13 (59.1)	39 (76.5)	7 (58.3)	5 (41.7)
Fast food, times/week	Less often (≤ 2), more often (> 2)	107	42 (77.8)	5 (41.7)	7 (58.3)	43 (81.1)	4 (40.0)	6 (60.0)
Physical activity, times/week	Less often (< 3.5), more often (≥ 3.5)	106	40 (75.5)	7 (53.8)	6 (46.2)	39 (73.6)	7 (50.0)	7 (50.0)
Screen time, times/week	Less often (≤ 3), more often (> 3)	106	37 (71.2)	9 (60.0)	6 (40.0)	29 (53.7)	13 (52.0)	12 (48.0)
Availability at home								
Fruit	Less often (< 3.3), more often (≥ 3.3)	106	43 (81.1)	2 (20.0)[†]	8 (80.0)[†]	36 (67.9)	7 (41.2)	10 (58.8)
Vegetables	Less often (< 3.3), more often (≥ 3.3)	106	42 (79.2)	5 (45.5)	6 (54.5)	37 (69.8)	6 (37.5)	10 (62.5)
SSB[c]	Less often (≤ 2), more often (> 2)	107	44 (81.5)	5 (50.0)	5 (50.0)	42 (79.2)	7 (63.6)	4 (36.4)
Sweets & salty snacks	Less often (≤ 2), more often (> 2)	108	41 (75.9)	4 (30.8)	9 (69.2)	41 (75.9)	7 (53.8)	6 (46.2)
Fast food	Less often (≤ 1.7), more often (> 1.7)	108	36 (66.7)	8 (44.4)	10 (55.6)	37 (68.5)	10 (58.8)	7 (41.2)
Physical activity	Less often (< 3.3), more often (≥ 3.3)	108	40 (74.1)	11 (78.6)*	3 (21.4)*	35 (64.8)	14 (73.7)*	5 (26.3)*
Screen time	Less often (≤ 3), more often (> 3)	108	41 (75.9)	4 (30.8)	9 (69.2)	41 (75.9)	8 (61.5)	5 (38.5)

[a]Positive (i.e., favorable) direction of change is "low to high" for fruit, vegetable, and physical activity, while the favorable direction of change was "high to low" for SSBs, sweets/salty snacks, fast food, and screen time; [b]High- and low-cut points for each outcome are based on baseline item medians in the study dataset. Percent calculated out of N with any change; [c]SSB = sugar-sweetened beverage; [†]Indicates significant marginal changes between and within the groups. *p*-value < 0.10; *Indicates significant changes between and within the groups. *p*-value < 0.05.

Table 4.5. Results of GLMM models for adolescent-reported paternal parenting practices outcomes.

		Generalized Linear Mixed Model logistic regression[a]
		OR[b] (95% CI[b]) for indicated POST outcome category
Adolescent-reported paternal parenting practices	**Levels**	**Intervention group vs delayed-treatment control group**
Paternal expectation/limit		
Fruit, times/day (n=75)	Low intake (≤ 2 times/day)	Ref
	High intake (≥ 3 times/day or more)	3.05 (1.00, 9.32)[†]
Vegetables, times/day (n=79)	Low intake (≤ 2 times/day)	Ref
	High intake (≥ 3 times/day or more)	0.88 (0.27, 2.83)
SSB[b], times/week (n=85)	Low intake (≤ 1–3 times/week)	0.84 (0.19, 3.64)
	High intake (≥ 4–6 times/week).	Ref
Sweets & salty snacks, times/week (n=83)	Low intake (≤ 1–3 times/week)	1.79 (0.37, 8.69)
	High intake (≥ 4–6 times/week).	Ref
Fast food, times/week (n=87)	Low intake (≤ less than 1 time/week)	1.24 (0.47, 3.27)
	High intake (≥ 1–3 times/week).	Ref
Physical activity, hours/day (n=80)	Less hours (< 30 minutes to 1 hour)	Ref
	More hours (≥ 1 hour to 2 hours)	0.66 (0.25, 1.77)
Screen time, hours/day (n=74)	Less hours (≤ 1 hour to 2 hours)	6.16 (1.07, 35.52)*
	More hours (≥ 2 hours or more)	Ref
Paternal role modeling		
Fruit, times/week (n=99)	Less often (< 3)	Ref
	More often (≥ 3)	2.67 (1.04, 6.89)*
Vegetables, times/week (n=102)	Less often (< 3)	Ref
	More often (≥ 3)	1.02 (0.30, 3.41)
SSB[b], times/week (n=103)	Less often (≤ 2)	1.36 (0.50, 3.68)
	More often (> 2)	Ref
Sweets & salty snacks, times/week (n=103)	Less often (≤ 1.5)	1.72 (0.71, 4.15)
	More often (> 1.5)	Ref
Fast food, times/week (n=105)	Less often (≤ 2)	1.09 (0.40, 2.96)
	More often (> 2)	Ref
Physical activity, times/week (n=106)	Less often (< 3.5)	Ref
	More often (≥ 3.5)	1.39 (0.56, 3.44)
Screen time, times/week (n=106)	Less often (≤ 3)	0.80 (0.33, 1.92)
	More often (> 3)	Ref
Availability at home		
Fruit (n=104)	Less often (< 3.3)	Ref
	More often (≥ 3.3)	0.77 (0.28, 2.09)

Vegetables (n=104)	Less often (< 3.3)	Ref
	More often (≥ 3.3)	1.21 (0.47, 3.11)
SSB[b] (n=104)	Less often (≤ 2)	1.19 (0.41, 3.50)
	More often (> 2)	Ref
Sweets & salty snacks (n=105)	Less often (≤ 2)	1.42 (0.55, 3.65)
	More often (> 2)	Ref
Fast food (n=105)	Less often (≤ 1.7)	1.41 (0.58, 3.45)
	More often (> 1.7)	Ref
Physical activity (n=108)	Less often (< 3.3)	Ref
	More often (≥ 3.3)	1.19 (0.50, 2.84)
Screen time (n=108)	Less often (≤ 3)	0.54 (0.19, 1.49)
	More often (> 3)	Ref

[a]Generalized mixed models controlled by adolescent age and sex, baseline family meal frequency, and baseline paternal food/meal involvement, *p*-value < 0.05. Models were estimating odds of high intake for healthy outcomes (fruit, vegetable, physical activity) and odds of low intake for unhealthy outcomes (SSB, sweets/salty snack, fast food, screen time) for modeling and availability at home; [b]OR = odds ratio, CI = confidence interval, SSB = sugar-sweetened beverage; †Indicates significant marginal changes between and within the groups. *p*-value < 0.10; *Indicates significant changes between and within the groups. *p*-value < 0.05.

3.3. Modifier effects on paternal parenting practices model results

In the adjusted models, interaction between the group (intervention vs. delayed-treatment control) and the potential modifier of baseline paternal food responsibility were significant in two father-reported models: post frequency of vegetable modeling (p <0.001 for interaction term) and post making fruit available at home (p = 0.017 for interaction term) (Data not shown). Among fathers with low baseline food responsibility (n = 52), intervention fathers had higher odds of high post vegetable modeling frequency than delayed-treatment control fathers (OR = 6.17 [1.21, 31.4], p = 0.029). Among fathers with low baseline food responsibility (n = 56), intervention fathers had higher odds of high post fruit availability at home than delayed-treatment control fathers (OR = 9.54 [1.28, 71.1], p = 0.029). However, among fathers with high baseline food responsibility (n = 35), intervention fathers had lower odds of high post vegetable modeling frequency than delayed-treatment control group fathers (OR = 0.08 [0.01, 0.74], p = 0.028).

In the adjusted models, interaction between the group (intervention vs. delayed-treatment control) and the potential modifier of baseline family meal frequency was significant in one adolescent-reported model: post frequency of sweets/salty snack modeling (p = 0.015 for interaction term). Among fathers with low family meal frequency (n = 38) at baseline, intervention fathers had higher odds of low sweets/salty snack modeling frequency after the intervention than delayed-treatment control fathers (OR = 16.40 [1.19, 226.38], p = 0.038).

4. Discussion

This randomized controlled trial examined the effects of the Padres program and modifier effects on father- and adolescent-reported paternal parenting practices. Adjusted models showed improvements in three of 21 paternal parenting practices. Both fathers and adolescents reported increased paternal frequency of post fruit modeling while discrepancies were identified between fathers and adolescents regarding making fast food available at home, and paternal screen time expectation after the intervention. Overall, this study showed that both fathers and adolescents perceived improvements in some paternal parenting practices with a modifier effect of baseline paternal food responsibility and family meal frequency.

Based on the post-hoc power calculations, the study was underpowered to detect observed between group differences in baseline to post changes for most of the adolescent- and father-reported paternal parenting practices due to the small sample size. Power was < 80% for all observed comparisons except one paternal parenting practice. The study was originally powered to detect differences for father-reported fruit role modeling (power = 66%), fast food availability (power = 85%) as well as adolescent-reported screen time limits (power= 59%). However, some meaningful differences were not statistically significant due to small sample size whereas other differences were so small that lack of significance was not attributable to small sample size but to lack of a meaningful difference. For example, a larger sample size may have resulted in a statistically significant difference for the adolescent-reported paternal fruit expectations, which was marginally significantly different between intervention and delayed-treatment control groups.

Limited studies have examined improvements in community-based programs addressing Latino food and activity parenting practices, resulting in few studies available for comparison to the current study. One study with primarily low-income Hispanic parents (95% mothers) and children (3-11 years) showed baseline-to-post intervention improvements in two parenting practices involving food availability (Otterbach et al., 2018), but not in food modeling frequency. This finding was in contrast to the current study where agreement in improvement in paternal fruit modeling frequency was observed for fathers and adolescents in the intervention group compared to the delayed-treatment control group. However, the Otterbach et al. intervention was a pilot study, which did not include a control group, therefore the analyses could not be adjusted for potential baseline differences in intervention vs. control groups. This study also did not assess frequency of parenting practices from both a parent and child perspective.

In the current study, discrepancies between adolescents' and fathers' reports of parenting practices were reported, similar to other studies. A validation study that used baseline data from a subsample of the current study and data from additional fathers and youth (96 father-adolescent dyads) showed poor agreement between most father- and adolescent-reported parenting practices (Zhang et al., 2020). Similarly, Hou et al. (2018) also found discrepancies for parenting practices reported by Mexican immigrant fathers and adolescents with adolescents (68%) reporting lower scores for parental warmth, monitoring, and reasoning compared to fathers. Studies are lacking that examine explanatory factors for these discrepancies such as social desirability bias and limited parent-child communication. Examining both father- and adolescent-reported parenting practices with the same questions and identifying agreement provides an indication of perceived improvement in paternal parenting practices on the part of fathers and adolescents. Using adolescent- instead of father-reported information may also be useful in future studies because adolescent-reported paternal parenting practices showed better criterion validity with adolescent's food and activity behaviors compared to fathers in the Zhang et al. (2020) validation study.

Favorable influences of parental expectations and limits for adolescent food and activity behaviors may be based on the extent that parents are able to communicate expectations and limits to adolescents through verbal and nonverbal means. Family resiliency, which consists of individual factors such as family strengths, cultural values (e.g., familism), and community support has been associated with Latino families' health and wellbeing (Bermudez & Mancini, 2013). Familism has been a protective factor for Latino families because it enhances family cohesion, functioning, and communication (Avalos et al., 2020; Bermudez & Mancini, 2013). Familism may contribute to strong relationships and healthy communication between parents and children. For some health behaviors, studies have shown that positive parent-child communication has an important impact on Hispanic/Latino youth behaviors, including sex behaviors (Sutton et al., 2014) and substance use (Pokhrel et al., 2008). However, the impact of parent-child communication on food and activity parenting practices and behaviors are understudied. In the current study, father-adolescent communication subscales (openness, satisfaction, and problems) were not significantly improved as a result of the Padres intervention, which might have contributed to the lack of significant improvements in most father- and adolescent-reported expectations and limits.

The current study demonstrated no change in most of the paternal parenting practices based on father and adolescent reports, which could be related to a high frequency of positive parenting practices reported at baseline. The majority of fathers and adolescents in the intervention and delayed-treatment control groups reported a high frequency for fruit, vegetable, and physical activity role modeling and availability parenting practices and low frequency for SSB, sweets/salty snack, fast food and screen time role modeling and availability parenting practices at baseline, which might have created ceiling effects for these measures. In addition to ceiling effects, other factors affect the ability to show differences in frequency of paternal parenting practices including modifiers. For example, in the modifier analyses, fathers who reported low food responsibility at baseline had better post vegetable modeling frequency and making fruit available at home compared to delayed-treatment control group fathers. Therefore, fathers who reported low food responsibility before the intervention may have been better able to apply what they learned during the intervention to improve the frequency of some positive parenting practices.

Another possible explanation for not observing improvements for most paternal parenting practices in the current study could be associated with social determinants of health. Evidence from decades has shown that being part of a low-income household and lacking primary education attainment are two key social factors associated with poor health in the United States (Braveman et al., 2011). Racial and ethnic minorities with low socioeconomic status, including the Hispanic/Latino population, experience health disparities (Braveman et al., 2011; Thornton et al., 2016). The majority of fathers in this study were high school graduates or lower (79%) and low-income (87%), even though most had full-time employment. Fathers' income and busy work schedules may have kept fathers from implementing parenting practices they learned in the program. For example, limited resources to purchase healthy foods may restrict the ability to make healthy foods available at home and/or role model healthy food intake. Also, fathers who work long hours may have limited time to interact with adolescents and apply parenting practices; thus, a longer period of time from post intervention to completion of evaluation surveys might allow fathers to put what they learned in the program into practice.

This study had several limitations. The COVID-19 pandemic did not allow for continued in-person program implementation after March 2020. Along with a low retention rate, a smaller sample size than expected resulted in the study being underpowered to detect significant changes in most of the father and adolescent reported paternal parenting practice comparisons. The Padres program was only implemented in community centers and churches in the Minneapolis/St. Paul metropolitan area with low-income families, which limited the generalizability of study findings to the broader Latino/Hispanic population. Some participants may have been interested in nutrition and health, which could also have affected the generalizability of the findings. Group assignment was used instead of random assignment for a small number of participants who had an unmatched randomization and group assignment due to technical issues. All data except BMI measures came from self-reported surveys. Thus, recall and/or social desirability biases may have led participants to underreport unhealthy behaviors and overreport healthy behaviors.

5. Conclusion

The current study showed positive changes in some father- and adolescent-reported paternal food parenting practices from baseline to post among intervention group participants. Differences in post paternal food parenting practices between intervention and delayed-treatment control groups were found for several practices. In addition, the study identified paternal food responsibility (for fathers) and family meals (for adolescents) as modifiers for food parenting practices. Both fathers and adolescents agreed on a significant improvement in paternal fruit modeling frequency after the intervention while discrepancies between father- and adolescent-reported improvements in other paternal parenting practices were observed. In addition, this study highlighted the importance of considering social determinants of health and family strengths when evaluating intervention-based changes in paternal parenting practices among Latino families.

Chapter 5: Overall Discussion and Future Directions

This dissertation research evaluated a father-focused, community-based healthy lifestyle intervention to prevent overweight and obesity among Latino adolescents. Studies in this dissertation focused on differences in changes in EBRBs and weight status of fathers and/or youth between intervention and delayed-treatment control group father/adolescent dyads. In addition, studies examined the role of contextual factors (father meal/food involvement, father food/physical activity/screen time responsibilities, and family meals), intervention dose effect, and modifier effect in paternal parenting practices and Latino adolescent EBRBs and weight status. This chapter includes a summary of the findings presented in Chapters 2-4, an overall discussion of relationships between studies, strengths and limitations of the studies, and implications for research and practices.

In Chapter 2, associations among paternal food parenting practices and food/meal involvement, family meals and adolescent food behaviors were assessed separately and in combination. This study showed that Latino adolescent consumption of more healthy foods and less unhealthy foods was associated with more frequent paternal food parenting practices around role modeling and availability. Adolescent fruit intake was also positively associated with the combinations of paternal fruit parenting practices and family meals.

In Chapter 3, the intervention impact and intervention dose effect of the Padres program on Latino father and adolescent EBRBs and weight status were examined in a randomized controlled trial. In this study, positive changes from baseline to post intervention regarding father unhealthy food intake (SSBs, sweets/salty snacks, and fast food) were observed among fathers in the intervention group while an improvement in intervention father post sweets/salty snack intake was identified compared to delayed-treatment control fathers. No intervention effects were observed for any adolescent behaviors or weight status. In further analysis, a higher intervention dose (attending 7-8 sessions) was associated with lower father unhealthy food (SSBs, sweets/salty snacks, and fast food) intakes and lower adolescent sweets/salty snack intakes while higher intervention dose and mother attendance (attending 7-8 sessions with mothers) were related to lower adolescent BMI percentile.

In Chapter 4, the intervention impact and modifier effects on paternal food- and activity-related parenting practices reported by fathers and adolescents were assessed in a randomized controlled trial. This assessment showed improvements for several paternal food and activity parenting practices including father-reported frequency of fruit role modeling and fast food availability and adolescent reported paternal allowance of adolescent screen time and frequency of fruit role modeling. An agreement on fruit role modeling was found between fathers and adolescents but discrepancies between fathers and adolescents were observed for the remaining improved practices. This study also identified paternal food responsibilities (father-reported) and family meals (adolescent-reported) as modifiers of the frequency of paternal food parenting practices.

The cross-sectional study in Chapter 2 using baseline survey data and 24-hour dietary recalls showed several positive associations between the frequency of paternal food parenting practices and Latino adolescent dietary intakes. Therefore, the Padres program was designed to improve the frequency of positive paternal parenting practices, which was expected to lead to improved father and adolescent EBRBs and weight status. However, the Padres program randomized controlled trial to test the effectiveness of the Padres program only produced a limited number of improvements in paternal parenting practices, father and adolescent EBRBs and weight status (Chapters 3 and 4). Several factors may have contributed to the lack of improvement in behaviors after implementation of the Padres program including restrictions on time and income based on the social determinants of health, inadequate sample size, and insufficient time for behavioral change to occur by measuring change the week after the last intervention session. In addition, the lack of changes in the frequency of positive parenting practices could also have contributed to the lack of improvements in Latino father and adolescent dietary behaviors and physical activity.

The studies in Chapters 3 and 4 had insufficient sample size because the Padres program in-person implementation had to be discontinued as a result COVID-19 pandemic restrictions in March 2020 along with a low retention rate for existing participants (60%). Primary sample size calculations were based on adolescent EBRB outcomes. Post-hoc sample size calculations were completed for father- and adolescent-reported paternal parenting practice outcomes. These calculations showed that the studies reported in Chapters 3 and 4 were underpowered due to inadequate sample size to detect significant changes for most of the outcomes. Similar to this dissertation research, the O'Connor et al. feasibility study of the Papas Saludables, Niños Saludables program also had a small sample size due to the nature of the study (T. M. O'Connor, Beltran, et al., 2020). This program with Hispanic/Latino fathers was designed to prevent obesity among their 5–12-year-old children by teaching healthy lifestyle behaviors. However, this study also showed no improvements in any child health outcomes (BMI z score, total calorie intake, physical activity, and sedentary time) or father outcomes (BMI, total calorie intake, physical activity, sedentary time, coparenting, respecto, and familism). Because of the feasibility nature of the study, it was underpowered to detect improvements as a result of completing the program. Thus, future community-based randomized controlled trials with larger sample size and adequate power are needed to examine paternal parenting practices and adolescent EBRBs among Latino families.

The overall retention rate for Latino father/adolescent dyads in the current study was 60%, which limited the sample size, although the retention rate for adolescents was higher (69%) because some attended the post data collection session with their mothers. The overall retention of the Padres program was similar to two studies with Hispanic/Latino parents and their children and lower than a previous feasibility RCT with Latino fathers and their children (ages 5-12 years). The Healthy Children, Healthy Families: Parents making a difference! (HCHF) program had a 60% retention rate after 2 years among 85 Hispanic parents and children (3-11 years) (Otterbach et al., 2018). A randomized controlled trial called The Aventuras para Niños program with Latino children (kindergarden through 2nd grade) had an overall retention rate of 55% after 3 years with the condition-specific retention rates of 48% (Family-only), 50% (Family + Community), 59% (Community-only), and 59% (control) (Crespo et al., 2012). However, in both of these programs, the majority of the participants were mothers, the children were younger than the adolescents in the Padres program, and the follow-up time (2 or 3 years) was much longer than the Padres program (≈3 months). The retention rate of the Padres program was lower than a previous intervention feasibility trial (Papas Saludables, Niños Saludables) program with 36 low-income Latino families (fathers with/without a mother and 1-3 children). The retention rate for the feasibility trial was

75% (goal was 80%) from baseline to follow-up assessment. The trial also had 72% of participants who provided both anthropometric and behavioral data at follow up (T. M. O'Connor, Beltran, et al., 2020; T. M. O'Connor, Perez, et al., 2020). Additional study is needed to determine which barriers to retention were most salient in interventions for Latino fathers and to identify strategies to overcome these barriers.

Social determinants of health including poverty, lack of access to high-quality employment, and racism can restrict the ability of families to obtain healthy foods and have opportunities for physical activity. Healthy dietary behaviors of people of color are affected by structural factors, such as inequities in food access and affordability in the U.S. (Conrad, 2019). Potochnick et al. (2019) showed that 42% of Hispanic/Latino youth (ages 8-16) experienced food-insecurity in their household between 2012-2014 and 10% experienced severe food-insecurity that resulted in hunger. Because the majority of the Padres program participants were low-income families, the ability to buy foods they needed to incorporate into their diets as a family and engage in father food parenting practices promoted by the Padres program may have been limited. Time constraints related to employment might be another essential barrier for father food and activity-related parenting practices. The most frequently reported factors that reduced father involvement in supportive food and activity-related behaviors were having limited time and being tired due to busy work schedules, based on focus group study findings with Latino fathers and their adolescents (10-14 years of age) (Zhang et al., 2018). Some fathers attending the Padres program may have needed to work multiple jobs, which could limit the frequency of positive father food and activity-related parenting practices, thus limiting improvements in adolescent EBRB and weight status.

Another possible reason for lack of significant improvements in paternal parenting practices and father and adolescent EBRBs could be related to an insufficient time period for fathers and adolescents to practice learned behaviors from the Padres program prior to post assessment surveys. Father and adolescent behavioral measures were performed one week after the final session of the Padres program except for adolescent dietary intake, which was assessed within 2-3 weeks after the final session. Kumayika et al. (2000) indicated that people may need several weeks to months for successful short term behavioral change and 6 months to 1 year or more for successful long term behavioral changes in terms of the intakes of fat, fiber, fruit, vegetables, and sodium.

Latino father representation in family-focused interventions is important to improve Latino adolescents EBRBs and weight status based on responsibilities fathers have for adolescent food intake and physical activity. Tallie et al. (2018) showed the proportion of Hispanic women who cooked at home in 2003 and 2016 (73.4% and 75.1%, respectively) was higher than men, however the proportion of Hispanic men who cooked at home significantly increased in 2016 (41.6%) compared to 2003 (31.2 %) ($p < 0.05$ for the trend). Similar to these findings, results in Chapter 4 of this dissertation showed that 37% of fathers reported being responsible for food (planning, buying, preparing cooking meals and deciding and controlling what their child eats) most of the time or always. Also, 34% of fathers reported organizing adolescent physical activity most of the times or always, while 54% of fathers reported controlling adolescent screen time most of the times or always. Chapter 2 results indicated that Latino adolescents consumed higher healthy foods and fewer unhealthy foods when fathers had more frequent positive paternal food parenting practices. Therefore, while substantial, father influence on adolescent dietary and physical activity behaviors, may not have been extensive enough to result in behavior change after the Padres program as reported in Chapter 3. Mothers were shown to have the primary responsibility for their children's dietary behaviors while fathers were shown to engage more in their children's activity-related behaviors compared to food-related behaviors in previous qualitative studies with Latino mothers (Davis et al., 2016; Lora et al., 2017), fathers (Yavuz et al., 2018), and mixed-parent participants (De Grubb et al., 2018; Turner et al., 2014). Familism is a core value among Latino families (Bermudez & Mancini, 2013), related to support for strong relationships and good communication between parents and adolescents, which might result in more frequent positive parental food and activity parenting practices among both mothers and fathers. In the intervention dose analysis reported in Chapter 3, both high intervention dose and mother participation were associated with better weight status of Latino adolescents. Based on the shared influence that mothers and fathers have on adolescent behaviors and the core value of familism, fathers and mothers should be included in Latino family-focused obesity prevention interventions.

In this dissertation, father and adolescent perceptions of paternal parenting practices were examined and discrepancies between father- and adolescent-reports were observed. In a preliminary study with 96 father-adolescent (10-14 years) dyads who were from predominantly low-income, two-parent families, Zhang et al. (Zhang et al., 2020) assessed the criterion validity of the existing measurement instruments for examining Latino father- and adolescent-reported paternal parenting practices specific to seven EBRBs (fruit, vegetables, sugary drinks, sweets/salty snacks, fast food, physical activity, and screen time). This preliminary study indicated that adolescent-reported paternal parenting practices items showed higher criterion validity with adolescent food and activity behaviors than father-reported. Thus, using adolescent-reported paternal parenting practices in future studies may provide the best indication of potential influence of father behaviors on adolescent food- and activity-related behaviors.

Strengths and Limitations

A strength of the studies in this dissertation is the examination of relationships among Latino father and adolescent EBRBs with paternal positive parenting practices specific to each EBRB, which to date have not been studied extensively either on the basis of cross-sectional or intervention studies. Previous studies of these relationships had also not been examined among low-income, immigrant Latino families with 10-14 year-old adolescents with a disproportionately high obesity rate. Other strengths include the implementation of a randomized controlled trial (Chapters 3 and 4) testing the effectiveness of the Padres program developed on the principles of CBPR and SCT. Intervention dose effect and behavior modifier effects were also examined. Bilingual and bicultural educators taught the parents and parent-adolescent joint segments of the Padres program learning sessions. In addition, parallel father and adolescent paternal parenting practice questions were used in Chapter 4.

Several limitations exist regarding the studies presented in this dissertation. First, studies had a smaller sample size than expected because in-person implementation was discontinued after March 2020 due to the COVID-19 pandemic. In addition, the retention rate was only 60%. Second, self-reported data collection might lead to recall bias and/or social desirability bias of participants even though certain precautions were taken to limit these biases. Specifically, to limit the potential for bias, the frequency of paternal parenting practices was assessed from both father and adolescent report and adolescent food intake data were based on the average of three NDSR 24-hour dietary recall interviews. Third, the sample was not representative of the entire Latino population because participants were from a limited geographical area from low-income households. Finally, several dyads had an incorrect randomization assignment for the randomized controlled trial. The data from these dyads were based on their group assignment (attendance at intervention or delayed-treatment control group sessions) instead of random assignment.

Implications for Research and Practice

Based on the associations among adolescent-reported paternal parenting practices and adolescent-reported diet and activity behaviors (Chapter 2), the lack of changes in frequency of paternal parenting practices (Chapter 4) may account in part for the lack of changes in adolescent dietary behaviors (Chapter 3). As suggested, several factors may have been responsible for the lack of changes in frequency of paternal parenting practices. Future studies could be conducted with adequate sample sizes, longer term assessment of outcomes, and promotion of strategies to take advantage of positive SDoH and to address negative aspects. Researchers also need to address potential low retention rates of Latino families in community-based childhood obesity prevention programs because of work schedules and extensive program time commitments.

Overall, the findings of this multidisciplinary, community-focused, culturally and linguistically appropriate healthy lifestyle program showed that a family-based approach, which includes both fathers and mothers instead of only fathers may be needed by practitioners to improve food- and activity-related parenting practices and adolescent EBRBs and weight status among Latino population. This dissertation research suggested that Latino father representation is important in Latino family-based programs because of their substantial involvement in food/meals with their adolescent and responsibilities for food buying, preparation and planning, physical activity, and screen time. To improve father representation in the family-based programs, attentions need to paid to making classes most convenient locations, offering at times and days that don’t interfere with fathers work schedule. Health disparities (e.g., income, education) and Latino family and cultural strengths (e.g., familism, social support) are important considerations for public health practitioners when they focus on improving lifestyle behaviors of Latino families and adolescents.

Bibliography

Al-Khudairy, L., Loveman, E., Colquitt, L. J., Mead, E., Johnson, R. E., Fraser, H., Olajide, J., Murphy, M., O'Malley, C., Azevedo, L. B., Ells, L. J., Metzendorf, M. I., & Rees, K. (2017). Diet, physical activity and behavioural interventions for the treatment of overweight or obese adolescents aged 12 to 17 years. *Cochrane Database of Systematic Reviews*, *6*, Art. No.: CD012691. https://doi.org/10.1002/14651858.CD012691

Allen, M. L., Garcia-Huidobro, D., Hurtado, G. A., Allen, R., Davey, C. S., Forster, J. L., Hurtado, M., Lopez-Petrovich, K., Marczak, M., Reynoso, U., Trebs, L., & Svetaz, M. V. (2012). Immigrant family skills-building to prevent tobacco use in Latino youth: Study protocol for a community-based participatory randomized controlled trial. *Trials*, *13*(242). https://doi.org/10.1186/1745-6215-13-242

Andaya, A. A., Arredondo, E. M., Alcaraz, J. E., Lindsay, S. P., & Elder, J. P. (2011). The Association between family meals, TV viewing during meals, and fruit, vegetables, soda, and chips intake among Latino Children. *Journal of Nutrition Education and Behavior*, *43*(5), 308–315. https://doi.org/10.1016/j.jneb.2009.11.005

Arredondo, E. M., Sotres-Alvarez, D., Stoutenberg, M., Davis, S. M., Crespo, N. C., Carnethon, M. R., Castañeda, S. F., Isasi, C. R., Espinoza, R. A., Daviglus, M. L., Perez, L. G., & Evenson, K. R. (2016). Physical activity levels in U.S. Latino/Hispanic adults: Results from the Hispanic Community Health Study/Study of Latinos. *American Journal of Preventive Medicine*, *50*(4), 500–508. https://doi.org/10.1016/j.amepre.2015.08.029

Arroyo-Johnson, C., Allen, M. L., Colditz, G. A., Hurtado, G. A., Davey, C. S., Thompson, V. L. S., Drake, B. F., Svetaz, M. V., Rosas-Lee, M., & Goodman, M. S. (2015). A table of two community networks program centers: Operationalizing and assessing CBPR principles and evaluating partnership outcomes. *Progress in Community Health Partnership*, *9*(Suppl), 61–69. https://doi.org/10.1353/cpr.2015.0026.A

Ash, T., Agaronov, A., Young, T. L., Aftosmes-Tobio, A., & Davison, K. K. (2017). Family-based childhood obesity prevention interventions: A systematic review and quantitative content analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 1–12. https://doi.org/10.1186/s12966-017-0571-2

Aune, D., Giovannucci, E., Boffetta, P., Fadnes, L. T., Keum, N. N., Norat, T., Greenwood, D. C., Riboli, E., Vatten, L. J., & Tonstad, S. (2017). Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality-A systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, *46*(3), 1029–1056. https://doi.org/10.1093/ije/dyw319

Avalos, M. R. A., Ayers, S. L., Patrick, D. L., Jager, J., Castro, F. G., Konopken, Y. P., Olson, M. L., Keller, C. S., Soltero, E. G., Williams, A. N., & Shaibi, G. Q. (2020). Familism, self-esteem, and weight-specific quality of life among Latinx adolescents with obesity. *Journal of Pediatric Psychology*, *45*(8), 848–857. https://doi.org/10.1093/jpepsy/jsaa047

Ayala, G. X., Baquero, B., Arredondo, E. M., Campbell, N., Larios, S., & Elder, J. P. (2007). Association between family variables and Mexican American children's dietary behaviors. *Journal of Nutrition Education and Behavior*, *39*(2), 62–69. https://doi.org/10.1016/j.jneb.2006.08.025

Baltaci, A., Hurtado Choque, G. A., Davey, C., Reyes Peralta, A., Alvarez de Davila, S., Zhang, Y., Gold, A., & Larson, N. (2021). *Padres Preparados, Jóvenes Saludables: Intervention impact and dose effects of a randomized controlled trial on Latino father and adolescent energy balance-related behaviors* [Manuscript Submitted for Publication]. Department of Food Science and Nutrition, University of Minnesota.

Bandura, A., & Cliffs, N. J. (1986). Social foundations of thought and action: A Social Cognitive Theory (pp. 376). Englewood . In *: Prentice-Hall, 1986. xiii, 617 pp.* (First printing). Prentice Hall.

Banfield, E. C., Liu, Y., Davis, J. S., Chang, S., & Frazier-Wood, A. (2016). Poor adherence to U.S. dietary guidelines for children and adolescents in the NHANES population. *Journal of the Academy of Nutrition and Dietetics*, *428*(4), 709–719. https://doi.org/10.1016/j.jand.2015.08.010.Poor

Barkin, S. L., Gesell, S. B., Po'e, E. K., Escarfuller, J., & Tempesti, T. (2012). Culturally tailored, family-centered, behavioral obesity intervention for Latino-American preschool-aged children. *Pediatrics*, *130*(3), 445–456. https://doi.org/10.1542/peds.2011-3762

Barnes, H. L., & Olson, D. H. (1985). Parent-Adolescent Communication and the Circumplex Model. *Source: Child Development*, *56*(2), 438–447.

Barnett, T. A., Kelly, A. S., Rohm Young, D., Perry, C. K., Pratt, C. A., Edwards, N. M., Rao, G., & Vos, M. B. (2018). Sedentary behaviors in today's youth: Approaches to the prevention and management of childhood obesity. *Circulation*, *138*, e142–e159. https://doi.org/10.1161/CIR.0000000000000591

Basiotis, P. P., Carlson, A., Gerrior, S. A., Juan, W. Y., & Lino, M. (2002). *The Healthy Eating Index:1999-2000*. U.S.Department of Agriculture, Center for Nutrition Policy and Promotion.

Baxter, S. D., Hardin, J. W., Guinn, C. H., Royer, J. A., Mackelprang, A. J., & Smith, A. F. (2009). Fourth-grade children's dietary recall accuracy is influenced by retention interval (target period and interview time). *Journal of the American Dietetic Association*, *109*(5), 846–856. https://doi.org/10.1016/j.jada.2009.02.015

Behnke, A. O., MacDermid, S. M., Coltrane, S. L., Parke, R. D., Duffy, S., & Widaman, K. F. (2008). Family cohesion in the lives of Mexican American and European American parents. *Journal of Marriage and Family*, *70*, 1045–1059.

Bellisle, F. (2014). Meals and snacking, diet quality and energy balance. *Physiology and Behavior*, *134*, 38–43. https://doi.org/10.1016/j.physbeh.2014.03.010

Berge, J. M., Maclehose, R. F., Larson, N., Laska, M., & Neumark-Sztainer, D. (2016). Family food preparation and its effects on adolescent dietary quality and eating patterns. *Journal of Adolescent Health*, *59*(5), 530–536. https://doi.org/10.1016/j.jadohealth.2016.06.007

Bermudez, J. M., & Mancini, J. A. (2013). Familias Fuertes: Family resilience among Latinos. In D. S. Becvar (Ed.), *Handbook of Family Resilience* (2013th edition, pp. 215–227). Springer Science + Business Media.

Bernabé, E., Vehkalahti, M. M., Sheiham, A., Aromaa, A., & Suominen, A. L. (2014). Sugar-sweetened beverages and dental caries in adults: A 4-year prospective study. *Journal of Dentistry*, *42*(8), 952–958. https://doi.org/10.1016/j.jdent.2014.04.011

Biddle, S. J. H., García, E. B., Pedisic, Z., Bennie, J., Vergeer, I., & Wiesner, G. (2017). Screen time, other sedentary behaviours, and obesity risk in adults: A review of reviews. *Current Obesity Reports*, *6*, 134–147. https://doi.org/10.1007/s13679-017-0256-9

Birch, L. L., & Davison, K. K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America*, *48*(4), 893–907. https://doi.org/10.1016/S0031-3955(05)70347-3

Bleich, S. N., Vercammen, K. A., Koma, J. W., & Li, Z. (2018). Trends in beverage consumption among children and adults, 2003-2014. *Obesity*, *26*(2), 432–441. https://doi.org/10.1002/oby.22056

Bo, S., de Carli, L., Venco, E., Fanzola, I., Maiandi, M., de Michieli, F., Durazzo, M., Beccuti, G., Cavallo-Perin, P., Ghigo, E., & Ganzit, G. P. (2014). Impact of snacking pattern on overweight and obesity risk in a cohort of 11-to 13-year-old adolescents. *Journal of Pediatric Gastroenterology and Nutrition*, *59*(4), 465–471. https://doi.org/10.1097/MPG.0000000000000453

Bowen, K. J., Sullivan, V. K., Kris-Etherton, P. M., & Petersen, K. S. (2018). Nutrition and cardiovascular disease—An update. *Current Atherosclerosis Reports*, *20*(8). https://doi.org/10.1007/s11883-018-0704-3

Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A., & Ludwig, D. S. (2004). Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics*, *113*(1), 112–118. https://doi.org/10.1542/peds.113.1.112

Braithwaite, I., Stewart, A. W., Hancox, R. J., Beasley, R., Murphy, R., & Mitchell, E. A. (2014). Fast-food consumption and body mass index in children and adolescents: An international cross-sectional study. *BMJ Open*, *4*, e005813. https://doi.org/10.1136/bmjopen-2014-005813

Branscum, P., & Sharma, M. (2011). A systematic analysis of childhood obesity prevention interventions targeting Hispanic children: Lessons learned from the previous decade. *Obesity Reviews*, *12*(5). https://doi.org/10.1111/j.1467-789X.2010.00809.x

Braveman, P., Egerter, S., & Williams, D. R. (2011). The social determinants of health: Coming of age. *Annual Review of Public Health*, *32*, 381–398. https://doi.org/10.1146/annurev-publhealth-031210-101218

Carlson, S. A., Fulton, J. E., Lee, S. M., Foley, J. T., Heitzler, C., & Huhman, M. (2010). Influence of limit-setting and participation in physical activity on youth screen time. *Pediatrics*, *126*, e89–e96. https://doi.org/10.1542/peds.2009-3374

Cassady, B. A., Considine, R. v., & Mattes, R. D. (2012). Beverage consumption, appetite, and energy intake: What did you expect? *American Journal of Clinical Nutrition*, *95*(3), 587–593. https://doi.org/10.3945/ajcn.111.025437

Centers for Disease Control and Prevention. (2016, February 26). *Growth chart training-A SAS program for the 2000 CDC growth charts (ages 0 to <20 years)*. https://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm

Centers for Disease Control and Prevention. (2017). *National Health and Nutrition Examination Survey (NHANES), anthropometric procedures manual*.

https://wwwn.cdc.gov/nchs/data/nhanes/2017-2018/manuals/2017_Anthropometry_Procedures_Manual.pdf

Christofaro, D. G., Anderson, L. B., Andrade, S. M., Barros, M. V., Saraiva, B. T., Fernandes, R. A., & Ritti-Dias, R. M. (2018). Adolescents' physical activity is associated with previous and current physical activity practice by their parents. *Jornal de Pediatria*, *94*, 48–55. https://doi.org/10.1016/j.jped.2017.01.007

Colby, S. L., & Ortma, J. M. (2015). *Projections of the size and composition of the U.S. population: 2014 to 2060, current population reports, P25-1143.* U.S. Census Bureau. https://www.census.gov/content/dam/Census/library/publications/2015/demo/p25-1143.pdf

Conrad, A. (2020). *Identifying and countering white supremacy culture in food systems*. https://wfpc.sanford.duke.edu/reports/identifying-and-countering-white-supremacy-culture-food-systems

Couch, S. C., Glanz, K., Zhou, C., Sallis, J. F., & Saelens, B. E. (2014). Home food environment in relation to children's diet quality and weight status. *Journal of the Academy of Nutrition and Dietetics*, *114*(10), 1569–1579. https://doi.org/doi:10.1016/j.jand.2014.05.015

Crespo, N. C., Elder, J. P., Ayala, G. X., Campbell, N. R., Arredondo, E. M., Slymen, D. J., Baquero, B., Sallis, J. F., & McKenzie, T. L. (2012). Results of a multi-level intervention to prevent and control childhood obesity among Latino children: The Aventuras Para Niños study. *Annals of Behavioral Medicine*, *43*(1), 84–100. https://doi.org/10.1007/s12160-011-9332-7

Davis, R. E., Cole, S. M., Blake, C. E., McKenney-Shubert, S. J., & Peterson, K. E. (2016). Eat, play, view, sleep: Exploring Mexican American mothers' perceptions of decision making for four behaviors associated with childhood obesity risk. *Appetite*, *101*, 104–113. https://doi.org/10.1016/j.appet.2016.02.158

Davison, K. K., Cutting, T. M., & Birch, L. L. (2003). Parents' activity-related parenting practices predict girls' physical activity. *Medicine and Science in Sports and Exercise*, *35*(9), 1589–1595. https://doi.org/10.1249/01.MSS.0000084524.19408.0C

Davison, K. K., Gicevic, S., Aftosmes-Tobio, A., Ganter, C., Simon, C. L., Newlan, S., & Manganello, J. A. (2016). Fathers' representation in observational studies on parenting and childhood obesity: A systematic review and content analysis. *American Journal of Public Health*, *106*(11), e14–e21. https://doi.org/10.2105/AJPH.2016.303391

De Bourdeaudhuij, I., Te Velde, S., Brug, J., Due, P., Wind, M., Sandvik, C., Maes, L., Wolf, A., Perez Rodrigo, C., Yngve, A., Thorsdottir, I., Rasmussen, M., Elmadfa, I., Franchini, B., & Klepp, K. I. (2008). Personal, social and environmental predictors of daily fruit and vegetable intake in 11-year-old children in nine European countries. *European Journal of Clinical Nutrition*, *62*, 834–841. https://doi.org/10.1038/sj.ejcn.1602794

De Grubb, M. C. M., Salemi, J. L., Gonzalez, S. J., Sanderson, M., Zoorob, R. J., Mkanta, W., & Levine, R. S. (2018). Parenting style and perceptions of children's weight among US Hispanics: A qualitative analysis. *Health Promotion International*, *33*, 132–139. https://doi.org/10.1093/heapro/daw050

De Luca, S. M., Yueqi, Y., Daley, D., & Padilla, Y. (2018). A longitudinal study of Latino and non-Hispanic mothers' and fathers' depressive symptoms and its association with parent-child communication. *Journal of Affective Disorders*, *227*, 580–587. https://doi.org/10.1016/j.jad.2017.10.046

De-Jongh González, O., Tugault-Lafleur, C. N., O'Connor, T. M., Hughes, S. O., & Mâsse, L. C. (2021). Are fathers' and mothers' food parenting practices differentially associated with children's eating behaviors? *Appetite*, *166*, 105434. https://doi.org/10.1016/j.appet.2021.105434

Dunford, E. K., & Popkin, B. M. (2017). Disparities in snacking trends in US adults over a 35 year period from 1977 to 2012. *Nutrients*, *9*(809). https://doi.org/10.3390/nu9080809

Dunford, E., & Popkin, B. (2018). 37 year snacking trends for US children 1977–2014. *Pediatric Obesity*, *13*(4), 247–255. https://doi.org/10.1111/ijpo.12220

Ells, L. J., Rees, K., Brown, T., Mead, E., Al-Khudairy, L., Azevedo, L., McGeechan, G. J., Baur, L., Loveman, E., Clements, H., Rayco-Solon, P., Farpour-Lambert, N., & Demaio, A. (2018). Interventions for treating children and adolescents with overweight and obesity: An overview of Cochrane reviews. *International Journal of Obesity*, *42*, 1823–1833. https://doi.org/10.1038/s41366-018-0230-y

Evenson, K. R., Arredondo, E. M., Carnethon, M. R., & Delamater, A. M. (2019). Physical activity and sedentary behavior among US Hispanic/Latino youth: The SOL youth study. *Medicine & Science in Sports and Exercise*, *51*(5), 891–899. https://doi.org/10.1249/MSS.0000000000001871

Ferrer, R. L., Cruz, I., Burge, S., Bayles, B., & Castilla, M. I. (2014). Measuring capability for healthy diet and physical activity. *Annals of Family Medicine*, *12*(1), 46–56. https://doi.org/10.1370/afm.1580

Fielding-Singh, P. (2017). Dining with dad: Fathers' influences on family food practices. *Appetite*, *117*, 98–108. https://doi.org/10.1016/j.appet.2017.06.013

Fleary, S. A., & Ettienne, R. (2019). The relationship between food parenting practices, parental diet and their adolescents' diet. *Appetite*, *135*, 79–85. https://doi.org/10.1016/j.appet.2019.01.008

Flores, G., Maldonado, J., & Durán, P. (2012). Making tortillas without lard: Latino parents' perspectives on healthy eating, physical activity, and weight-management strategies for overweight Latino children. *Journal of the Academy of Nutrition and Dietetics*, *112*(1), 81–89. https://doi.org/10.1016/j.jada.2011.08.041

Freeman, E., Fletcher, R., Collins, C. E., Morgan, P. J., Burrows, T., & Callister, R. (2012). Preventing and treating childhood obesity: Time to target fathers. *International Journal of Obesity*, *36*, 12–15. https://doi.org/10.1038/ijo.2011.198

Fryar, C.D., Carroll, M. D., & Afful, J. (2020). Prevalence of overweight, obesity, and severe obesity among children and adolescents aged 2–19 years: United States, 1963–1965 through 2017–2018. *NCHS Health E-Stats.*

Fulkerson, J. A., Story, M., Mellin, A., Leffert, N., Neumark-Sztainer, D., & French, S. A. (2006). Family dinner meal frequency and adolescent development: Relationships with developmental assets and high-risk behaviors. *Journal of Adolescent Health*, *39*, 337–345. https://doi.org/10.1016/j.jadohealth.2005.12.026

Gallo, L. C., Penedo, F. J., Los, K. E. De, & Arguelles, W. (2009). Resiliency in the face of disadvantage: Do Hispanic cultural characteristics protect health outcomes?

Journal of Personality, *77*(6), 1707–1746. https://doi.org/10.1111/j.1467-6494.2009.00598.x

Gallo, S., Jones, M. T., Doig, A. C., Kogan, K., Fields, J., Wonderlich, J. A., Hansen, A., LaCharite, K., & Mehlenbeck, R. (2020). Feasibility of a multidisciplinary and culturally adapted pediatric weight management program for Latino families: Results from the Vidas Activas y Familias Saludables pilot study. *Journal of Nutrition Education and Behavior*, *52*(1), 55–63. https://doi.org/10.1016/j.jneb.2019.10.002

Ganter, C., Chuang, E., Aftosmes-Tobio, A., Blaine, R. E., Giannetti, M., Land, T., & Davison, K. K. (2015). Community stakeholders' perceptions of barriers to childhood obesity prevention in low-income families, Massachusetts 2012-2013. *Preventing Chronic Disease*, *12*(E42). https://doi.org/10.5888/PCD12.140371

Godin, G. (2011). The Godin-Shephard leisure-time physical activity questionnaire. *Health & Fitness Journal of Canada*, *4*(1), 18–22.

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, *10*, 141–146.

Gordon-Larsen, P., The, N. S., & Adair, L. S. (2010). Longitudinal trends in obesity in the United States from adolescence to the third decade of life. *Obesity*, *18*(9), 1801–1804. https://doi.org/10.1038/oby.2009.451

Granner, M. L., Sargent, R. G., Calderon, K. S., Hussey, J. R., Evans, A. E., & Watkins, K. W. (2004). Factors of fruit and vegetable intake by race, gender, and age among young adolescents. *Journal of Nutrition Education and Behavior*, *36*(4), 173–180. https://doi.org/10.1016/S1499-4046(06)60231-5

Hager, E. R., Quigg, A. M., Black, M. M., Coleman, S. M., Heeren, T., Rose-Jacobs, R., Cook, J. T., Ettinger De Cuba, S. A., Casey, P. H., Chilton, M., Cutts, D. B., Meyers, A. F., & Frank, D. A. (2010). Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*, *126*(1), e26–e32. https://doi.org/10.1542/peds.2009-3146

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015-2016. *NCHS Data Brief*, *288*. https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#1.

Hall, L., Collins, C. E., Morgan, P. J., Burrows, T. L., Lubans, D. R., & Callister, R. (2011). Children's intake of fruit and selected energy-dense nutrient-poor foods is associated with fathers' intake. *Journal of the American Dietetic Association*, *111*, 1039–1044. https://doi.org/10.1016/j.jada.2011.04.008

Hammons, A. J., & Fiese, B. H. (2011). Is frequency of shared family meals related to the nutritional health of children and adolescents? *Pediatrics*, *127*(6), e1565–e1574. https://doi.org/10.1542/peds.2010-1440

Harris, H. A., Jansen, E., & Rossi, T. (2020). 'It's not worth the fight': Fathers' perceptions of family mealtime interactions, feeding practices and child eating behaviours. *Appetite*, *150*, 104642. https://doi.org/10.1016/j.appet.2020.104642

Hebden, L., O'Leary, F., Rangan, A., Singgih Lie, E., Hirani, V., & Allman-Farinelli, M. (2017). Fruit consumption and adiposity status in adults: A systematic review of current evidence. *Critical Reviews in Food Science and Nutrition*, *57*(12), 2526–2540. https://doi.org/10.1080/10408398.2015.1012290

Heerman, W. J., Jaka, M. M., Berge, J. M., Trapl, E. S., Sommer, E. C., Samuels, L. R., Jackson, N., Haapala, J. L., Kunin-Batson, A. S., Olson-Bullis, B. A., Hardin, H. K., Sherwood, N. E., & Barkin, S. L. (2017). The dose of behavioral interventions to prevent and treat childhood obesity: A systematic review and meta-regression. *International Journal of Behavioral Nutrition and Physical Activity*, *157*, 14. https://doi.org/10.1186/s12966-017-0615-7

Heerman, W. J., Sommer, E. C., Qi, A., Burgess, L. E., Mitchell, S. J., Samuels, L. R., Martin, N. C., & Barkin, S. L. (2020). Evaluating dose delivered of a behavioral intervention for childhood obesity prevention: A secondary analysis. *BMC Public Health*, *20*(885). https://doi.org/10.1186/s12889-020-09020-w

Hess, J. M., Jonnalagadda, S. S., & Slavin, J. L. (2016). What is a snack, why do we snack, and how can we choose better snacks? A review of the definitions of snacking, motivations to snack, contributions to dietary intake, and recommendations for improvement. *Advances in Nutrition*, *7*, 466–475. https://doi.org/10.3945/an.115.009571

Hess, J. M., & Slavin, J. L. (2018). The benefits of defining "snacks." *Physiology and Behavior*, *193*, 284–287. https://doi.org/10.1016/j.physbeh.2018.04.019

Hou, Y., Kim, S. Y., & Benner, A. D. (2018). Parent-adolescent discrepancies in reports of parenting and adolescent outcomes in Mexican immigrant families. *Journal of Youth Adolescence*, *47*, 430–444. https://doi.org/10.1007/s10964-017-0717-1

Hruby, A., & Hu, F. B. (2015). The epidemiology of obesity: A big picture. *PharmacoEconomics*, *33*, 673–689. https://doi.org/10.1007/S40273-014-0243-X

Hume, C., Horst, K. v., Brug, J., Salmon, J., & Oenema, A. (2010). Understanding the correlates of adolescents' TV viewing: A social ecological approach. *International Journal of Pediatric Obesity*, *5*, 161–168. https://doi.org/10.3109/17477160903242550

Hutchens, A., & Lee, R. E. (2018). Parenting practices and children's physical activity: An integrative review. *The Journal of School Nursing*, *34*(1), 68–85. https://doi.org/10.1177/1059840517714852

Isganaitis, E., & Lustig, R. H. (2005). Fast food, central nervous system insulin resistance, and obesity. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *25*(12), 2451–2462. https://doi.org/10.1161/01.ATV.0000186208.06964.91

Jago, R., Edwards, M. J., Urbanski, C. R., & Sebire, S. J. (2013). General and specific approaches to media parenting: A systematic review of current measures, associations with screen-viewing, and measurement implications. *Childhood Obesity*, *9*(1), S51–S72. https://doi.org/10.1089/chi.2013.0031

Jaka, M. M., Haapala, J. L., Trapl, E. S., Kunin-Batson, A. S., Olson-Bullis, B. A., Heerman, W. J., Berge, J. M., Moore, S. M., Matheson, D., & Sherwood, N. E. (2016). Reporting of treatment fidelity in behavioral pediatric obesity intervention trials: A systematic review. *Obesity Reviews*, *17*(12), 1287–1300. https://doi.org/10.1111/obr.12464

Jaworowska, A., Blackham, T., Davies, I. G., & Stevenson, L. (2013). Nutritional challenges and health implications of takeaway and fast food. *Nutrition Reviews*, *71*(5), 310–318. https://doi.org/10.1111/nure.12031

Johnson, C. M., Sharkey, J. R., & Gómez, L. (2021). Latino fathers as catalistas (agents of change): Strategies to support Latino fathers in childhood obesity prevention.

Journal of Nutrition Education and Behavior, *53*(6), 540–545. https://doi.org/10.1016/j.jneb.2021.01.014

Kim, S. A., Moore, L. v., Galuska, D., Wright, A. P., Harris, D., Grummer-Strawn, L. M., Merlo, C. L., Nihiser, A. J., & Rhodes, D. G. (2014). Vital signs: Fruit and vegetable intake among children - United States, 2003-2010. *Morbidity and Mortality Weekly Report*, *63*(31), 671–676. http://www.ncbi.nlm.nih.gov/pubmed/25102415%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4584658

Kremers, S. P. J., Visscher, T. L. S., Seidell, J. C., van Mechelen, W., & Brug, J. (2005). Cognitive determinants of energy balance-related behaviours: Measurement issues. *Sports Medicine*, *35*(11), 923–933. https://doi.org/10.2165/00007256-200535110-00001

Kumanyika, S. K., Bowen, D., Rolls, B. J., Horn, L. van, Perri, M. G., Czajkowski, S. M., & Schron, E. (2000). Maintenance of dietary behavior change. *Health Psychology*, *19*(1(Suppl)), 42–56. https://doi.org/10.1037/0278-6133.19.SUPPL1.42

Lam, C. B., & McHale, S. M. (2015). Developmental patterns and parental correlates of youth leisure-time physical activity. *Journal of the Family Psychology*, *29*(1), 100–107. https://doi.org/http://dx.doi.org/10.1037/fam0000049

Lam, C. B., McHale, S. M., & Updegraff, K. A. (2012). Gender dynamics in Mexican American families: Connecting mothers', fathers', and youths' experiences. *Sex Roles*, *67*(1–2), 17–28. https://doi.org/10.1007/s11199-012-0137-3

Langellier, B. A., & Massey, P. M. (2016). Nutrition activation and dietary intake disparities among US adults. *Public Health Nutrition*, *19*(17), 3123–3134. https://doi.org/10.1017/S1368980016001464

Larson, N. I., Miller, J. M., Watts, A. W., Story, M. T., & Neumark-Sztainer, D. R. (2016). Adolescent snacking behaviors are associated with dietary intake and weight status. *The Journal of Nutrition*, *146*, 1348–1355. https://doi.org/10.3945/jn.116.230334

Larson, N. I., Neumark-Sztainer, D., Hannan, P. J., & Story, M. (2007). Family Meals during Adolescence Are Associated with Higher Diet Quality and Healthful Meal Patterns during Young Adulthood. *Journal of the American Dietetic Association*, *107*(9), 1502–1510. https://doi.org/10.1016/j.jada.2007.06.012

Larson, N., Story, M., Eisenberg, M. E., & Neumark-Sztainer, D. (2016). Secular trends in meal and snack patterns among adolescents from 1999 to 2010. *Journal of the Academy of Nutrition and Dietetics*, *116*(2), 240-250.e2. https://doi.org/10.1016/j.jand.2015.09.013

LeCroy, M. N., Siega-Riz, A. M., Albrecht, S. S., Ward, D. S., Cai, J., Perreira, K. M., Isasi, C. R., Mossavar-Rahmani, Y., Gallo, L. C., Castañeda, S. F., & Stevens, J. (2019). Association of food parenting practice patterns with obesogenic dietary intake in Hispanic/Latino youth: Results from the Hispanic Community Children's Health Study/Study of Latino Youth (SOL Youth). *Appetite*, *140*, 277–287. https://doi.org/10.1016/j.appet.2019.05.006

Ledoux, T. A., Hingle, M. D., & Baranowski, T. (2011). Relationship of fruit and vegetable intake with adiposity: A systematic review. *Obesity Reviews*, *12*(5), e143–e150. https://doi.org/10.1111/j.1467-789X.2010.00786.x

Lee, S., Bartolic, S., & Vandewater, E. A. (2009). Predicting children's media use in the USA: Differences in cross-sectional and longitudinal analysis. *British Journal of Developmental Psychology*, *27*(1), 123–143. https://doi.org/10.1348/026151008X401336

Lepeleere, S. D., Bourdeaudhuij, I. D., Cardon, G., & Verloigne, M. (2015). Do specific parenting practices and related parental self-efficacy associate with physical activity and screen time among primary schoolchildren? A cross-sectional study in Belgium. *BMJ Open*, *5*, e007209. https://doi.org/10.1136/bmjopen-2014-007209

Lepeleere, S. D., Desmet, A., Verloigne, M., Cardon, G., & Bourdeaudhuij, I. D. (2013). What practices do parents perceive as effective or ineffective in promoting a healthy diet, physical activity, and less sitting in children: parent focus groups. *BMC Public Health*, *13*(1067). https://doi.org/10.1186/1471-2458-13-1067

Li, M., Fan, Y., Zhang, X., Hou, W., & Tang, Z. (2014). Fruit and vegetable intake and risk of type 2 diabetes mellitus: Meta-analysis of prospective cohort studies. *BMJ Open*, *4*, e005497. https://doi.org/10.1136/bmjopen-2014-005497

Lin, B.-H., & Frazao, E. (1997). Nutritional quality of foods at and away from home. *Food Review*, 33–41.

Lindsay, A. C., Sussner, K. M., Kim, J., & Gortmaker, S. (2006). The role of parents in preventing childhood obesity. *The Future of Children*, *16*(1), 169–186. https://doi.org/10.1353/foc.2006.0006

Liszewska, N., Scholz, U., Radtke, T., & Horodyska, K. (2018). Association between children's physical activity and parental practices enhancing children's physical activity: The moderating effects of children's BMI z-score. *Frontiers in Psychology*, *8*(2359). https://doi.org/10.3389/fpsyg.2017.02359

Litchford, A., Roskos, M. R. S., & Wengreen, H. (2020). Influence of fathers on the feeding practices and behaviors of children: A systematic review. *Appetite*, *147*, 104558. https://doi.org/10.1016/j.appet.2019.104558

Lloyd, A. B., Lubans, D. R., Plotnikoff, R. C., Collins, C. E., & Morgan, P. J. (2014). Maternal and paternal parenting practices and their influence on children's adiposity, screen-time, diet and physical activity. *Appetite*, *79*, 149–157. https://doi.org/10.1016/j.appet.2014.04.010

Loprinzi, P. D., Cardinal, B. J., Loprinzi, K. L., & Lee, H. (2012). Parenting practices as mediators of child physical activity and weight status. *Obesity Facts*, *5*, 420–430. https://doi.org/10.1159/000341097

Lora, K. R., Cheney, M., & Branscum, P. (2017). Hispanic mothers' views of the father's role in promoting healthy behaviors at home: Focus groups findings. *Journal of the Academy of Nutrition and Dietetics*, *117*(6), 914–922. https://doi.org/10.1016/j.jand.2017.01.005

Loth, K. A., Maclehose, R. F., Larson, N., Berge, J. M., & Neumark-sztainer, D. (2016). Food availability, modeling and restriction: How are these different aspects of the family eating environment related to adolescent dietary intake? *Appetite*, *96*, 80–86. https://doi.org/10.1016/j.appet.2015.08.026.Food

Lowe, K. D., Lott, M. A., & Jensen, C. D. (2020). Associations between parent-child communication and connectedness, parent feeding behavior, and child body mass in pre-adolescent children. *Journal of Pediatric Psychology*, *46*(1), 59–68. https://doi.org/10.1093/jpepsy/jsaa087

Lytle, L. A., Nichaman, M. Z., Obarzanek, E., Glovsky, E., Montgomery, D., Nicklas, T., Zive, M., & Feldman, H. (1993). Validation of 24-hour recalls assisted by food records in third-grade children. The CATCH collaborative group. *Journal of the American Dietetic Association*, *93*(12), 1431–1436. https://doi.org/10.1016/0002-8223(93)92247-U

Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-sweetened beverages and weight gain in children and adults: A systematic review and meta-analysis. *American Journal of Clinical Nutrition*, *98*(4), 1084–1102. https://doi.org/10.3945/ajcn.113.058362

Malik, V. S., Popkin, B. M., Bray, G. A., Després, J. P., & Hu, F. B. (2010). Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation*, *121*(11), 1356–1364. https://doi.org/10.1161/CIRCULATIONAHA.109.876185

Marriott, B. P., Hunt, K. J., Malek, A. M., & Newman, J. C. (2019). Trends in intake of energy and total sugar from sugar-sweetened beverages in the United States among children and adults, NHANES 2003-2016. *Nutrients*, *11*(9), 1–13. https://doi.org/10.3390/nu11092004

Matthews-Ewald, M. R., Posada, A., Wiesner, M., & Olvera, N. (2015). An exploratory factor analysis of the Parenting strategies for Eating and physical Activity Scale (PEAS) for use in Hispanic mothers of adolescent and preadolescent daughters with overweight. *Eating Behaviors*, *19*, 193–199. https://doi.org/10.1016/j.eatbeh.2015.10.001

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social Cognitive Theory. In K. Glanz, B. k. Rimer, & K. Viswanath (Eds.), *Health behaviors and health education: Theory, research, and practice* (4th edition, pp. 169–188). Jossey-Bass.

Mcintosh, A., Kubena, K. S., Tolle, G., Dean, W., Kim, M., Jan, J., & Anding, J. (2011). Determinants of children’s use of and time spent in fast-food and full-service restaurants. *Journal of Nutrition Education and Behavior*, *43*(3), 142–149. https://doi.org/10.1016/j.jneb.2010.04.002

Merlo, C. L., Jones, S. E., Michael, S. L., Chen, T. J., Sliwa, S. A., Hee Lee, S., Brener, N. D., Lee, S. M., & Park, S. (2020). Dietary and physical activity behaviors among high school students: Youth Risk Behavior Survey, United States, 2019. *Morbidity and Mortality Weekly Report*, *69*(1), 64–76.

Morgan, P. J., & Young, M. D. (2017). The Influence of fathers on children’s physical activity and dietary behaviors: Insights, recommendations and future directions. *Current Obesity Reports*, *6*, 324–333. https://doi.org/10.1007/s13679-017-0275-6

Morgan, P. J., Young, M. D., Lloyed, A. B., Wang, M. L., Eather, N., Miller, A., Murtagh, E. M., Barnes, A. T., & L, P. S. (2017). Involvement of fathers in pediatric obesity treatment and prevention trials: A systematic review. *Pediatrics*, *139*(2). https://doi.org/doi:10.1542/peds.2016-2635

National Cancer Institute. (2019). *Usual Dietary Intakes: U.S. Population, 2007–2010*. https://epi.grants.cancer.gov/diet/usualintakes/

National Physical Activity Plan Alliance. (2018). *The 2018 United States Report Card on Physical Activity for Children and Youth*. https://doi.org/10.1097/00042192-200101000-00007

Neshteruk, C. D., Nezami, B. T., Nino-tapias, G., Davison, K. K., & Ward, D. S. (2017). The influence of fathers on children's physical activity: A review of the literature from 2009 to 2015. *Preventive Medicine*, *102*, 12–19. https://doi.org/10.1016/j.ypmed.2017.06.027

Neumark-Sztainer, D., Hannan, P. J., Story, M., Croll, J., & Perry, C. (2003). Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. *Journal of the American Dietetic Association*, *103*, 317–322. https://doi.org/10.1053/jada.2003.50048

Niemeier, H. M., Raynor, H. A., Lloyd-Richardson, E. E., Rogers, M. L., & Wing, R. R. (2006). Fast food consumption and breakfast skipping: Predictors of weight gain from adolescence to adulthood in a nationally representative sample. *Journal of Adolescent Health*, *39*, 842–849. https://doi.org/10.1016/j.jadohealth.2006.07.001

Nour, M., Lutze, S. A., Grech, A., & Allman-Farinelli, M. (2018). The relationship between vegetable intake and weight outcomes: A systematic review of cohort studies. *Nutrients*, *10*(1626), 1–21. https://doi.org/10.3390/nu10111626

O'Connor, E. A., Evans, C. v., Burda, B. U., Walsh, E. S., Eder, M., & Lozano, P. (2017). Screening for obesity and intervention for weight management in children and adolescents evidence report and systematic review for the US Preventive Services Task Force. *Journal of the American Medical Association*, *317*(23), 2427–2444. https://doi.org/10.1001/jama.2017.0332

O'Connor, T. M., Beltran, A., Musaad, S., Perez, O., Flores, A., Galdamez-Calderon, E., Isbell, T., Arredondo, E. M., Cardona, R. P., Cabrera, N., Marton, S. A., Baranowski, T., & Morgan, P. J. (2020). Feasibility of targeting Hispanic fathers and children in an obesity intervention: Papás Saludables Niños Saludables. *Childhood Obesity*, *16*(6), 379–392. https://doi.org/10.1089/chi.2020.0006

O'Connor, T. M., Perez, O., Beltran, A., García, I. C., Arredondo, E., Cardona, R. P., Cabrera, N., Thompson, D., Baranowski, T., & Morgan, P. J. (2020). Cultural adaptation of 'Healthy Dads, Healthy Kids' for Hispanic families: Applying the ecological validity model. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(52). https://doi.org/https://doi.org/10.1186/s12966-020-00949-0

O'Connor, T., Perez, O., Garcia, I. C., & Gallagher, M. (2018). Engaging Latino fathers in children's eating and other obesity-related behaviors: A review. *Current Nutrition Reports*, *7*(2), 29–38. https://doi.org/10.1007/s13668-018-0225-2

Ogden, C. L., Fryar, C. D., Martin, C. B., Freedman, D. S., Carroll, M. D., Gu, Q., & Hales, C. M. (2020). Trends in obesity prevalence by race and Hispanic origin - 1999-2000 to 2017-2018. *Journal of the American Medical Association*, *324*(12), 1208–1210. https://doi.org/10.1001/jama.2020.14590

Ornelas, I. J., Perreira, K. M., & Ayala, G. X. (2007). Parental influences on adolescent physical activity: A longitudinal study. *International Journal of Behavioral Nutrition and Physical Activity*, *4*(3). https://doi.org/10.1186/1479-5868-4-3

Ortega-Avila, A. G., Papadaki, A., & Jago, R. (2019). The role of the home environment in sugar-sweetened beverage intake among northern Mexican adolescents: A qualitative study. *Journal of Public Health: From Theory to Practice*, *27*, 791–801. https://doi.org/10.1007/s10389-018-0993-6

Otterbach, L., Mena, N. Z., Greene, G., Redding, C. A., Groot, A. De, & Tovar, A. (2018). Community-based childhood obesity prevention intervention for parents improves health behaviors and food parenting practices among Hispanic, low-income parents. *BMC Obesity*, *5*(11). https://doi.org/https://doi.org/10.1186/s40608-018-0188-2 RESEARCH

Overcash, F., & Reicks, M. (2021). Diet quality and eating practices among Hispanic/Latino men and women: NHANES 2011-2016. *International Journal of Environmental Research and Public Health*, *18*(1302).

Pan, A., & Hu, F. B. (2011). Effects of carbohydrates on satiety: Differences between liquid and solid food. *Current Opinion in Clinical Nutrition and Metabolic Care*, *14*(4), 385–390. https://doi.org/10.1097/MCO.0b013e328346df36

Parada, H., Ayala, G. X., Horton, L. A., Ibarra, L., & Arrendondo, E. M. (2016). Latino fathers' feeding-related parenting strategies on children's eating. *Ecology of Food and Nutrition*, *55*(3), 292–307. https://doi.org/doi:10.1080/03670244.2016.1161616

Pearson, N., Ball, K., & Crawford, D. (2011). Predictors of changes in adolescents' consumption of fruits, vegetables and energy-dense snacks. *British Journal of Nutrition*, *105*(5), 795–803. https://doi.org/10.1017/S0007114510004290

Pearson, N., & Biddle, S. J. H. (2011). Sedentary behavior and dietary intake in children, adolescents, and adults: A systematic review. *American Journal of Preventive Medicine*, *41*(2), 178–188. https://doi.org/10.1016/j.amepre.2011.05.002

Penilla, C., Tschann, J. M., Deardorff, J., Flores, E., Pasch, L. A., Butte, N. F., Gregorich, S. E., Greenspan, L. C., Martinez, S. M., & Ozer, E. (2017). Fathers' feeding practices and children's weight status in Mexican American families. *Appetite*, *117*, 109–116. https://doi.org/10.1016/j.appet.2017.06.016

Pereira, M. A., Kartashov, A. I., Ebbeling, C. B., van Horn, L., Slattery, M. L., Jacobs, P. D. R., & Ludwig, D. S. (2005). Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet*, *365*(9453), 36–42. https://doi.org/10.1016/S0140-6736(04)17663-0

Perez, O., Beltran, A., Isbell, T., Galdamez-Calderon, E., Baranowski, T., Morgan, P. J., & O'Connor, T. M. (2021). Papás Saludables, Niños Saludables: Perspectives from Hispanic parents and children in a culturally adapted father-focused obesity program. *Journal of Nutrition Education and Behavior*, *53*(3), 246–253. https://doi.org/10.1016/j.jneb.2020.11.006

Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., George, S. M., & Olson, R. D. (2018). The physical activity guidelines for Americans. *Journal of the American Medical Association*, *320*(19), 2020–2028. https://doi.org/10.1001/jama.2018.14854

Piernas, C., & Popkin, B. M. (2010). Trends in snacking among U.S. children. *Health Affairs*, *29*(3), 398–404. https://doi.org/10.1377/hlthaff.2009.0666

Pinard, C. A., Yaroch, A. L., Hart, M. H., Serrano, E. L., McFerren, M. M., & Estabrooks, P. A. (2014). The validity and reliability of the Comprehensive Home Environment Survey (CHES). *Health Promotion Practice*, *15*(1), 109–117. https://doi.org/10.1177/1524839913477863

Pinquart, M. (2014). Associations of general parenting and parent-child relationship with pediatric obesity: A meta-analysis. *Journal of Pediatric Psychology*, *39*(4), 381–393. https://doi.org/10.1093/jpepsy/jst144

Pokhrel, P., Unger, J. B., Wagner, K. D., Ritt-Olson, A., & Sussman, S. (2008). Effects of parental monitoring, parent–child communication, and parents' expectation of the child's acculturation on the substance use behaviors of urban, Hispanic Adolescents. *Journal of Ethnicity in Substance Abuse*, *7*(2), 200–213.

Poorolajal, J., Sahraei, F., Mohamdadi, Y., Doosti-Irani, A., & Moradi, L. (2020). Behavioral factors influencing childhood obesity: A systematic review and meta-analysis. *Obesity Research and Clinical Practice*, *14*, 109–118. https://doi.org/10.1016/j.orcp.2020.03.002

Potochnick, S., Perreira, K. M., Bravin, J. I., Castañeda, S. F., Daviglus, M. L., Gallo, L. C., & Isasi, C. R. (2019). Food insecurity among Hispanic/Latino youth: Who is at risk and what are the health correlates? *Journal of Adolescent Health*, *64*(5), 631–639. https://doi.org/10.1016/j.jadohealth.2018.10.302

Prado, G., Fernandez, A., st. George, S. M., Lee, T. K., Lebron, C., Tapia, M. I., Velazquez, M. R., & Messiah, S. E. (2020). Results of a family-based intervention promoting healthy weight strategies in overweight Hispanic adolescents and parents: An RCT. *American Journal of Preventive Medicine*, *59*(5), 658–668. https://doi.org/10.1016/j.amepre.2020.06.010

Prentice, A. M., & Jebb, S. A. (2003). Fast foods, energy density and obesity: A possible mechanistic link. *Obesity Reviews*, *4*(4), 187–194. https://doi.org/10.1046/j.1467-789X.2003.00117.x

Rahill, S., Kennedy, A., & Kearney, J. (2020). A review of the influence of fathers on children's eating behaviours and dietary intake. *Appetite*, *147*, 104540. https://doi.org/10.1016/j.appet.2019.104540

Ramirez, E. R., Norman, G. J., Rosenberg, D. E., Jacqueline, K., Saelens, E., Durant, N., & Sallis, J. F. (2011). Adolescent screen time and rules to limit screen time in the home. *Journal of Adolescent Health*, *48*(4), 379–385. https://doi.org/10.1016/j.jadohealth.2010.07.013.Adolescent

Rennie, K. L., Johnson, L., & Jebb, S. A. (2005). Behavioural determinants of obesity. *Best Practice and Research Clinical Endocrinology and Metabolism*, *19*(3), 343–358. https://doi.org/10.1016/j.beem.2005.04.003

Rogers, R., Eagle, T. F., Sheetz, A., Woodward, A., Leibowitz, R., Song, M., Sylvester, R., Corriveau, N., Kline-Rogers, E., Jiang, Q., Jackson, E. A., & Eagle, K. A. (2015). The relationship between childhood obesity, low socioeconomic status, and race/ethnicity: Lessons from Massachusetts. *Childhood Obesity*, *11*(6), 691–695. https://doi.org/10.1089/chi.2015.0029

Rosenheck, R. (2008). Fast food consumption and increased caloric intake: A systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews*, *9*(6), 535–547. https://doi.org/10.1111/j.1467-789X.2008.00477.x

Rosinger, A., Herrick, K., Gahche, J., & Park, S. (2017). Sugar-sweetened beverage consumption among U.S. youth, 2011-2014. *NCHS Data Brief*, *271*.

Sadeghi, B., Kaiser, L. L., Schaefer, S., Tseregounis, I. E., Martinez, L., & Torre, A. De. (2017). Multifaceted community-based intervention reduces rate of BMI growth in obese Mexican-origin boys. *Pediatric Obesity*, *12*, 247–256. https://doi.org/10.1111/ijpo.12135

Same, R. v, Feldman, D. I., Shah, N., Martin, S. S., Rifai, M. al, Blaha, M. J., Graham, G., & Ahmed, H. M. (2016). Relationship between sedentary behavior and cardiovascular risk. *Current Cardiology Reports*, *18*(6). https://doi.org/10.1007/s11886-015-0678-5

Sánchez-Zamorano, L. M., Solano-González, M., Macias-Morales, N., Flores-Sánchez, G., Galván-Portillo, M. v, & Lazcano-Ponce, E. C. (2019). Perception of parents' physical activity as a positive model on physical activity of adolescents. *Preventive Medicine*, *127*, 105797. https://doi.org/10.1016/j.ypmed.2019.105797

Santiago-Torres, M., Adams, A. K., Carrel, A. L., LaRowe, T. L., & Schoeller, D. A. (2014). Home food availability, parental dietary intake, and familial eating habits influence the diet quality of urban Hispanic children. *Childhood Obesity*, *10*(5), 408–415. https://doi.org/10.1089/chi.2014.0051

Scaglioni, S., de Cosmi, V., Ciappolino, V., Parazzini, F., Brambilla, P., & Agostoni, C. (2018). Factors influencing children's eating behaviours. *Nutrients*, *10*(6), 1–17. https://doi.org/10.3390/nu10060706

Schmid, D., & Michael, F. (2014). Television viewing and time spent sedentary in relation to cancer risk: A meta-analysis. *Journal of the National Cancer Institute*, *106*(7). https://doi.org/10.1093/jnci/dju098

Schwingshackl, L., Hoffmann, G., Kalle-Uhlmann, T., Arregui, M., Buijsse, B., & Boeing, H. (2015). Fruit and vegetable consumption and changes in anthropometric variables in adult populations: A systematic review and meta-analysis of prospective cohort studies. *PLoS ONE*, *10*(10), e0140846. https://doi.org/10.1371/journal.pone.0140846

Silfee, V., Lemon, S., Lora, V., & Rosal, M. (2017). Sedentary Behavior and Cardiovascular Disease Risk Factors among Latino Adults. *Journal of Health Care Poor Underserved*, *28*(7), 798–811. https://doi.org/10.1353/hpu.2017.0075

Singh, A. S., Chinapaw, M. J., Uijtdewilligen, L., Vik, F. N., van Lippevelde, W., Fernández-Alvira, J. M., Stomfai, S., Manios, Y., van der Sluijs, M., Terwee, C., & Brug, J. (2012). Test-retest reliability and construct validity of the ENERGY-parent questionnaire on parenting practices, energy balance-related behaviours and their potential behavioural determinants: The ENERGY-project. *BMC Research Notes*, *5*(434), 1–10. https://doi.org/10.1186/1756-0500-5-434

Skinner, A. C., Ravanbakht, S. N., Skelton, J. A., Perrin, E. M., & Armstrong, S. C. (2018). Prevalence of obesity and severe obesity in US children, 1999 – 2016. *Pediatrics*, *141*(3). https://doi.org/10.1542/peds.2017-3459

Soltero, E. G., Peña, A., Gonzalez, V., Hernandez, E., Mackey, G., Callender, C., Dave, J. M., & Thompson, D. (2021). Family-based obesity prevention interventions among Hispanic children and families: A scoping review. *Nutrients*, *13*, 2690. https://doi.org/10.3390/nu13082690

Springer, A. E., Kelder, S. H., Barroso, C. S., Drenner, K. L., Shegog, R., Ranjit, N., & Hoelscher, D. M. (2010). Parental influences on television watching among children living on the Texas – Mexico border. *Preventive Medicine*, *51*, 112–117. https://doi.org/10.1016/j.ypmed.2010.05.013

Stewart, S. D., & Menning, C. L. (2009). Family structure, nonresident father involvement, and adolescent eating patterns. *Journal of Adolescent Health*, *45*, 193–201. https://doi.org/10.1016/j.jadohealth.2009.01.005

Sutton, M. Y., Lasswell, S. M., Lanier, Y., & Miller, K. S. (2014). Impact of parent-child communication interventions on sex behaviors and cognitive outcomes for

Black/African-American and Hispanic/Latino youth: A systematic review, 1988-2012. *Journal of Adolescent Health*, *54*(4), 369–384. https://doi.org/10.1016/j.jadohealth.2013.11.004

Taillie, L. S. (2018). Who's cooking? Trends in US home food preparation by gender, education, and race/ethnicity from 2003 to 2016. *Nutrition Journal*, *17*(41). https://doi.org/10.1186/s12937-018-0347-9

Tamayo, M. C., Dobbs, P. D., & Pincu, Y. (2021). Family-Centered Interventions for Treatment and Prevention of Childhood Obesity in Hispanic Families: A Systematic Review. In *Journal of Community Health* (Vol. 46, Issue 3, pp. 635–643). Springer. https://doi.org/10.1007/s10900-020-00897-7

The National Academies of Science, Engineering, Medicine. (2017). Social Determinants of Health. In J. N. Weinstein, A. Geller, Y. Negussie, & A. Baciu (Eds.), *Communities in Action: Pathways to Health Equity* (pp. 116–160). https://doi.org/10.17226/24624

Thomson, J. L., Tussing-Humphreys, L. M., Goodman, M. H., & Landry, A. S. (2019). Diet quality in a nationally representative sample of American children by sociodemographic characteristics. *American Journal of Clinical Nutrition*, *109*(1), 127–138. https://doi.org/10.1093/ajcn/nqy284

Thornton, R. L. J., Glover, C. M., Cené, C. W., Glik, D. C., Henderson, J. A., & Williams, D. R. (2016). Evaluating strategies for reducing health disparities by addressing the social determinants of health. *Health Affairs*, *35*(8), 1416–1423. https://doi.org/10.1377/hlthaff.2015.1357

Thul, C. M., Eisenberg, M. E., Larson, N. I., & Neumark-Sztainer, D. (2015). Physical activity patterns among Minnesota Somali adolescents. *Journal of Physical Activity and Health*, *12*(9), 1320–1326. https://doi.org/10.1123/jpah.2014-0146

Townsend, M. S., Kaiser, L. L., Allen, L. H., Block Joy, A., & Murphy, S. P. (2003). Selecting items for a food behavior checklist for a limited-resource audience. *Journal of Nutrition Education and Behavior*, *35*(2), 69–82.

Tripicchio, G. L., Kachurak, A., Davey, A., Bailey, R. L., Dabritz, L. J., & Fisher, J. O. (2019). Associations between snacking and weight status among adolescents 12–19 years in the United States. *Nutrients*, *11*(7), 1–11. https://doi.org/10.3390/nu11071486

Tschann, J. M., Martinez, S. M., Penilla, C., Gregorich, S. E., Pasch, L. A., de Groat, C. L., Flores, E., Deardorff, J., Greenspan, L. C., & Butte, N. F. (2015). Parental feeding practices and child weight status in Mexican American families: A longitudinal analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(66), 1–10. https://doi.org/10.1186/s12966-015-0224-2

Turner, B. J., Navuluri, N., Winkler, P., Vale, S., & Finley, E. (2014). A qualitative study of family healthy lifestyle behaviors of Mexican-American and Mexican immigrant fathers and mothers. *Journal of the Academy of Nutrition and Dietetics*, *114*, 562–569. https://doi.org/10.1016/j.jand.2013.12.010

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (2020). *2020 – 2025 dietary guidelines for Americans (9th edition)*. https://www.dietaryguidelines.gov/

U.S. Department of Health and Human Services. (2018). *Physical activity guidelines for Americans (2nd edition).* https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

U.S. Department of Health and Human Services and U.S. Department of Agriculture. (2015). *2015 – 2020 dietary guidelines for Americans (8th edition).* https://doi.org/10.1097/NT.0b013e31826c50af

Utter, J., Neumark-Sztainer, D., Jeffery, R., & Story, M. (2003). Couch potatoes or french fries: Are sedentary behaviors associated with body mass index, physical activity, and dietary behaviors among adolescents? *Journal of the American Dietetic Association*, *103*(10), 1298–1305. https://doi.org/10.1016/S0002-8223(03)01079-4

Vaughn, A. E., Ward, D. S., Fisher, J. O., Faith, M. S., Hughes, S. O., Kremers, S. P. J., Musher-Eizenman, D. R., O'Connor, T. M., Patrick, H., & Power, T. G. (2016). Fundamental constructs in food parenting practices: A content map to guide future research. *Nutrition Reviews*, *74*(2), 98–117. https://doi.org/10.1093/nutrit/nuv061

Velde, S. J. T., Horst, K. V. D., Oenema, A., Timperio, A., Crawford, D., & Brug, J. (2011). Parental and home influences on adolescents' TV viewing: A mediation analysis. *International Journal of Pediatric Obesity*, *6*, e364–e372. https://doi.org/10.3109/17477166.2010.490264

Vikraman, S., Fryar, C. D., & Ogden, C. L. (2015). Caloric intake from fast food among children and adolescents in the United States, 2011-2012. *NCHS Data Brief*, *213*.

Watts, A. W., Barr, S. I., Hanning, R. M., Lovato, C. Y., & Mâsse, L. C. (2018). The home food environment and associations with dietary intake among adolescents presenting for a lifestyle modification intervention. *BMC Nutrition*, *4*(1), 1–9. https://doi.org/10.1186/s40795-018-0210-6

Watts, A. W., Loth, K., Berge, J. M., Larson, N., & Neumark-Sztainer, D. (2017). No time for family meals? Parenting practices associated with adolescent fruit and vegetable intake when family meals are not an option. *Journal of the Academy of Nutrition and Dietetics*, *117*(5), 707–714. https://doi.org/10.1016/j.jand.2016.10.026

Watts, A. W., Miller, J., Larson, N. I., Einsenberg, M. E., Story, M. T., & Neumark-Sztainer, D. (2019). Multicontextual correlates of adolescent sugar-sweetened beverage intake. *Eating Behaviors*, *30*, 42–48. https://doi.org/10.1016/j.eatbeh.2018.04.003

Ways to Enhance Children's Activity and Nutrition (WE CAN). (2013, February 13). *Reduce screen time*. National Heart, Lung, and Blood Institute. https://www.nhlbi.nih.gov/health/educational/wecan/reduce-screen-time/index.htm

Weaver, R. G., Brazendale, K., Hunt, E., Sarzynski, M. A., Beets, M. W., & White, K. (2019). Disparities in childhood overweight and obesity by income in the United States: An epidemiological examination using three nationally representative datasets. *International Journal of Obesity*, *43*, 1210–1222. https://doi.org/10.1038/s41366-019-0331-2

Wilfley, D. E., Saelens, B. E., Stein, R. I., Best, J. R., Kolko, R. P., Schechtman, K. B., Wallendorf, M., Robinson Welch, R., Perri, M. G., Epstein, L. H., & Author, C. (2017). Dose, content, and mediators of family-based treatment for childhood obesity-A multisite randomized clinical trial. *JAMA Pediatrics*, *171*(12), 1151–1159. https://doi.org/10.1001/jamapediatrics.2017.2960

Wilmot, E. G., Edwardson, C. L., Achana, F. A., Davies, M. J., Gorely, T., Gray, L. J., Khunti, K., Yates, T., & Biddle, S. J. H. (2012). Sedentary time in adults and the association with diabetes, cardiovascular disease and death: Systematic review and meta-analysis. *Diabetologia*, *55*, 2895–2905. https://doi.org/10.1007/s00125-012-2677-z

World Health Organization. (2012). *Guideline: Sodium intake for adults and children*. https://www.who.int/publications/i/item/9789241504836

World Health Organization. (2015). *Guideline: Sugars intake for adults and children.* https://www.who.int/publications/i/item/9789241549028

World Health Organization. (2018). *Physical activity*. https://www.who.int/news-room/fact-sheets/detail/physical-activity

World Health Organization and World Obesity. (2018). *Taking action on childhood obesity*. https://apps.who.int/iris/bitstream/handle/10665/274792/WHO-NMH-PND-ECHO-18.1-eng.pdf?ua=1

Wright, M. S., Wilson, D. K., Griffin, S., & Evans, A. (2010). A qualitative study of parental modeling and social support for physical activity in underserved adolescents. *Health Education Research*, *25*(2), 224–232. https://doi.org/10.1093/her/cyn043

Wu, X. Y., Han, L. H., Zhang, J. H., Luo, S., Hu, J. W., & Sun, K. (2017). The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. *PLoS ONE*, *12*(11), e0187668. https://doi.org/10.1371/journal.pone.0187668

Xu, H., Wen, L. M., & Rissel, C. (2015). Associations of parental influences with physical activity and screen time among young children: A systematic review. *Journal of Obesity*, *2015*, 546925. https://doi.org/10.1155/2015/546925

Yang, L., Cao, C., Kantor, E. D., Nguyen, L. H., Zheng, X., Park, Y., Giovannucci, E. L., Matthews, C. E., Colditz, G. A., & Cao, Y. (2019). Trends in sedentary behavior among the US population, 2001-2016. *Journal of the American Medical Association*, *321*(16), 1587–1597. https://doi.org/10.1001/jama.2019.3636

Yavuz, H. M., van Ijzendoorn, M. H., Mesman, J., & van der Veek, S. (2015). Interventions aimed at reducing obesity in early childhood: A meta-analysis of programs that involve parents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *56*(6), 677–692. https://doi.org/10.1111/jcpp.12330

Yavuz, H. M., van Ijzendoorn, M. H., Mesman, J., & van der Veek, S. (2018). A qualitative study conducted in the USA exploring Latino fathers' beliefs, attitudes and practices related to their young children's eating, physical activity and sedentary behaviours. *Public Health Nutrition*, *21*(1), 403–415. https://doi.org/10.1017/S1368980017002579

Yee, A. Z. H., Lwin, M. O., & Ho, S. S. (2017). The influence of parental practices on child promotive and preventive food consumption behaviors: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(47). https://doi.org/10.1186/s12966-017-0501-3

Zenk, S. N., Schulz, A. J., Johnson-Lawrence, V., & Gaines, C. R. (2017). Longitudinal associations between observed and perceived neighborhood food availability and body mass index in a multiethnic urban sample. *Health Education and Behavior*, *44*(1), 41–51. https://doi.org/10.1177/1090198116644150.Longitudinal

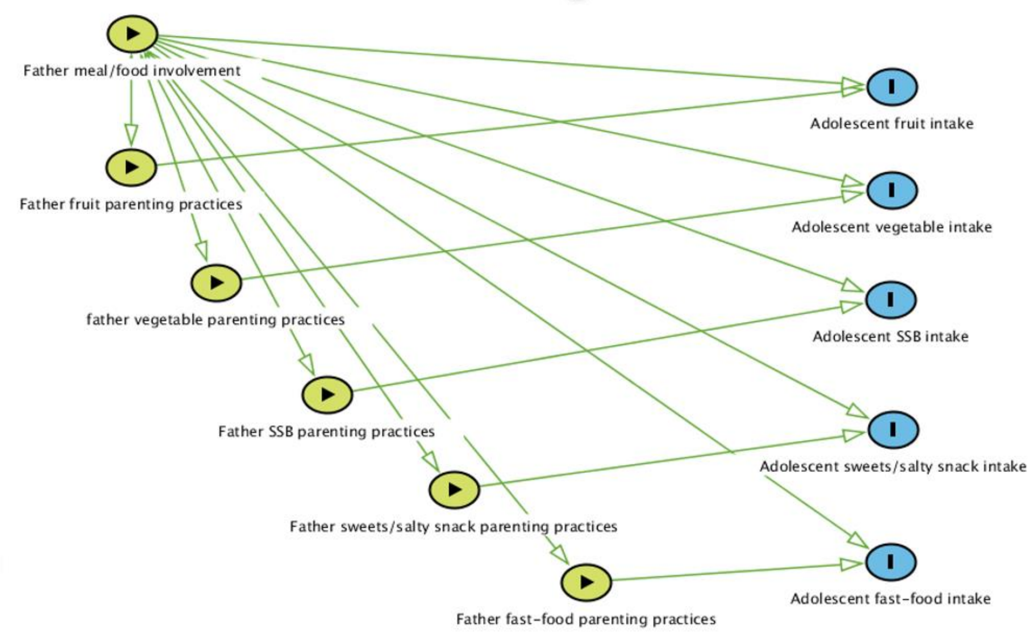
Zhang, Y., Hurtado, G. A., Flores, R., Alba-Meraz, A., & Reicks, M. (2018). Latino fathers' perspectives and parenting practices regarding eating, physical activity, and screen time behaviors of early adolescent children: Focus group findings. *Journal of the Academy of Nutrition and Dietetics*, *118*(11), 2070–2080. https://doi.org/10.1016/j.jand.2018.03.025

Zhang, Y., Hurtado, G. A., Reyes, A. P., Arellano Brazys, P., Perdue, L., Alvarez de Davila, S., Flores, R., Popelka, J. M., & Reicks, M. (2019). Padres Preparados, Jóvenes Saludables, a family-based program to prevent obesity among Latino early adolescents: Pilot test findings. *Journal of Human Sciences and Extension*, *7*(3), 68–91.

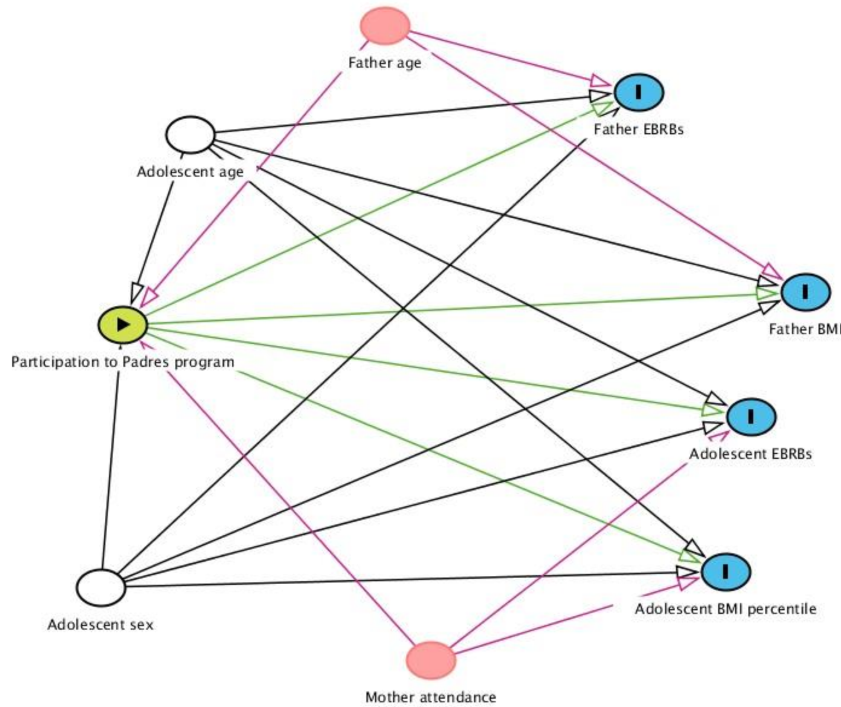
Zhang, Y., Reyes Peralta, A., Arellano Roldan Brazys, P., Hurtado, G. A., Larson, N., & Reicks, M. (2020). Development of a survey to assess Latino fathers' parenting practices regarding energy balance–related behaviors of early adolescents. *Health Education and Behavior*, *47*(1), 123–133. https://doi.org/10.1177/1090198119878769

Appendix A. Directed Acyclic Graphs (DAGs) for Identifying Potential Covariates for Statistical Models in Chapter 2, 3, and 4

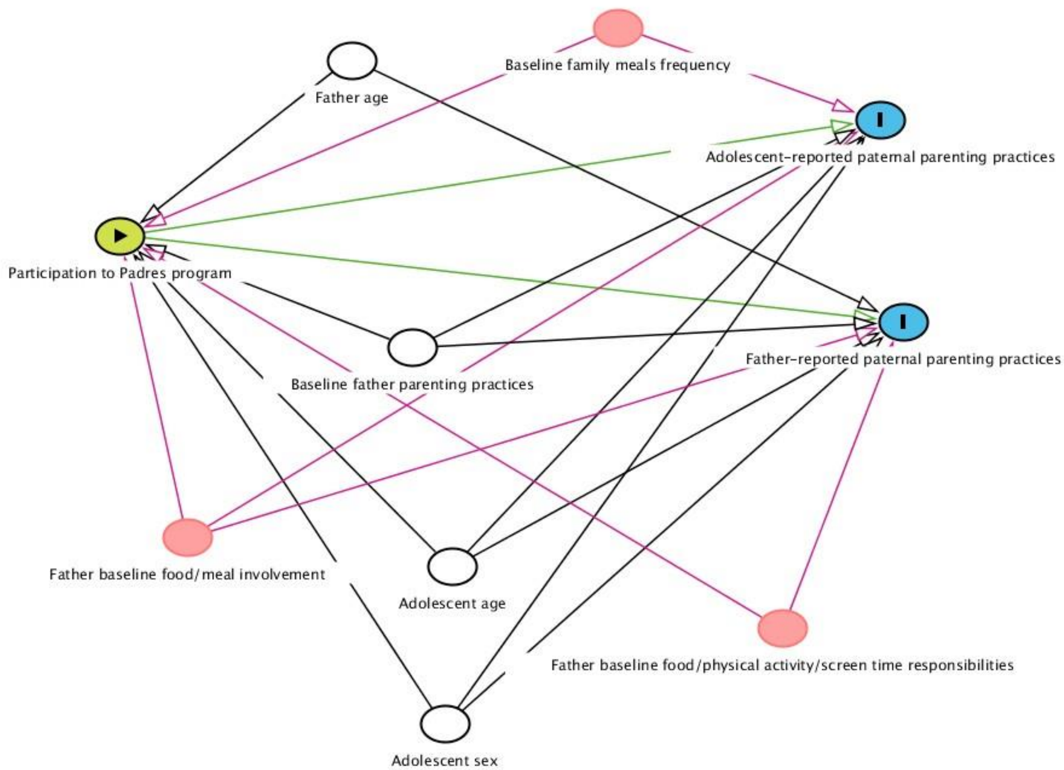
a. **DAG for Chapter 2**



b. DAG for Chapter 3



c. DAG for Chapter 4



Appendix B. SAS Codes for Statistical Analysis in Chapter 2

```
/*Import the data for the analysis*/
proc import out= abfmp_f datafile="C:\Users\balta026\Desktop\Family meals paper\Padres compile
data_06012020"
DBMS=xlsx;
sheet="Father-pre";
Run;
proc import out= abfmp_c datafile="C:\Users\balta026\Desktop\Family meals paper\Padres compile
data_06012020"
DBMS=xlsx;
sheet="Child-pre";
Run;
proc sort data = abfmp_f;
by famid;
run;
proc sort data = abfmp_c;
by famid;
run;
data abfmp;
merge abfmp_f abfmp_c;
by famid;
run;

data abfmp;
set abfmp;
*Adolescent PARENT PAIRS****************************************;
*fg: to identify adolescent-parent data pairs,
*CM means adolescent-mother pair,
*CF means adolescent-father pair,
*T means adolescent-father-mother triad,
*M or F means only parent data available.
*Records with M or F from the family datasheet were excluded from abfmp;
if cid NE " " and fid EQ " " and mid NE " " then fg="CM";
if cid NE " " and mid EQ " " and fid NE " "  then fg="CF";
if cid NE " " and fid NE " " and mid NE " " then fg="T";
if cid EQ " " and fid NE " " and mid EQ " " then fg="F";
if cid EQ " " and fid EQ " " and mid NE " " then fg="M";

if fg="CF" or fg="T" then cf="Y"; *to separate adolescent-father pairs;
run;

proc freq data=abfmp;
tables cf;
run;

*create the AFD dataset with only adolescent-father dyad observations;
data abfmp;
set abfmp;
where cf="Y";
run;

data abfmp;
set abfmp;
```

```
array miss _numeric_;
do over miss;
if miss=88 then miss=.;
end;

/*Adolescent Sex*/
if csex=1 then csex=0; *boy;
if csex=2 then csex=1; *girl;

/*Adolescent age groups*/
if cage>=9 and cage<=11 then cagec=0;
if cage>=12 then cagec=1;

/*Delete unreasonable values of parent's age*/
if fage<20 then fage=.;

/*Create father age categories*/
if fage > 20 and fage <= 40 then fagec=0;
if fage >= 41 then fagec=1;

/*Years in the US*/
if fus >=fage then fus=.; *exclude unreasonable values;

if fus>=0 and fus <10 then yrsinus = 0;
if fus = > 10 and fus < 20 then yrsinus = 1;
if fus = > 20 and fus < 30 then yrsinus = 2;
if fus = > 30 then yrsinus = 3;

/*Language*/
if flan = 1 or flan=2 then language= 0; *exclusive or primary spanish;
if flan = 3 then language= 1; *equally or more english;
if flan = 5 or flan=4 then language= 2; *More or only English;

/*Employement*/
if femp=2 then fempc=1; *Self-employed;
if femp=3 or femp=6 or femp=7 then fempc=2; *Unemployed;
if femp=4 then fempc=3; *Part-time employed;
if femp=5 then fempc=4; *Full-time employed;

/*Education*/
if fedu=1 or fedu=2 or fedu=3 then feduc=1; **middle school or lower;
if fedu=4 or fedu=5 then feduc=2; *GED or high school;
if fedu=6 or fedu=7 or fedu=8 then feduc=3; *some college or higher;

/*Marital Status*/
if fmar=1 or fmar=3 or fmar=4 or fmar=5 then fmarc=1; *Single;
if fmar=2 or fmar=6 then fmarc=2; *Married or with partner;

/*Household Income*/
if finc=1 or finc=2 then fincc=1; *<=$24,999;
if finc=3 or finc=4 then fincc=2; *$25,000 to <=$49,999;
if finc=5 or finc=6 then fincc=3; *$50,000 to <=$99,999;

/*Number of children in the home*/
if fch=1 then fchc=1;
if fch=2 or fch=3 then fchc=2;
```

```
if fch>=4 then fchc=3;

/*Food insecurity*/
if ffs1=1 or ffs1=2 then ffs1c=1;
if ffs1=3 then ffs1c=2;
if ffs2=1 or ffs2=2 then ffs2c=1;
if ffs2=3 then ffs2c=2;
if ffs1c=1 or ffs2c=1 then insec=1;
else insec=0;

/*Participation to the financial assistance programs*/
if ffin="1" or ffin="1,2,3" or ffin="1,3" or ffin="2" or ffin="2,3" or ffin="3" then ffinc=1;
if ffin="3,5" or ffin="5" or ffin="66" then ffinc="2";
run;

proc freq data=abfmp;
tables csex cage cagec fagec yrsinus language fempc feduc fmarc fincc fchc insec ffinc;
Run;

*Dependent variables***********;
data abfmp;
set abfmp;
/*Create new paternal expectation/limit variables by recoding expectation/limits 66=I don't know response
as missing*/
if cf1=66 then cf1= .;
if cv1=66 then cv1= .;
if cd1=66 then cd1= .;
if cs1=66 then cs1= .;
if cff1=66 then cff1= .;

*Create dichotomized paternal expectation variables;
*Median for fruit and vegetable were 3. Median for SSB and snack were 2. Medium for fast food was 1.
*Recode 0 = Low intake, 1= high intake per day;
*High intake is favorable for fruit and vegetables while low intake is favorable for SSB, snack, and fast
food;

cf1b=cf1;
if 0 <= cf1 < 3 then cf1b=0; *Low intake;
if cf1 >= 3 then cf1b=1; *High intake (favorable);

cv1b=cv1;
if 0 <= cv1 < 3 then cv1b=0; *Low intake;
if cv1 >= 3 then cv1b=1; *High intake (favorable);

cd1b=cd1;
if cd1 >= 2 then cd1b=0; * High intake;
if 0 <= cd1 < 2 then cd1b=1; *Low intake (favorable);

cs1b=cs1;
if cs1 > 2 then cs1b=0; *High intake;
if 0 <= cs1 <= 2 then cs1b=1; *Low intake (favorable);

cff1b=cff1;
if cff1 > 1 then cff1b=0; *High intake;
if 0 <= cff1 <= 1 then cff1b=1; *Low intake (favorable);
```

```
*Paternal behavioral role modeling;
*Create behavioral modeling scale;
cfbm = (cf2 + cf3)/2;
cvbm = (cv2 + cv3)/2;
cdbm = (cd2 + cd3)/2;
csbm =(cs2 + cs3)/2;
cffbm =(cff2 + cff3)/2;
cpbm = (cp2 + cp3)/2;
cstbm =(cst2 + cst3)/2;

/*Create dichotomized paternal behavior modeling variables*/
if cfbm >=1 and cfbm<=3 then cfbmc=0;
if cfbm >3 then cfbmc=1;

if cvbm >=1 and cvbm<=3 then cvbmc=0;
if cvbm >3 then cvbmc=1;

if cdbm >2 then cdbmc=0;
if cdbm >=1 and cdbm<=2 then cdbmc=1; *Less often modeling (favorable);

if csbm >2 then csbmc=0;
if csbm >=1 and csbm<=2 then csbmc=1; *Less often modeling (favorable);

if cffbm >2 then cffbmc=0;
if cffbm >=1 and cffbm<=2 then cffbmc=1; *Less often modeling (favorable);

/*Create paternal provision scale*/
*Adolescent reported;
cfp=(cf6+cf7+cf9)/3;
cvp=(cv6+cv7+cv9)/3;
cdp=(cd6+cd7+cd8)/3;
csp=(cs6+cs7+cs8)/3;
cffp=(cff6+cff7+cff8)/3;
cpp=(cp6+cp7+cp8)/3;

/*Create dichotomized paternal availability variables*/
if cfp>=1 and cfp<3.6 then cfpc=0; *low availability;
if cfp>=3.6 then cfpc=1; *High availability (favorable);

if cvp>=1 and cvp<3.3 then cvpc=0; *low availability;
if cvp>=3.3 then cvpc=1; *High availability (favorable);

if cdp>=1 and cdp<2 then cdpc=1; *Low availability (favorable);
if cdp>=2 then cdpc=0; *high availability;

if csp>=1 and csp<2 then cspc=1; *low availability (favorable);
if csp>=2 then cspc=0; *high availability;

if cffp>=1 and cffp<2 then cffpc=1; *low availability (favorable);
if cffp>=2 then cffpc=0; *high availability;

/*Create paternal provision scale on family meals and father meal/food involvement variables (fathers
involvement in planning, buying/preparing meals)*/
*Adolescent reported;

cfm2c=cfm2;
```

```
if cfm2 >=0 and cfm2<=3 then cfm2c=0;
if cfm2 >3 then cfm2c=1;

cinp=(cin1+cin2+cin3)/3;

*Create dichotomized father meal/food involvement variable;
if cinp >=1 and cinp<=3 then cinpc=0;
if cinp >3 then cinpc=1;
run;

/*Frequencies and percentages and median of parenting practices, family meal, and father meal/food
involvement variables*/
proc freq data=abfmp;
tables cf1b cv1b cd1b cs1b cff1b cfbmc cvbmc cdbmc csbmc cffbmc cfpc cvpc cdpc cspc cffpc cfm2c
cinpc;
Run;

/*Mean and SD for adolescent intake variables*/
Proc means data=abfmp;
var ndfw ndvw ndd nds ndfa;
run;

/*Squareroot transformations with continuous variables*/
data abfmp;
set abfmp;
ndfwt=sqrt(ndfw);
ndvwt=sqrt(ndvw);
nddt=sqrt(ndd);
ndst=sqrt(nds);
ndfat=sqrt(ndfa);
run;

/*Demographics with father meal/food involvement variables*/

/*Adolescent sex*/
proc freq data=abfmp;
tables csex*cfm2c/chisq;
run;
proc freq data=abfmp;
tables csex*cinpc/chisq;
run;
/*Adolescent age*/
proc freq data=abfmp;
tables cagec*cfm2c/chisq;
run;
proc freq data=abfmp;
tables cagec*cinpc/chisq;
run;
/*Father age*/
proc freq data=abfmp;
tables fagec*cfm2c/chisq;
run;
proc freq data=abfmp;
tables fagec*cinpc/chisq;
run;
/*Father education*/
```

```
proc freq data=abfmp;
tables feduc*cfm2c/chisq;
run;
proc freq data=abfmp;
tables feduc*cinpc/chisq;
run;
/*Father employment*/
proc freq data=abfmp;
tables fempc*cfm2c/chisq;
run;
proc freq data=abfmp;
tables fempc*cinpc/chisq;
run;
/*Marital status*/
proc freq data=abfmp;
tables fmarc*cfm2c/chisq;
run;
proc freq data=abfmp;
tables fmarc*cinpc/chisq;
run;
/*Household income*/
proc freq data=abfmp;
tables fincc*cfm2c/chisq;
run;
proc freq data=abfmp;
tables fincc*cinpc/chisq;
run;
/*Language at home*/
proc freq data=abfmp;
tables language*cfm2c/chisq;
run;
proc freq data=abfmp;
tables language*cinpc/chisq;
run;
/*Financial assistance*/
proc freq data=abfmp;
tables ffinc*cfm2c/chisq;
run;
proc freq data=abfmp;
tables ffinc*cinpc/chisq;
run;
/*Food security*/
proc freq data=abfmp;
tables insec*cfm2c/chisq;
run;
proc freq data=abfmp;
tables insec*cinpc/chisq;
run;
/*Number of children in home */
proc ttest data=abfmp;
class cfm2c;
var fch;
run;
proc ttest data=abfmp;
class cinpc;
var fch;
```

```
run;
/*Number of years in US*/
proc ttest data=abfmp;
class cfm2c;
var fus;
run;
proc ttest data=abfmp;
class cinpc;
var fus;
run;

**** t-tests and proc means for adolescent intake and demographics*******;

*Adolescent sex, and NDSR;
proc ttest data=abfmp;
class csex;
var ndfw ndvw ndd nds ndfa;
run;
*Adolescent age and NDSR;
proc ttest data=abfmp;
class cagec;
var ndfw ndvw ndd nds ndfa;
run;
*Father age and NDSR;
proc ttest data=abfmp;
class fagec;
var ndfw ndvw ndd nds ndfa;
run;
*Father education and NDSR;
proc means data=abfmp nonobs maxdec=3 sum mean std;
class feduc;
var ndfw ndvw ndd nds ndfa;
run;
proc glm data=abfmp;
class feduc;
model ndfw=feduc/ss3;
run;
proc glm data=abfmp;
class feduc;
model ndfw=feduc/ss3 solution;
run;
proc glm data=abfmp;
class feduc;
model ndvw=feduc/ss3;
run;
proc glm data=abfmp;
class feduc;
model ndd=feduc/ss3;
run;
proc glm data=abfmp;
class feduc;
model nds=feduc/ss3;
run;
proc glm data=abfmp;
class feduc;
model ndfa=feduc/ss3;
```

```
run;
*Father employment and NDSR;
proc means data=abfmp nonobs maxdec=3 sum mean std;
class fempc;
var ndfw ndvw ndd nds ndfa;
run;
proc glm data=abfmp;
class fempc;
model ndfw=fempc/ss3;
run;
proc glm data=abfmp;
class fempc;
model ndfw=fempc/ss3 solution;
run;
proc glm data=abfmp;
class fempc;
model ndvw=fempc/ss3;
run;
proc glm data=abfmp;
class fempc;
model ndd=fempc/ss3;
run;
proc glm data=abfmp;
class fempc;
model nds=fempc/ss3;
run;
proc glm data=abfmp;
class fempc;
model ndfa=fempc/ss3;
run;
*Father marital status and NDSR;
proc ttest data=abfmp;
class fmarc;
var ndfw ndvw ndd nds ndfa;
run;
*Father marital status and NDSR;
proc ttest data=abfmp;
class fmarc;
var ndfwt ndvwt nddt ndst ndfat;
run;
*Household income and NDSR;
proc means data=abfmp nonobs maxdec=3 sum mean std;
class fincc;
var ndfw ndvw ndd nds ndfa;
run;
proc glm data=abfmp;
class fincc;
model ndfw=fincc/ss3;
run;
proc glm data=abfmp;
class fincc;
model ndfw=fincc/ss3 solution;
run;
proc glm data=abfmp;
class fincc;
model ndvw=fincc/ss3;
```

```
run;
proc glm data=abfmp;
class fincc;
model ndd=fincc/ss3;
run;
proc glm data=abfmp;
class fincc;
model nds=fincc/ss3;
run;
proc glm data=abfmp;
class fincc;
model ndfa=fincc/ss3;
run;
*Father food security and NDSR;
proc ttest data=abfmp;
class insec;
var ndfw ndvw ndd nds ndfa ;
run;
*Father financial assistance programs and NDSR;
proc ttest data=abfmp;
class ffinc;
var ndfw ndvw ndd nds ndfa ;
run;
proc ttest data=abfmp;
class ffinc;
var ndfwt ndvwt nddt ndst ndfat ;
run;
*Number of children at home and NDSR;
proc means data=abfmp nonobs maxdec=3 sum mean std;
class fchc;
var ndfw ndvw ndd nds ndfa;
run;
proc glm data=abfmp;
class fchc;
model ndfw=fchc/ss3;
run;
proc glm data=abfmp;
class fchc;
model ndfw=fchc/ss3 solution;
run;
proc glm data=abfmp;
class fchc;
model ndvw=fchc/ss3;
run;
proc glm data=abfmp;
class fchc;
model ndd=fchc/ss3;
run;
proc glm data=abfmp;
class fchc;
model nds=fchc/ss3;
run;
proc glm data=abfmp;
class fchc;
model ndfa=fchc/ss3;
run;
```

```
***Linear regression with adolescent intake and demographics*************;

/*Fruit intake with demographics*/
proc reg data=abfmp;
model ndfw=csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=cagec csex / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=fagec csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=feduc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=fempc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=fmarc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=level csex cagec  / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=fincc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=insec csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=ffinc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfw=fchc csex cagec / clb;
run;
quit;
/*Vegetable intake with demographics*/
proc reg data=abfmp;
model ndvw=csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=cagec csex/ clb;
run;
```

```
quit;
proc reg data=abfmp;
model ndvw=fagec csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=feduc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=fempc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=fmarc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=level csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=fincc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=insec csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=ffinc csex cagec/ clb;
run;
quit;
proc reg data=abfmp;
model ndvw=fchc csex cagec/ clb;
run;
quit;
/*SSBs intake with demographics*/
proc reg data=abfmp;
model ndd=csex cagec fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=cagec csex fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=fagec csex cagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=feduc csex cagec fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=fempc csex cagec fagec ffinc fmarc/ clb;
```

```
run;
quit;
proc reg data=abfmp;
model ndd=fmarc csex cagec fagec ffinc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=level csex cagec fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=fincc csex cagec fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=insec csex cagec fagec ffinc fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=ffinc csex cagec fagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndd=fchc csex cagec fagec ffinc fmarc/ clb;
run;
quit;
/*Snacks intake with demographics*/
proc reg data=abfmp;
model nds=csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=cagec csex fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=fagec csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=feduc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=fempc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=fmarc csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model nds=level csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
```

```
model nds=fincc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=insec csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=ffinc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model nds=fchc csex cagec fmarc/ clb;
run;
quit;
/*fast food intake with demographics*/
proc reg data=abfmp;
model ndfa=csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=cagec csex fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=fagec csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=feduc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=fempc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=fmarc csex cagec/ clb;
run;
quit;
proc reg data=abfmp;
model ndfat=fmarc csex cagec/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=level csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=fincc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=insec csex cagec fmarc/ clb;
run;
quit;
```

```
proc reg data=abfmp;
model ndfa=ffinc csex cagec fmarc/ clb;
run;
quit;
proc reg data=abfmp;
model ndfa=fchc csex cagec fmarc/ clb;
run;
quit;

*** t-tests with adolescent intake and parenting practices**************;

/*Paternal expectation and child intake */
proc ttest data=abfmp;
class cf1b;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cv1b;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cd1b;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cs1b;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cff1b;
var ndfw ndvw ndd nds ndfa;
run;
/*Role modeling and child intake*/
proc ttest data=abfmp;
class cfbmc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cvbmc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cdbmc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class csbmc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cffbmc;
var ndfw ndvw ndd nds ndfa;
run;
/*Food availability at home and child intake*/
proc ttest data=abfmp;
class cfpc;
```

```
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cvpc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cdpc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cspc;
var ndfw ndvw ndd nds ndfa;
run;
proc ttest data=abfmp;
class cffpc;
var ndfw ndvw ndd nds ndfa;
run;

**** Linear regression with adolescent intake and meals******************;

/*Adolescent intake with family meals*/
proc reg data=abfmp;
model ndfw=cfm2c csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=cfm2c csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndd=cfm2c csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model nds=cfm2c csex cagec / clb;
run;
quit;
proc reg data=abfmp;
model ndfa=cfm2c csex cagec / clb;
run;
quit;
/*Adolescent intake with father food/meal involvement*/
proc reg data=abfmp;
model ndfw=cinpc csex cagec fincc / clb;
run;
quit;
proc reg data=abfmp;
model ndvw=cinpc csex cagec fincc / clb;
run;
quit;
proc reg data=abfmp;
model ndd=cinpc csex cagec fincc / clb;
run;
quit;
proc reg data=abfmp;
```

```
model nds=cinpc csex cagec fincc / clb;
run;
quit;
proc reg data=abfmp;
model ndfa=cinpc csex cagec fincc / clb;
run;
quit;

******** Linear regression with Intake and parenting practices*********;
***************SETTING EXPECTATIONS**************************************;

* Child intake with setting fruit expectations;
proc glm data=abfmp;
class cf1b(ref="0");
model ndfw=cf1b csex cagec /solution;
run;
proc reg data=abfmp;
model ndfw=cf1b csex cagec / clb;
run;
quit;
* Child intake with setting vegetable expectations;
proc reg data=abfmp;
model ndvw=cv1b csex cagec / clb;
run;
quit;
* Child intake with setting SSB expectations;
proc glm data=abfmp;
class cd1b(ref="0");
model ndd=cd1b csex cagec ffinc /solution;
run;
proc reg data=abfmp;
model ndd=cd1b csex cagec ffinc / clb;
run;
quit;
* Child intake with setting snack expectations;
proc reg data=abfmp;
model nds=cs1b csex cagec fmarc / clb;
run;
quit;
* Child intake with setting fast food expectations;
proc reg data=abfmp;
model ndfa=cff1b csex cagec fmarc / clb;
run;
quit;

***************ROLE MODELING**************************************;

* Child intake with fruit role modeling;
proc glm data=abfmp;
class cfbmc(ref="0");
model ndfw=cfbmc csex cagec /solution;
run;
proc reg data=abfmp;
model ndfw=cfbmc csex cagec / clb;
run;
quit;
```

```
* Child intake with vegetable role;
proc reg data=abfmp;
model ndvw=cvbmc csex cagec / clb;
run;
quit;
* Child intake with SSB role modeling;
proc reg data=abfmp;
model ndd=cdbmc csex cagec ffinc / clb;
run;
quit;
* Child intake with snack role modeling;
proc reg data=abfmp;
model nds=csbmc csex cagec fmarc / clb;
run;
quit;
* Child intake with fast food role modeling;
proc reg data=abfmp;
model ndfa=cffbmc csex cagec fmarc / clb;
run;
quit;

***************AVAILABILITY AT HOME*************************************;

* Child intake with fruit availability;
proc glm data=abfmp;
class cfpc(ref="0");
model ndfw=cfpc csex cagec /solution;
run;
proc reg data=abfmp;
model ndfw=cfpc csex cagec / clb;
run;
quit;
* Child intake with vegetable availability;
proc reg data=abfmp;
model ndvw=cvpc csex cagec / clb;
run;
quit;
* Child intake with SSB availability;
proc reg data=abfmp;
model ndd=cdpc csex cagec ffinc / clb;
run;
quit;
* Child intake with snack availability;
proc reg data=abfmp;
model nds=cspc csex cagec fmarc / clb;
run;
quit;
* Child intake with fast food availability;
proc reg data=abfmp;
model ndfa=cffpc csex cagec fmarc / clb;
run;
quit;

******** Linear regression with Intake and parenting practices WITH TANSFORMED VALUES (USED
FOR P-VALUES)*************************************;
```

```
***************SETTING EXPECTATIONS WITH TANSFORMED VALUES*********************;

* Child intake with setting fruit expectations;
proc glm data=abfmp;
class cf1b(ref="0");
model ndfwt=cf1b csex cagec /solution;
run;
proc reg data=abfmp;
model ndfwt=cf1b csex cagec / clb;
run;
quit;
* Child intake with setting vegetable expectations;
proc reg data=abfmp;
model ndvwt=cv1b csex cagec / clb;
run;
quit;
* Child intake with setting SSB expectations;
proc glm data=abfmp;
class cd1b(ref="0");
model nddt=cd1b csex cagec ffinc /solution;
run;
proc reg data=abfmp;
model nddt=cd1b csex cagec ffinc / clb;
run;
quit;
* Child intake with setting snack expectations;
proc reg data=abfmp;
model ndst=cs1b csex cagec fmarc / clb;
run;
quit;
* Child intake with setting fast food expectations;
proc reg data=abfmp;
model ndfat=cff1b csex cagec fmarc / clb;
run;
quit;

*******ROLE MODELING WITH TRANSFORMED VALUES*******************;

* Child intake with fruit role modeling;
proc glm data=abfmp;
class cfbmc(ref="0");
model ndfwt=cfbmc csex cagec /solution;
run;
proc reg data=abfmp;
model ndfwt=cfbmc csex cagec / clb;
run;
quit;
* Child intake with vegetable role;
proc reg data=abfmp;
model ndvwt=cvbmc csex cagec / clb;
run;
quit;
* Child intake with SSB role modeling;
proc reg data=abfmp;
model nddt=cdbmc csex cagec ffinc / clb;
```

```
run;
quit;
* Child intake with snack role modeling;
proc reg data=abfmp;
model ndst=csbmc csex cagec fmarc / clb;
run;
quit;
* Child intake with fast food role modeling;
proc reg data=abfmp;
model ndfat=cffbmc csex cagec fmarc / clb;
run;
quit;

**********AVAILABILITY AT HOME WITH TRANSFORMED VALUES*********************;

* Child intake with fruit availability;
proc glm data=abfmp;
class cfpc(ref="0");
model ndfwt=cfpc csex cagec /solution;
run;
proc reg data=abfmp;
model ndfwt=cfpc csex cagec / clb;
run;
quit;
* Child intake with vegetable availability;
proc reg data=abfmp;
model ndvwt=cvpc csex cagec / clb;
run;
quit;
* Child intake with SSB availability;
proc reg data=abfmp;
model nddt=cdpc csex cagec ffinc / clb;
run;
quit;
* Child intake with snack availability;
proc reg data=abfmp;
model ndst=cspc csex cagec fmarc / clb;
run;
quit;
* Child intake with fast food availability;
proc reg data=abfmp;
model ndfat=cffpc csex cagec fmarc / clb;
run;
quit;

*****************************************************************;
/*Paternal fruit expectation (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-fruit intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cf1b cfm2c;
model ndfwt = cfm2c|cf1b csex cage / solution e;
store catcat;
*Interaction was significant p=0.054;
run;
```

```
proc plm restore = catcat;
slice cfm2c*cf1b / sliceby=cf1b diff adj=bon plots=none nof e means;
slice cfm2c*cf1b / sliceby=cfm2c diff adj=bon plots=none nof e means;
run;
*Estimating simple effects with the lsmestimate statement;
*To calculate simple effects of each interaction conditions;
Proc plm restore=catcat;
lsmestimate cfm2c*cf1b 'LowFexp-HigFexp, cfm2c=low(0)'   [1,1 1][-1,2 1],
                                                   'LowFexp-HigFexp, cfm2c=high(1)'  [1,1 2][-1,2 2],
                                                   'Lowcfm2-Higcfm2, cf1b=low(0)'   [1,1 1][-1,1 2],
                                                   'Lowcfm2-Higcfm2, cf1b=high(1)'  [1,2 1][-1,2 2] /e
adj=bon;
run;
proc plm restore=catcat;
effectplot interaction (x=cf1b sliceby=cfm2c) / clm connect;
effectplot interaction (x=cfm2c sliceby=cf1b) / clm connect;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cf1b cinpc;
model ndfwt = cinpc|cf1b csex cage fincc fchc / solution e;
store catcat;
*Interaction was not significant;
run;

/*Role modeling-fruit (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-fruit intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cfbmc cfm2c;
model ndfwt = cfm2c|cfbmc csex cage / solution e;
store catcat;
*Interaction was not significant;
run;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cfbmc cinpc;
model ndfwt = cinpc|cfbmc csex cage fincc fchc / solution e;
store catcat;
*Interaction was not significant;
run;

/*Food availability-fruit (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR fruit intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cfpc cfm2c;
model ndfwt = cfm2c|cfpc csex cage / solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
```

```
class cfpc cinpc;
model ndfwt = cinpc|cfpc csex cage fincc fchc/ solution e;
store catcat;
*Interaction was not significant;
run;

*****************************************************************;
/*Paternal vegetable expectation (categorical) and meals with fathers (categorical), family meals
(categorical),
father food/meal involvement (categorical), and NDSR-Vegatable intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cv1b cfm2c;
model ndvwt = cfm2c|cv1b csex cage/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cv1b cinpc;
model ndvwt = cinpc|cv1b csex cage fincc fchc/ solution e;
store catcat;
*Interaction was not significant;
run;

/*Role modeling-vegetable (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-Vegetable intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cvbmc cfm2c;
model ndvwt = cfm2c|cvbmc csex cage/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cvbmc cinpc;
model ndvwt = cinpc|cvbmc csex cage fincc fchc/ solution e;
store catcat;
*Interaction was not significant;
run;

/*Food availability-vegetable (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR Vegetable intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cvpc cfm2c;
model ndvwt = cfm2c|cvpc csex cage/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
```

```
class cvpc cinpc;
model ndvwt = cinpc|cvpc csex cage fincc fchc/ solution e;
store catcat;
*Interaction was not significant;
run;
****************************************************************************;
/*Paternal SSB expectation (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-SSB intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cd1b cfm2c;
model nddt = cfm2c|cd1b csex cage ffinc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cd1b cinpc;
model nddt = cinpc|cd1b csex cage fincc fchc ffinc/ solution e;
store catcat;
*Interaction was not significant;
run;

/*Role modeling-SSB(categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-SSB intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cdbmc cfm2c;
model nddt = cfm2c|cdbmc csex cage ffinc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cdbmc cinpc;
model nddt = cinpc|cdbmc csex cage fincc fchc ffinc/ solution e;
store catcat;
*Interaction was significant (p=0.027);
run;
proc plm restore = catcat;
slice cinpc*cdbmc / sliceby=cdbmc diff adj=bon plots=none nof e means;
slice cinpc*cdbmc / sliceby=cinpc diff adj=bon plots=none nof e means;
run;
*Estimating simple effects with the lsmestimate statement;
*To calculate simple effects of each interaction conditions;
Proc plm restore=catcat;
lsmestimate cinpc*cdbmc 'LowRmod-HigRmod, cinpc=low(0)'   [1,1 1][-1,2 1],
                        'LowRmod-HigRmod, cinpc=high(1)'  [1,1 2][-1,2 2],
                        'Lowcinp-Higcinp, cdbmc=low(0)'   [1,1 1][-1,1 2],
                        'Lowcinp-Higcinp, cdbmc=high(1)'  [1,2 1][-1,2 2] /e
adj=bon;
run;

proc plm restore=catcat;
```

```
effectplot interaction (x=cdbmc sliceby=cinpc) / clm connect;
effectplot interaction (x=cinpc sliceby=cdbmc) / clm connect;
run;

/*Food availability-SSB (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR SSB intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cdpc cfm2c;
model nddt = cfm2c|cdpc csex cage ffinc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cdpc cinpc;
model nddt = cinpc|cdpc csex cage fincc fchc ffinc/ solution e;
store catcat;
*Interaction was not significant;
run;

****************************************************************
/*Paternal snack expectation (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-snack intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cs1b cfm2c;
model ndst = cfm2c|cs1b csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cs1b cinpc;
model ndst = cinpc|cs1b csex cage fincc fchc fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;

/*Role modeling-snacks (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-Snack intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class csbmc cfm2c;
model ndst = cfm2c|csbmc csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class csbmc cinpc;
model ndst = cinpc|csbmc csex cage fincc fchc fmarc/ solution e;
store catcat;
```

```
*Interaction was not significant;
run;

/*Food availability-snacks (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR snack intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cspc cfm2c;
model ndst = cfm2c|cspc csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cspc cinpc;
model ndst = cinpc|cspc csex cage fincc fchc fmarc/ solution e;
store catcat;
*Interaction was significant (p=0.0617);
run;
proc plm restore = catcat;
slice cinpc*cspc / sliceby=cspc diff adj=bon plots=none nof e means;
slice cinpc*cspc / sliceby=cinpc diff adj=bon plots=none nof e means;
run;
*Estimating simple effects with the lsmestimate statement;
*To calculate simple effects of each interaction conditions;
Proc plm restore=catcat;
lsmestimate cinpc*cspc 'LowFavb-HigFavb, cinpc=low(0)'   [1,1 1][-1,2 1],
                                                          'LowFavb-HigFavb, cinpc=high(1)'  [1,1 2][-1,2 2],
                                                          'Lowcinp-Higcinp, cspc=low(0)'   [1,1 1][-1,1 2],
                                                          'Lowcinp-Higcinp, cspc=high(1)'  [1,2 1][-1,2 2] /e
adj=bon;
run;
proc plm restore=catcat;
effectplot interaction (x=cspc sliceby=cinpc) / clm connect;
effectplot interaction (x=cinpc sliceby=cspc) / clm connect;
run;

*****************************************************************;
/*Paternal fast food expectation (categorical) and meals with fathers (categorical), family meals
(categorical),
father food/meal involvement (categorical), and NDSR-fast food intake (continuous)*/
*family meals;
proc glm data=abfmp order=internal;
class cff1b cfm2c;
model ndfat = cfm2c|cff1b csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cff1b cinpc;
model ndfat = cinpc|cff1b csex cage fincc fchc fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
```

```
/*Role modeling-fast food (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR-fast food intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cffbmc cfm2c;
model ndfat = cfm2c|cffbmc csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cffbmc cinpc;
model ndfat = cinpc|cffbmc csex cage fincc fchc fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;

/*Food availability-snacks (categorical) and meals with fathers (categorical), family meals (categorical),
father food/meal involvement (categorical), and NDSR snack intake (continuous)*/

*family meals;
proc glm data=abfmp order=internal;
class cffpc cfm2c;
model ndfat = cfm2c|cffpc csex cage fmarc/ solution e;
store catcat;
*Interaction was not significant;
run;
*father food/meal involvement;
proc glm data=abfmp order=internal;
class cffpc cinpc;
model ndfat = cinpc|cffpc csex cage fincc fchc fmarc/ solution e;
store catcat
/*Interaction was not significant*/
run;
```

Appendix C. Parents survey (in English)

Padres Preparados, Jóvenes Saludables

Parent Survey

Participant ID: ____________________

Date: ____________________________

Site: _____________________________

Dear Parent,
Thank you for your interest in the program! This survey will collect important information about eating, physical activity and screen time. The information you share will help us develop better programs for Latino families, so please provide answers that are best for you.
Please remember that there are no right or wrong answers. If you have questions, please ask.
Sincerely,
The Project Team

How to complete the questionnaire?

- *Mark your answers with a pencil.*
- *Completely erase any answer you want to change.*
- *Completely fill the circle or circle the number for some questions.*

<u>IMPORTANT:</u> Please think only about the child participating in this program when you answer the following questions.

Part 1

We want to know what you think and do regarding your child's food intake, physical activity and screen time. Please choose only one answer for each question.

Section 1: Fruit Intake

This section asks about what you think and do regarding your child's fruit intake. Fruits may be fresh, canned, frozen, or dried, and may be whole, cut-up, or pureed.

1. How many cups of fruit do you want your child to eat in a day?
O None O 1 cup O 2 cups O 3 cups or more O As many as he or she wants *one cup of fruit equals one small apple, one large banana, or eight large strawberries.

For the questions below, please circle the number that best describes you or your child.

How many times in a week	Almost never or never	Less than once in a week	1-3 times in a week	4-6 times in a week	Once a day or more
2. does your child see you eating fruit?	1	2	3	4	5
3. do you eat fruits with your child?	1	2	3	4	5

How often do you …	Almost never or never	Rarely	Some times	Often	Almost always/ always
4. tell your child to eat fruit like you do?	1	2	3	4	5
5. tell your child that you like fruit?	1	2	3	4	5
6. buy fruit for your child to eat?	1	2	3	4	5
7. prepare fruit for your child to eat?	1	2	3	4	5
8. ask your spouse to buy fruit for your child to eat? (Please don't answer if this does not apply to you.)	1	2	3	4	5
9. make sure your child has different kinds of fruit to choose from?	1	2	3	4	5

Section 2: Vegetable Intake

This section asks about what you think and do regarding your child's vegetable intake. Vegetables may be raw, canned, dried or cooked; and may be whole, cut-up, or mashed. Vegetables include fresh and dried beans and peas. Deep fried starchy vegetables, such as French fries, are not counted as vegetables.

1. How many cups of vegetables do you want your child to eat in a day?
O None O 1 cup O 2 cups O 3 cups or more O As many as he or she wants. *a cup of vegetables equals one large bell pepper, two large stalks of celery, or 3 spears of broccoli.

For the questions below, please circle the number that best describes you or your child.

How many times in a week	**Almost never or never**	**Less than once in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. does your child see you eating vegetables?	1	2	3	4	5
3. do you eat vegetables with your child?	1	2	3	4	5

How often do you …	**Almost never or never**	**Rarely**	**Some times**	**Often**	**Almost always or always**
4. tell your child to eat vegetables like you do?	1	2	3	4	5
5. tell your child you like vegetables?	1	2	3	4	5
6. buy vegetables for your child to eat?	1	2	3	4	5
7. prepare vegetables for your child to eat?	1	2	3	4	5
8. ask your spouse to buy vegetables for your child to eat? (Please don't answer if this does not apply to you.)	1	2	3	4	5
9. make sure your child has different kinds of vegetables to choose from?	1	2	3	4	5

Section 3. Sugary Drinks

This section asks about what you think and do regarding your child's consumption of sugary drinks. Sugary drinks include regular sodas, fruit-flavored drinks, sport and energy drinks, sweetened tea and coffee drinks, and powdered or reconstituted drinks.

1. How often do you allow your child to drink sugary drinks?
O No sugary drinks are allowed O Less than once in a week O 1-3 times in a week O 4-6 times in a week O Once a day or more O As often as he or she wants

For the questions below, please circle the number that best describes you or your child.

How many times in a week	**Almost never or never**	**Less than once in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. does your child see you drinking sugary drinks?	1	2	3	4	5
3. do you drink sugary drinks with your child?	1	2	3	4	5

How often do you …	**Almost never or never**	**Rarely**	**Some times**	**Often**	**Almost always or always**
4. tell your child not to drink sugary drinks like you don't drink sugary drinks?	1	2	3	4	5
5. tell your child that you don't want to drink sugary drinks?	1	2	3	4	5
6. buy sugary drinks for your child to drink?	1	2	3	4	5
7. prepare sugary drinks for your child to drink?	1	2	3	4	5
8. give your child money to buy sugary drinks?	1	2	3	4	5
9. keep sugary drinks out of your child's reach?	1	2	3	4	5
10. reward or treat your child with sugary drinks?	1	2	3	4	5

Section 4. Sweets and Salty Snacks

This section asks about what you think and do regarding your child's consumption of sweets and salty snacks. Sweets include candy, jam, syrup, chocolate confections, dairy desserts, and grain-based desserts. Salty snacks include potato chips, corn chips, crackers, cheese balls or curls, and other similar food items.

1. How often do you allow your child to eat sweets or salty snacks?
O No sweets and/or no salty snacks are allowed O Less than once in a week O 1-3 times in a week O 4-6 times in a week O Once a day or more O As often as he or she wants

For the questions below, please circle the number that best describes you or your child.

How many times in a week …	**Almost never or never**	**Less than once in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. does your child see you eating sweets or salty snacks?	1	2	3	4	5
3. do you eat sweets or salty snacks with your child?	1	2	3	4	5

How often do you …	**Almost never or never**	**Rarely**	**Some times**	**Often**	**Almost always or always**
4. tell your child not to eat sweets or salty snacks like you don't eat sweets or salty snacks?	1	2	3	4	5
5. tell your child that you don't want to eat sweets or salty snacks?	1	2	3	4	5
6. buy sweets or salty snacks for your child to eat?	1	2	3	4	5
7. prepare sweets or salty snacks for your child to eat?	1	2	3	4	5
8. give your child money to buy sweets or salty snacks?	1	2	3	4	5
9. keep sweets or salty snacks out of your child's reach?	1	2	3	4	5
10. reward or treat your child with sweets or salty snacks?	1	2	3	4	5

Section 5. Fast Food

This section asks about what you think and do regarding your child's consumption of fast food. Fast food includes food bought from quick service places such as fast food restaurants.

1.	How often do you allow your child to eat fast food?

- O No fast food is allowed
- O Less than once in a week
- O 1-3 times in a week
- O 4-6 times in a week
- O Once a day or more
- O As often as he or she wants

For the questions below, please circle the number that best describes you or your child.

How many times in a week …	**Almost never or never**	**Less than once in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. does your child see you eating fast food?	1	2	3	4	5
3. do you eat fast food with your child?	1	2	3	4	5

How often do you …	**Almost never or never**	**Rarely**	**Some times**	**Often**	**Almost always or always**
4. tell your child not to eat fast food like you don't eat fast food?	1	2	3	4	5
5. tell your child that you don't want to eat fast food?	1	2	3	4	5
6. buy fast food for your child to eat?	1	2	3	4	5
7. go to fast food restaurants with your child	1	2	3	4	5
8. give your child money to buy fast food?	1	2	3	4	5
9. reward or treat your child with fast food?	1	2	3	4	5

Section 6. Physical Activity

This section asks about what you think and do regarding your child's physical activity. Physical activity includes sports, exercise, active games, and house chores.

1. How much time do you want your child to be physically active in a day?
O 0 minutes O 30 minutes or less O 30 minutes to one hour O 1 hour to 2 hours O 2 hours or more O As much as he or she wants

For the questions below, please circle the number that best describes you or your child.

How many times in a week …	**Almost never or never**	**Less than once in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. does your child see you being physically active?	1	2	3	4	5
3. are you physically active with your child?	1	2	3	4	5

How often do you …	**Almost never or never**	**Rarely**	**Some times**	**Often**	**Almost always or always**
4. tell your child to be physically active like you are?	1	2	3	4	5
5. tell your child that you like being physically active?	1	2	3	4	5
6. take your child to a place he/she can be physically active?	1	2	3	4	5
7. send your child outside to be physically active when the weather is nice?	1	2	3	4	5
8. make opportunities available for your child to be physically active?	1	2	3	4	5

Section 7. Screen Time

This section asks about what you think and do regarding your child's screen time. Screen time includes watching TV and movies, playing video games, and using computers, smartphones, and tablets for fun <u>but not for activities related to study or work.</u>

1. How much screen time do you allow your child to have in a day?

- O No screen time is allowed
- O 30 minutes or less
- O 30 minutes to one hour
- O 1 hour to 2 hours
- O 2 hours or more
- O As much as he or she wants

For the questions below, please circle the number that best describes you or your child.

How many times in a week …	Almost never or never	Less than once in a week	1-3 times in a week	4-6 times in a week	Once a day or more
2. does your child see you having screen time?	1	2	3	4	5
3. do you have screen time together with your child?	1	2	3	4	5

How often do you …	Almost never or never	Rarely	Some times	Often	Almost always or always
4. tell your child not to have screen time like you don't have screen time?	1	2	3	4	5
5. tell your child that you do not want to have screen time?	1	2	3	4	5
6. give screen time opportunities to your child? (Examples include giving a smartphone, tablet, or computer to your child to use, or allowing your child to use the TV or video game.)	1	2	3	4	5
7. reward your child with screen time?	1	2	3	4	5
8. take away screen time to control your child's behavior?	1	2	3	4	5

Section 8. Eating and Cooking Together

1.	During the past 7 days, how many times did all or most of your family living in your house eat a meal together?
	O Never
	O 1 to 2 times
	O 3 to 4 times
	O 5 to 6 times
	O 7 times
	O More than 7 times

2.	During the past 7 days, how many times did you and your child eat a meal together?
	O Never
	O 1 to 2 times
	O 3 to 4 times
	O 5 to 6 times
	O 7 times
	O More than 7 times

How often do you …	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
3. plan meals together with your child?	1	2	3	4	5
4. buy foods together with your child?	1	2	3	4	5
5. prepare foods together with your child?	1	2	3	4	5

Part 3. Communication

The following questions are about communication between parents and children. Please select the option that best represents your style of communication with your child.

How often do these statements apply to you and your child?		Almost never/never	Once in awhile	About half of time	Very often	Almost always/ always
1.	It is difficult making my son/daughter talk with me.	1	2	3	4	5
2.	When I want to talk to my son/daughter about something important, I try to find a time that is peaceful during the day.	1	2	3	4	5
3.	When I talk with my son/daughter I tend to say things that I probably shouldn't say.	1	2	3	4	5
4.	When I talk with my son/daughter, I intend to use eye contact.	1	2	3	4	5
5.	I organize my thoughts before talking to my child.	1	2	3	4	5
6.	It is easy for me to express my true feelings to my child.	1	2	3	4	5
7.	When my child misbehaves, I punish my son/daughter without speaking to him/her.	1	2	3	4	5
8.	When I listen to my child, I try to understand his/her feelings.	1	2	3	4	5
9.	I try to see my son's or daughter's point of view.	1	2	3	4	5
How often do these statement apply to you and your child?		**Never**	**Once in awhile**	**About half of time**	**Very often**	**Always**
10.	It is important to listen attentively when my son/daughter speaks to me.	1	2	3	4	5
11.	I don't listen to everything that my son/daughter says because I am thinking about what I want to say.	1	2	3	4	5
12.	I interrupt my son/daughter to say what I want to say.	1	2	3	4	5
13.	I recognize when my son/daughter and I try to say the same thing, but in a different way.	1	2	3	4	5

14.	I try to observe the body language of my child to better understand what he/she is trying to say.	1	2	3	4	5
15.	I try to respond to what my son/daughter is saying instead of reacting to the tone of his or her voice.	1	2	3	4	5
16.	I assure myself that I understand what my son/daughter says before I respond.	1	2	3	4	5
How often do these statements apply to you and your child?		**Never**	**Once in awhile**	**About half of time**	**Very often**	**Always**
17.	I try to re-phrase what my child said, to make sure that I understand him/her.	1	2	3	4	5
18.	I am very satisfied with the communication between my son/daughter and me.	1	2	3	4	5
19.	It is easy to express my point of view to my son/daughter.	1	2	3	4	5
20.	It is easy to talk about problems with my son/daughter.	1	2	3	4	5

Part 4. Responsibilities

How often are you responsible for…	Almost never or never	Rarely	Half of time	Most of time	Almost always or always
1. planning meals?	1	2	3	4	5
2. buying food for meals?	1	2	3	4	5
3. preparing or cooking foods for meals?	1	2	3	4	5
4. deciding what your child eats?	1	2	3	4	5
5. controlling what your child eats?	1	2	3	4	5
6. organizing your children's physical activities?	1	2	3	4	5
7. controlling your child's screen time?	1	2	3	4	5

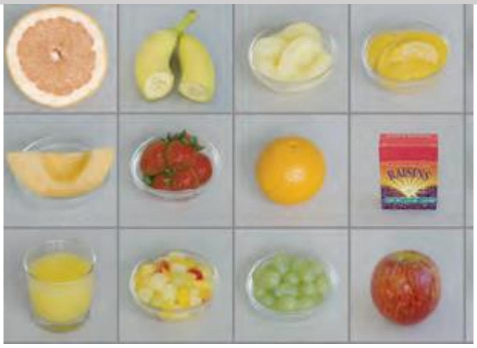
Part 6. Food Checklist

We are interested in what people eat. The questions below will ask you about how often and how much you eat certain types of foods.

1. Do you eat more than one kind of fruit each day?

O No
O Yes, sometimes
O Yes, often
O Yes, always

2. How many servings of fruits do you eat each day? (This could be half or whole servings)



____________servings

3. Do you eat fruits or vegetables as snacks?

O No
O Yes, sometimes
O Yes, often
O Yes, always

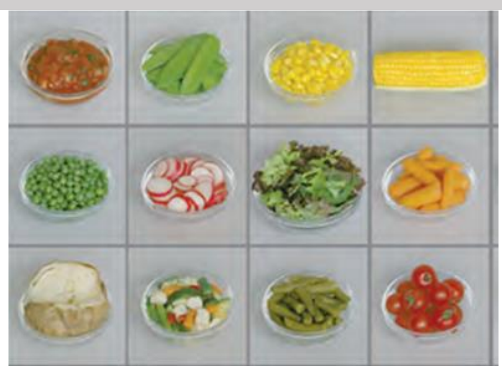
4. Do you eat more than one kind of vegetable each day?

O No
O Yes, sometimes
O Yes, often
O Yes, always

5. Do you eat 2 or more vegetables at your main meal?

O No
O Yes, sometimes
O Yes, often
O Yes, always

6. How many servings of vegetables do you eat each day? (This could be half or whole servings)



____________servings

7. Do you drink fruit drinks, sport drinks or punch?

O No
O Yes, sometimes
O Yes, often
O Yes, always

8. Do you drink regular soda?

O No
O Yes, sometimes
O Yes, often
O Yes, always

9. Do you eat cake, candy, ice cream, or other sweets or desserts?

O No
O Yes, sometimes
O Yes, often
O Yes, always

10. Do you eat chips, puffs, or other salty snacks?

O No
O Yes, sometimes
O Yes, often
O Yes, always

11. Do you eat fast foods from fast food restaurants such as Pizza Hut, McDonalds, or Taco bell?

O No
O Yes, sometimes
O Yes, often
O Yes, always

12. Do you use this label when food shopping?

O No
O Yes, sometimes
O Yes, often
O Yes, always

Part 7. Your Physical Activity

Considering a **7-day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write in each circle the appropriate number)?

	TIMES PER WEEK
a) **STRENUOUS EXERCISE (HEART BEATS RAPIDLY)** (i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)	◯
b) **MODERATE EXERCISE** **(NOT EXHAUSTING)** (i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	◯
c) **MILD EXERCISE** **(MINIMAL EFFORT)** (i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)	◯

2. Considering a **7-day period** (a week), during your **leisure time**, how often do you engage in any regular activity long enough to **work up a sweat** (heart beats rapidly)?

OFTEN	SOMETIMES	NEVER/RARELY
1. ❒	2. ❒	3. ❒

Part 8. Your Screen Time

In your free time on an average WEEKDAY (ONE day from Monday to Friday),

how many hours do you spend doing the following activities?	0 hr	0.5 hr	1 hr	2 hr	3hr	4 hr	5+ hr
1. Watching TV/DVDs/Videos							
2. Using a computer (not for work)							
3. Playing electronic games while sitting							
4. Using smartphones or tablets							

In your free time on an average WEEKEND day (Saturday or Sunday),

how many hours do you spend doing the following activities?	0 hr	0.5 hr	1 hr	2 hr	3 hr	4 hr	5+ hr
1. Watching TV/DVDs/Videos							
2. Using a computer (not for work)							
3. Playing electronic games while sitting							
4. Using smartphones or tablets							

Please circle the answer that best applies to you and the neighborhood where you lived for the majority of the past year.

	strongly disagree	somewhat disagree	somewhat agree	strongly agree
1. The crime rate in my neighborhood makes it unsafe to go on walks during the day.	1	2	3	4
2. The crime rate in my neighborhood makes it unsafe to go on walks at night	1	2	3	4

Part 11. About You and Your Family

This part asks some basic information about you, your child and your family.

1. Your sex:	2. How old are you?
O Male O Female O Other	___________years old

3. How many years have you lived in the U.S?
_______________years O I born in the U.S. If you were not born in the U.S., what is your country of birth? ___________________________

4. What is your highest level of formal education? (mark only one)	5. What is your current employment status? (mark only one)
O I didn't go to school O Primary school O Middle school O High school O GED O Some college or technical school O Bachelor's degree O Advanced degree	O Student O Self-employed O Unemployed O Employed part-time O Employed full-time O Homemaker O Retired

6. What is your current marital status? (mark only one)	7. What is your annual household income? (mark only one)
O Single O Married O Separated O Divorced O Widowed O Living with a partner	O Under $15,000 O $15,000 to $24,999 O $25,000 to $34,999 O $35,000 to $49,999 O $50,000 to $74,999 O $75,000 to $99,999

8. How many children under the age of 18 live in your household?
_____________ child(ren)

9. How many adults including yourself live in your household?
_____________ adults

10. What languages are used in your household?

- O Native language only (Spanish or any language other than English)
- O More native language than English
- O Almost equal amount of native language and English
- O More English than native language
- O English only

11. Do you or anyone in your household participate in any of these programs? (mark all that apply)

- O WIC
- O SNAP (Supplemental Nutrition Assistance Program)
- O Free or reduced price foods at school
- O Minnesota Family Investment Program (also known as Cash Assistance)
- O None
- O I don't know

The next two statements are about the food eaten in your household and whether you were able to afford the food you need.

12. Within the past 12 months, we worried about whether our food would run out before we got money to buy more.

- O Often true
- O Sometimes true
- O Never true

13. Within the past 12 months, the food we bought just didn't last and we didn't have money to get more.

- O Often true
- O Sometimes true
- O Never true

In the past year, did you or anyone in your household participate in any classes, training, or other group activities for becoming a better parent?

- O Yes
- O No
- O I don't know

14. Have you or anyone in your household ever attended any of the following nutrition classes?

- O SNAP (Supplemental Nutrition Assistance Program (Food Stamps) education
- O EFNEP (Expanded Food and Nutrition Education Program)
- O WIC
- O Cooking Matters
- O Extension, community education or school nutrition course
- O Any other nutrition and/or fitness classes, please specify ________________
- O I have not attended any such classes
- O I don't know

The following questions are about the child who is participating in this program. Please only think about this child when you answer these questions.
15. What is your relationship to the child participating in this study?
O Father O Mother O Grandfather O Grandmother O Uncle O Aunt O Sibling O Guardian male O Guardian female O Other, please specify ___________________

16. How concerned are you about your child's current weight as an adolescent?	17. How concerned are you about your child's future weight as an adult?
O Not concerned at all O A little concerned O Quite concerned O Very concerned	O Not concerned at all O A little concerned O Quite concerned O Very concerned

This is the end. Thank you very much for taking this survey!☺

Appendix D. Adolescent survey

Padres Preparados, Jóvenes Saludables
Prepared Parents, Healthy Youth

Youth Survey

Youth ID: ____________________

Date: ________________________

Hey there!
Thanks for taking this survey! Keep in mind that this is NOT a test. There are no right or wrong answers. Just choose the answers that are best for you. If you have any questions, please let us know!

How does it work?

- *Use a pencil*
- *Erase your changes completely.*
- *ONE answer to each question.*
- *DO NOT leave any questions unanswered. If you do not know or remember, give your best guess.*

Fruits are apples, bananas, oranges, pears, grapes, and more. They can be fresh, cut-up, canned or dried.

1. How many times in a day do you think your FATHER wants you to eat fruits?
O 0 times O 1 time O 2 times O 3 times or more O I don't know

How many times in a week	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. do you see your FATHER eating fruits?	1	2	3	4	5
3. does your FATHER eat fruits with you?	1	2	3	4	5

How often does your FATHER …	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you to eat fruit like he does?	1	2	3	4	5
5. tell you that he likes fruit?	1	2	3	4	5
6. buy fruits for you to eat?	1	2	3	4	5
7. prepare fruits for you to eat?	1	2	3	4	5
8. ask your MOTHER to buy fruits for you to eat?	1	2	3	4	5
9. make sure you have different kinds of fruits to choose from?	1	2	3	4	5

Vegetables are carrots, tomatoes, celery, lettuce, beans, broccoli, and more. They can be fresh, cup-up, canned, or cooked.

1. How many times in a day do you think your FATHER wants you to eat vegetables?
O 0 times O 1 time O 2 times O 3 times or more O I don't know

How many times in a week	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. do you see your FATHER eating vegetables?	1	2	3	4	5
3. does your FATHER eat vegetables with you?	1	2	3	4	5

How often does your FATHER…	**Almost never or never**	**Not often**	**Sometim es**	**Often**	**Almost always or always**
4. tell you to eat vegetable like he does?	1	2	3	4	5
5. tell you that he likes vegetable?	1	2	3	4	5
6. buy vegetables for you to eat?	1	2	3	4	5
7. prepare vegetables for you to eat?	1	2	3	4	5
8. ask your MOTHER to buy vegetables for you to eat?	1	2	3	4	5
9. make sure you have different kinds of vegetables to choose from?	1	2	3	4	5

Sugary drinks are regular sodas, fruit drinks, iced teas, sport drinks, and more.

1. How often does your FATHER allow you to drink sugary drinks?
O No sugary drinks are allowed O Less than 1 time in a week O 1-3 times in a week O 4-6 times in a week O 1 time or more in a day O As often as I want O I don't know.

How many times in a week …	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. do you see your FATHER drinking sugary drinks?	1	2	3	4	5
3. does your FATHER drink sugary drinks with you?	1	2	3	4	5

How often does your father …	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you not to drink sugary drinks like he does not drink them?	1	2	3	4	5
5. tell you that he does not want to drink sugary drinks?	1	2	3	4	5
6. buy sugary drinks for you to drink?	1	2	3	4	5
7. prepare sugary drinks for you to drink?	1	2	3	4	5
8. give you money to buy sugary drinks?	1	2	3	4	5
9. keep sugary drinks out of your reach?	1	2	3	4	5
10. reward or treat you with sugary drinks	1	2	3	4	5

Sweets are candies, cookies, cakes, ice cream, pastry, and more.
Salty snacks are potato chips, corn chips, Cheetos, Takis and more.

1. How often does your FATHER allow you to eat sweets and/or salty snacks?
O No sweets and/or salty snacks are allowed O Less than 1 time in a week O 1-3 times in a week O 4-6 times in a week O 1 or more times in a day O As often as I want O I don't know.

How many times in a week …	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. <u>do you see</u> your FATHER eating sweets and/or salty snacks?	1	2	3	4	5
3. does your FATHER eat sweets and/or salty snacks with you?	1	2	3	4	5

How often does your FATHER…	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you not to eat sweets and/or salty snacks like he does not eat them?	1	2	3	4	5
5. tell you that he does not want to eat sweets and/or salty snacks?	1	2	3	4	5
6. buy sweets and/or salty snacks for you to eat?	1	2	3	4	5
7. prepare sweets and/or salty snacks for you to eat?	1	2	3	4	5
8. give you money to buy sweets and/or salty snacks?	1	2	3	4	5
9. keep sweets and/or salty snacks out of your reach?	1	2	3	4	5
10. reward or treat you with sweets and/or salty snacks?	1	2	3	4	5

Fast foods are foods bought from fast food restaurants like McDonald's or convenient foods like frozen pizzas.

1. How often does your FATHER allow you to eat fast food?
O No fast food is allowed O Less than 1 time in a week O 1-3 times in a week O 4-6 times in a week O 1 or more times in a day O As often as I want O I don't know.

How many times in a week …	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. do you see your FATHER eating fast food?	1	2	3	4	5
3. does your FATHER eat fast food with you?	1	2	3	4	5

How often does your FATHER…	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you not to eat fast food like he does not eat fast food?	1	2	3	4	5
5. tell you that he does not want to eat fast food?	1	2	3	4	5
6. buy fast food for you to eat?	1	2	3	4	5
7. prepare fast food for you to eat?	1	2	3	4	5
8. give you money to buy fast food?	1	2	3	4	5
9. reward or treat you with fast food?	1	2	3	4	5

Physical activity includes exercise, sports, active games, and more.
Being physically active means your body moves and your heart beats faster.

1. How many hours in a day do you think your father wants you to be physically active?
O 0 minutes O 30 minutes or less O 30 minutes to 1 hour O 1 hour to 2 hours O 2 hours or more O I don't know

	Not active at all	**Not very active**	**Neither**	**Active**	**Very active**
2. How active is your FATHER?	1	2	3	4	5

	Almost never or never	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
3. How many times in a week is your FATHER physically active with you?	1	2	3	4	5

How often does your FATHER…	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you to be physically active like he is?	1	2	3	4	5
5. tell you that he likes being physically active?	1	2	3	4	5
6. take you to a place where you can be physically active?	1	2	3	4	5
7. send you outside to be physically active when the weather is nice?	1	2	3	4	5
8. provide opportunities for you to be physically active?	1	2	3	4	5

Screen time includes watching TV, playing video games, using smartphones, and more.

1. How much screen time does your FATHER allow you to have in a day?
O No screen time is allowed O 30 minutes or less O 30 minutes to 1 hour O 1 hour to 2 hours O 2 hours or more O As much as I want O I don't know.

How many times in a week…	**Almost never or never**	**Less than 1 time in a week**	**1-3 times in a week**	**4-6 times in a week**	**Once a day or more**
2. do you see your father having screen time?	1	2	3	4	5
3. does your father have screen time together with you?	1	2	3	4	5

How often does your FATHER	**Almost never or never**	**Not often**	**Sometimes**	**Often**	**Almost always or always**
4. tell you not to have screen time like he does not have screen time?	1	2	3	4	5
5. tell you that he does not want to have screen time?	1	2	3	4	5
6. provide you with screen time opportunities? (Examples are giving you a smartphone, tablet or computer to play, allowing you to use TV or video game)	1	2	3	4	5
7. reward you with screen time?	1	2	3	4	5
8. take away screen time to control your behavior?	1	2	3	4	5

1. During the past 7 days, how many times did you and your FATHER eat a meal together?
O Never O 1 to 2 times O 3 to 4 times O 5 to 6 times O 7 times O More than 7 times

2. During the past 7 days, how many times did you eat a meal with all or most of your FAMILY?
O Never O 1 to 2 times O 3 to 4 times O 5 to 6 times O 7 times O More than 7 times

How often does your FATHER…	Almost never or never	Not often	Sometimes	Often	Almost always or always
1. plan meals together with you?	1	2	3	4	5
2. buy foods together with you?	1	2	3	4	5
3. prepare foods together with you?	1	2	3	4	5

In a usual week, how many hours do you spend doing the following activities?

1. Vigorous exercise (heart beats rapidly) each week	
O None O Less than 30 minutes O 30 minutes-2 hours O 2 1/2-4 hours O 4 1/2-6 hours O 6+ hours	Examples: soccer, aerobic dancing, running, swimming laps, basketball, biking fast, tennis, skating, cross-country skiing
2. Moderate exercise (not difficult) each week	
O None O Less than 30 minutes O 30 minutes-2 hours O 2 1/2-4 hours O 4 1/2-6 hours O 6+ hours	Examples: walking quickly, baseball, gymnastics, easy bicycling, volleyball, skiing, snowboarding…
3. Mild exercise (little effort) each week	
O None O Less than 30 minutes O 30 minutes-2 hours O 2 1/2-4 hours O 4 1/2-6 hours O 6+ hours	Examples: walking slowly (to school, to friend's house, etc.), light house chores

In your free time <u>on an average WEEKDAY</u> (ONE day from Monday to Friday),

how many hours do you spend doing the following activities?	**0 hr**	**0.5 hr**	**1 hr**	**2 hr**	**3hr**	**4 hr**	**5+ hr**
5. Watching TV/DVDs/Videos							
6. Using a computer (not for homework)							
7. Playing electronic games while sitting							
8. Using smartphones or tablets							

In your free time <u>on an average WEEKEND day</u> (Saturday or Sunday),

how many hours do you spend doing the following activities?	**0 hr**	**0.5 hr**	**1 hr**	**2 hr**	**3 hr**	**4 hr**	**5+ hr**
5. Watching TV/DVDs/Videos							
6. Using a computer (not for homework)							
7. Playing electronic games while sitting							
8. Using smartphones or tablets							

This is the END. You did it! Thanks a lot! ☺

Appendix E. SAS Codes for Statistical Analysis in Chapter 3

Father Energy Balance Related Behaviors

```
***********************************************************************
**;
***********************************************************************
**;
******Program to evaluate Pre Post changes in father EBRB outcomes
*******;
*********Limit this analysis to sample fc_pre_dyad_cpost_pp = 1
*********;
************Includes Father Child Pre dyads and father post data
*********;
***********Keep analysis variables and rename for Post
******************;
***********to compare Pre-Post demographics
*****************************;
***********Use long form for Mixed models to account for site clusters
**;
***********************************************************************
**;
***********cf_EBRB_father.sas
*************************************************;

PROC IMPORT OUT= WORK.fc_long
            DATAFILE=  "C:\Users\balta026\Desktop\New
analysis\fc_prepost_long_112020.xlsx"
            DBMS= xlsx replace;
     GETNAMES=YES;
      *guessingrows = 200;
RUN;

proc contents data= fc_long order = varnum;
run;

****some data checks *********************;
proc freq data = fc_long;
where pre_post = 1;
table ffb2 ffb6 ffb7-ffb12 fpa1-fpa3 fswk1 - fswk4 fswd1 - fswd4;
run;

proc freq data = fc_long;
where pre_post = 2;
table ffb2 ffb6 ffb7-ffb12 fpa1-fpa3 fswk1 - fswk4 fswd1 - fswd4;
run;

proc freq data = fc_long;
table ffb2 ffb6 ffb7-ffb12 fpa1-fpa3 fswk1 - fswk4 fswd1 - fswd4;
run;

proc univariate data=fc_long;
var fpa1-fpa3;
run;
```

```
proc univariate data=fc_long;
where pre_post = 1;
var ffb2 ffb6;
run;

proc univariate data=fc_long;
where pre_post = 2;
var ffb2 ffb6;
run;

proc freq data = fc_long;
where pre_post = 1;
tables (frandom crandom fc_pre_dyad)*fgroup/chisq exact;
title 'Baseline father/child dyads by site';
run;
proc freq data = fc_long;
where pre_post = 1;
tables (frandom crandom fc_pre_dyad)*fsite/chisq exact;
title 'Baseline father/child dyads by site';
run;

proc freq data = fc_long;
where pre_post = 1;
tables (fc_pre_dyad)*fgroup*fattend/chisq exact;
title 'Baseline father/child dyads by group';
run;

proc freq data = fc_long;
where pre_post = 1 and fattend >=1;
tables (father_pre_post)*fgroup*fattend/chisq exact;
title 'Baseline father/child dyads by group';
run;

proc freq data=fc_long;
where pre_post = 1;
tables ffb2 ffb6;
title 'Father fruit and vegetable intake- BASELINE ';
run;

proc freq data=fc_long;
where pre_post = 2;
tables ffb2 ffb6;
title 'Father fruit and vegetable intake- POST ';
run;

proc freq data = fc_long;
where pre_post = 2;
table ffb2 ffb6 ffb7-ffb12 fpa1-fpa3 fswk1 - fswk4 fswd1 - fswd4;
run;

proc freq data= fc_long;
tables pre_post*(fattend);
run;

proc freq data = fc_long;
where pre_post = 1;
```

```
tables fattend;
run;

proc freq data=fc_long;
where fc_pre_dyad = 1 and pre_post=1;
tables fgroup;
title 'Father group- BASELINE ';
run;

proc format;
value age_c 0 = '8 - 12' 1= '>= 13';
value sex 1= 'Male' 2 = 'Female';
value age_f 0 = '21-40' 1 = '>40';
value inc 1 = '<$25K' 2 = '$25K -<$50K' 3 = '>= 50K';
value secure 0 = 'No food insecurity' 1 = 'food insecure';
value educ 1 = 'Middle school or less' 2 = 'HS grad or GRE'
             3 = 'College or Technical school';
value yrs_us 0 = '<10' 1 = '10 - <20' 2 = '20-<30' 3 = '>= 30';
value lang 0 = 'More Span than Eng' 1 = 'Equal Span & Eng' 2 = 'More
English';
value acc 1 = 'Low: 0-1' 2 = 'Moderate: 2' 3= 'High: 3-5';
value mar 1 = 'Married' 2 = 'Living with Partner' 3 =
'single/widow/divorced/separated';
value emp 1 = 'self-employed' 2 = 'unemployed/homemaker' 3 = 'PT' 4 =
'FT';
value safe 1 = 'safe n-hood' 2 = 'Unsafe n-hood';
value assist 0 = 'no financial assistance' 1 = 'Any assistance';
value bmi_f 1 = '< 18.5 Underwt' 2 = '18.5 - <25 Normal' 3 = '25 - <30
Overwt' 4 = '>= 30 Obese';
value bmi_c 1 = '<5%tile underwt' 2= '5-<85%tile Normal' 3 = '85-
95%tile Overwt' 4 = '>=95%tile Obese';
run;

*Demographics comparisons between father who completed both pre and
post tests and those who only completed pre test (dropouts);
proc freq data = fc_long;
where pre_post=1;
tables father_post;
title 'comparisons of fathers who completed both vs dropouts';
run;

proc freq data = fc_long;
where pre_post=1;
tables father_post* frandom;
run;

proc freq data = fc_long;
where pre_post=1;
tables (father_post fattend)* fgroup;
run;

proc freq data = fc_long;
where fgroup='C' and pre_post=1;
tables father_post*fattend;
run;

proc freq data = fc_long;
```

```
where father_post= 1;
tables fgroup* fattend;
run;

proc freq data = fc_long;
where pre_post=1;
tables (csex fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc)*father_post/chisq exact;
title 'Demographics comparisons of fathers who completed both vs
dropouts';
run;
proc ttest data =fc_long plots = none;
where pre_post=1;
class father_post;
var cage fage fbmi fch fad n_hh;
run;

******create a pre dataset and rename variables
********************************;
data pre_intake;
set fc_long;
where pre_post = 1;
ffb1_pre = ffb1;
ffb2_pre = ffb2;
ffb3_pre = ffb3;
ffb4_pre = ffb4;
ffb5_pre = ffb5;
ffb6_pre = ffb6;
ffb7_pre = ffb7;
ffb8_pre = ffb8;
ffb9_pre = ffb9;
ffb10_pre = ffb10;
ffb11_pre = ffb11;
ffb12_pre = ffb12;
fpa1_pre = fpa1;
fpa2_pre = fpa2;
fpa3_pre = fpa3;
fswk1_pre = fswk1;
fswk2_pre = fswk2;
fswk3_pre = fswk3;
fswk4_pre = fswk4;
fswd1_pre = fswd1;
fswd2_pre = fswd2;
fswd3_pre = fswd3;
fswd4_pre = fswd4;
fbmi_pre= fbmi;
fbmigrp_pre=fbmigrp;
fwt_kg_pre = fwt_kg;
fht_m_pre = fht_m;
fvgsc_pre =fvgsc;
ffm1_pre = ffm1;
ffm2_pre = ffm2;
fin1_pre = fin1;
fin2_pre = fin2;
fin3_pre = fin3;
finc_pre = finc;
```

```
keep famid fid cgroup fgroup fsite frandom totalsessions mattend
menroll fattend father_pre f_pre_pp father_post father_pre f_pre_pp
f_post_pp
pre_post father_pre_post father_pre_post_pp fc_pre_dyad fc_pre_dyad_pp
fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp fage fagec cage cagec cage_elig
csex fincc ffs feduc fusc flanc
fmarc fempc fnsc ffinc fre fch fad ffm1_pre ffm2_pre fin1_pre fin2_pre
fin3_pre finc_pre
fus fcob flan ffin n_hh fattend fbda ffb1_pre ffb2_pre ffb3_pre
ffb4_pre ffb5_pre ffb6_pre ffb7_pre ffb8_pre ffb9_pre ffb10_pre
ffb11_pre ffb12_pre
fpa1_pre fpa2_pre fpa3_pre fswk1_pre fswk2_pre fswk3_pre fswk4_pre
fswd1_pre fswd2_pre
fswd3_pre fswd4_pre fbmi_pre fbmigrp_pre fwt_kg_pre fht_m_pre
fvgsc_pre;
format fbmigrp_pre bmi_f. fbda mmddyy10. ;

*define outliners for baseline by [mean+1.5*IQR] for intakes;
if ffb2_pre>5.25 then ffb2_pre=5.25;
if ffb6_pre>6.0 then ffb6_pre=6.0;

*define outliners by >1.5 IQR for physical activity and recode them;
if fpa3_pre>5.0 then fpa3_pre=5.0;
if fpa2_pre>6.0 then fpa2_pre=6.0;
if fpa1_pre>6.0 then fpa1_pre=6.0;
run;

proc freq data = pre_intake;
table fpa1_pre fpa2_pre fpa3_pre ffb2_pre ffb6_pre;
run;

proc contents data = pre_intake;
run;

******create a post dataset and rename variables
********************************;
data post_intake;
set fc_long;
where pre_post = 2;
ffb1_post = ffb1;
ffb2_post = ffb2;
ffb3_post = ffb3;
ffb4_post = ffb4;
ffb5_post = ffb5;
ffb6_post = ffb6;
ffb7_post = ffb7;
ffb8_post = ffb8;
ffb9_post = ffb9;
ffb10_post = ffb10;
ffb11_post = ffb11;
ffb12_post = ffb12;
fpa1_post = fpa1;
fpa2_post = fpa2;
fpa3_post = fpa3;
fswk1_post = fswk1;
fswk2_post = fswk2;
```

```
fswk3_post = fswk3;
fswk4_post = fswk4;
fswd1_post = fswd1;
fswd2_post = fswd2;
fswd3_post = fswd3;
fswd4_post = fswd4;
fbmi_post= fbmi;
fbmigrp_post=fbmigrp;
fwt_kg_post = fwt_kg;
fht_m_post = fht_m;
fvgsc_post =fvgsc;
ffm1_post = ffm1;
ffm2_post = ffm2;
fin1_post = fin1;
fin2_post = fin2;
fin3_post = fin3;
finc_post = finc;

keep famid fid cgroup fgroup fsite frandom totalsessions mattend
menroll fattend father_pre f_pre_pp father_post father_pre f_pre_pp
f_post_pp
pre_post father_pre_post father_pre_post_pp fc_pre_dyad fc_pre_dyad_pp
fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp fage fagec cage cagec cage_elig
csex fre
fincc ffs feduc fusc flanc ffm1_post ffm2_post fin1_post fin2_post
fin3_post finc_post
fmarc fempc fnsc ffinc fch fad ffm2 finc fus fcob flan ffin n_hh
fattend cgroup fbda ffb1_post ffb2_post ffb3_post ffb4_post ffb5_post
ffb6_post ffb7_post ffb8_post ffb9_post ffb10_post ffb11_post
ffb12_post
fpa1_post fpa2_post fpa3_post fswk1_post fswk2_post fswk3_post
fswk4_post fswd1_post fswd2_post
fswd3_post fswd4_post fbmi_post fbmigrp_post fwt_kg_post fht_m_post
fvgsc_post;
format fbmigrp_post bmi_f. fbda mmddyy10.;

*define outliners for baseline by [mean+1.5*IQR] for intakes;
if ffb2_post>4.5 then ffb2_post=4.5;
if ffb6_post>4.5 then ffb6_post=4.5;

*define outliners by >1.5 IQR for physical activity and recode them;
if fpa3_post>6.0 then fpa3_post=6.0;
if fpa2_post>8.5 then fpa2_post=8.5;
if fpa1_post>6.0 then fpa1_post=6.0;
run;

proc freq data = post_intake;
table fpa1_post fpa2_post fpa3_post ffb2_post ffb6_post;
run;

proc contents data = post_intake;
run;
proc sort data = pre_intake;
by famid;
run;
```

```
proc sort data = post_intake;
by famid;
run;

data pre_post_intake;
merge post_intake pre_intake;
by famid;
run;

data fc_longb;
set pre_post_intake;
*create sum score of each food categories for pre;
ffi_pre=ffb2_pre; *daily fruit intake frequencies;
fvi_pre=ffb6_pre; *daily vegetable intake frequencies;
fdi_pre1=(ffb7_pre+ffb8_pre)/2; *daily sugary drink intake frequencies;
fsiswt_pre=ffb9_pre; *daily sweets intake frequencies;
fsisnk_pre=ffb10_pre; *daily salty snack intake frequencies;
fsi_pre1=(fsiswt_pre+fsisnk_pre)/2; *daily sweets/salty snack intake
frequencies;
fffi_pre1=ffb11_pre; *daily fast food intake frequencies;
******create imputed screen time for those missing 1 - 2 of 8
items*****;
*****add this to cf_pre_post.SAS code
***********************************;
fswk_imp_pre= sum(fswk1_pre,fswk2_pre,fswk3_pre,fswk4_pre); *screen
time hours on a typical weekday;
fswd_imp_pre= sum(fswd1_pre,fswd2_pre,fswd3_pre,fswd4_pre); *screen
time hours on a typical weekend day;
fsw_imp_pre= sum(fswk_imp_pre*5,fswd_imp_pre*2); *weekly screen time
hours;
fstd_imp_pre = fsw_imp_pre/7;
if fstd_imp_pre > 10 then fstd_imp_pre = 10;
******create weekly physical activity*****;
fmildpa_pre = fpa3_pre; *Father weekly mild PA;
fmpa_pre= fpa2_pre; *Father weekly moderate PA;
fvpa_pre = fpa1_pre; *Father weekly vigorous PA;
fpa_pre= sum(fmildpa_pre,fmpa_pre,fvpa_pre); *weekly mild, moderate-to-
vigorous physical activity times;
fmvpa_pre = sum(fmpa_pre,fvpa_pre); *weekly moderate-to-vigorous
physical activity times;

*create sum score of each food categories for post;
ffi_post=ffb2_post; *daily fruit intake frequencies;
fvi_post=ffb6_post; *daily vegetable intake frequencies;
fdi_post1=(ffb7_post+ffb8_post)/2; *daily sugary drink intake
frequencies;
fsiswt_post=ffb9_post; *daily sweets intake frequencies;
fsisnk_post=ffb10_post; *daily salty snack intake frequencies;
fsi_post1=(fsiswt_post+fsisnk_post)/2; *daily sweets/salty snack intake
frequencies;
fffi_post1=ffb11_post; *daily fast food intake frequencies;
******create imputed screen time for those missing 1 - 2 of 8
items*****;
*****add this to cf_pre_post.SAS code
***********************************;
fswk_imp_post= sum(fswk1_post,fswk2_post,fswk3_post,fswk4_post);
*screen time hours on a typical weekday;
```

```
fswd_imp_post= sum(fswd1_post,fswd2_post,fswd3_post,fswd4_post);
*screen time hours on a typical weekend day;
fsw_imp_post= sum(fswk_imp_post*5,fswd_imp_post*2); *weekly screen time
hours;
fstd_imp_post = fsw_imp_post/7; *daily screen time;
if fstd_imp_post > 10 then fstd_imp_post = 10;
******create weekly physical activity*****;
fmildpa_post = fpa3_post; *Father weekly mild PA;
fmpa_post= fpa2_post; *Father weekly moderate PA;
fvpa_post = fpa1_post; *Father weekly vigorous PA;
fpa_post= sum(fmildpa_post,fmpa_post,fvpa_post); *weekly mild,
moderate-to-vigorous physical activity times;
fmvpa_post = sum(fmpa_post,fvpa_post); *weekly moderate-to-vigorous
physical activity times;


******create father intervention dose variable
**************************************************;
******code 1 to 3 so that it matches group values in proc mixed
lsmestimate statements************;
f_int_dose = .;
if fattend = 0 then f_int_dose = 1;
if (1<= fattend <= 6) then f_int_dose = 2;
if (7 <= fattend <= 8) then f_int_dose = 3;
if fgroup = 'C' then f_int_dose = 1;

m_inv = .;
if mattend = 0 or mattend = . then m_inv = 0;
if mattend >= 1 then m_inv = 1;
if fgroup = 'C' then m_inv = 0;
*******create a variable to account for mother involvement in Int group
********;
m_grp = .;
if m_inv = 0 then m_grp = 0;
if m_inv = 0 and fgroup = 'I' then m_grp = 1;
if m_inv = 1 and fgroup = 'I' then m_grp = 2;
*******create a combined dose effect variable that includes mother
involvement*****;

run;

proc freq data= fc_longb;
tables fmildpa_pre fmpa_pre fvpa_pre fpa_pre fmvpa_pre;
title 'Father physical activity- BASELINE';
run;

proc freq data= fc_longb;
tables fmildpa_post fmpa_post fvpa_post fpa_post fmvpa_post;
title 'Father physical activity- POST';
run;

proc univariate data= fc_longb;
var fmildpa_pre fmpa_pre fvpa_pre fpa_pre fmvpa_pre;
run;

proc univariate data= fc_longb;
var fmildpa_post fmpa_post fvpa_post fpa_post fmvpa_post;
```

```
run;

proc means data = fc_longb n mean stddev median q1 q3 min max maxdec
=3;
var fmildpa_pre fmpa_pre fvpa_pre fpa_pre fmvpa_pre;
run;

proc means data = fc_longb n mean stddev median q1 q3 min max maxdec
=3;
var fmildpa_post fmpa_post fvpa_post fpa_post fmvpa_post ;
run;

proc freq data= fc_longb;
tables  fdi_pre1 fsi_pre1 fffi_pre1;
run;
proc freq data= fc_longb;
tables fdi_post1 fsi_post1 fffi_post1;
run;

proc freq data= fc_longb;
tables ffi_pre fvi_pre;
run;
proc freq data= fc_longb;
tables ffi_post fvi_post;
run;

proc freq data= fc_longb;
tables f_int_dose f_int_dose*fattend;
run;

proc freq data= fc_longb;
tables f_int_dose*fgroup;
run;

proc contents data = fc_longb;
run;

*******keep analysis data set and variables for analysis
*****************;
data fc_var;
set fc_longb;
label
 pre_post = 'Pre Post indicator'
 cagec = 'Child age group'
 csex = 'Child sex'
 fagec = 'Father age group'
 fincc = 'Father income group'
 ffs = 'Food security (from 2 questions)'
 feduc = 'Father education group'
 fusc = 'Father years in US'
 flanc = 'Father language group'
 fmarc = 'Father marital status'
 fempc = 'Father employment group'
 fnsc = 'Neighborhood safety (from 2 questions)'
 ffinc = 'Financial assistance'
 fbmigrp_pre = 'Father weight group for pre'
 ffb1_pre = 'eat more than one kind of fruit daily for pre'
```

```
 ffb3_pre = 'eat fruits or vegetbales as a snack for pre'
 ffb4_pre = 'eat more than one kind of vegetables daily for pre'
 ffb5_pre = 'eat two or more vegetables at main meal for pre'
 ffi_pre= 'Father fruit intake for pre'
 fvi_pre= 'Father vegetable intake for pre'
 fdi_pre1= 'Father SSB intake for pre'
 fsi_pre1= 'Father sweets/salty snack intake for pre'
 fffi_pre1= 'Father fast food intake for pre'
 ffb12_pre = 'father using food labels for pre'
 fvpa_pre = 'Father weekly vigorous PA for pre'
 fmpa_pre = 'Father weekly moderate PA for pre'
 fmildpa_pre = 'Father weekly mild PA for pre'
 fmvpa_pre = 'Father weekly mod/vigorous PA for pre'
 fpa_pre ='Father weekly PA: mild, mod, vigorous for pre'
 fsw_imp_pre = 'father screen time weekly for pre'
 fstd_imp_pre = 'father daily screentime topcoded at 10 hrs for pre'
 fbmi_pre = 'Father BMI for pre'
 fvgsc_pre = 'Father veggie meter score for pre'
 fbmigrp_post = 'Father weight group for post'
 ffb1_post = 'eat more than one kind of fruit daily for post'
 ffb3_post = 'eat fruits or vegetbales as a snack for post'
 ffb4_post = 'eat more than one kind of vegetables daily for post'
 ffb5_post = 'eat two or more vegetables at main meal for post'
 ffi_post= 'Father fruit intake for post'
 fvi_post= 'Father vegetable intake for post'
 fdi_post1= 'Father SSB intake for post'
 fsi_post1= 'Father sweets/salty snack intake for post'
 fffi_post1= 'Father fast food intake for post'
 ffb12_post = 'father using food labels for post'
 fvpa_post = 'Father weekly vigorous PA for post'
 fmpa_post = 'Father weekly moderate PA for post'
 fmildpa_post = 'Father weekly mild PA for post'
 fmvpa_post = 'Father weekly mod/vigorous PA for post'
 fpa_post ='Father weekly PA: mild, mod, vigorous for post'
 fsw_imp_post = 'father screen time weekly for post'
 fstd_imp_post = 'father daily screentime topcoded at 10 hrs for post'
 fbmi_post = 'Father BMI for post'
 fvgsc_post = 'Father veggie meter score for post'
 ffm1_pre = 'family meal for pre'
 ffm2_pre = 'meals with father for pre'
 finc_pre = 'father food/meal involvement for pre'
 ffm1_post = 'family meal for post'
 ffm2_post = 'meals with father post'
 finc_post = 'father food/meal involvement for post';

keep famid fid fsite frandom fgroup totalsessions fattend f_int_dose
mattend menroll m_inv m_grp
father_pre f_pre_pp father_post father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp
pre_post cage cagec cage_elig csex
fage fagec fre fch fad ffm1_pre ffm1_post ffm2_pre ffm2_post fin1_pre
fin1_post
fin2_pre fin2_post fin3_pre fin3_post finc_pre finc_post
fincc ffs feduc fus fcob fusc flan flanc
```

```
fmarc fempc fnsc ffin ffinc n_hh ffb1_pre ffb3_pre ffb4_pre ffb5_pre
ffi_pre fvi_pre fdi_pre1 fsi_pre1 fffi_pre1
ffb12_pre fvpa_pre fmpa_pre fmildpa_pre fmvpa_pre fpa_pre fsw_imp_pre
fstd_imp_pre fbmi_Pre fbmigrp_pre fvgsc_pre
ffb1_post ffb3_post ffb4_post ffb5_post ffi_post fvi_post fdi_post1
fsi_post1 fffi_post1 ffb12_post fvpa_post fmpa_post fmildpa_post
fmvpa_post fpa_post  fsw_imp_post fstd_imp_post
fbmi_post fbmigrp_post fbda fvgsc_post;
format cagec age_c. csex sex. fagec age_f. fincc inc. ffs secure. feduc
educ.
fusc yrs_us. flanc lang. fmarc mar. fempc emp. fnsc safe.
ffinc assist. fbmigrp_pre bmi_f. fbmigrp_post bmi_f.;
run;

*******set the dataset for this analysis
*****************************************;
data father_long;
********for primary PP analysis use this dataset
******************************;
set fc_var;
where father_pre_post = 1;
*******for sensitivity ITT (Intention to treat) analysis use this
dataset ***************************;
*where fc_pre_dyad_cpost = 1;
ffi_delta = ffi_post - ffi_pre;
fvi_delta = fvi_post - fvi_pre;
fvgsc_delta = fvgsc_post - fvgsc_pre;
fpa_delta = fpa_post - fpa_pre;
fmvpa_delta = fmvpa_post- fmvpa_pre;
fsw_imp_delta = fsw_imp_post -fsw_imp_pre;
fstd_imp_delta= fstd_imp_post - fstd_imp_pre;
fbmi_delta = fbmi_post - fbmi_pre;

 *****Create father SSB, snacks and fast food
variables***************;
fdi_pre= .;
if fdi_pre1 < 2 then fdi_pre = 0;
if fdi_pre1 >= 2 then fdi_pre = 1;

fsi_pre= .;
if fsi_pre1 < 2 then fsi_pre = 0;
if fsi_pre1 >= 2 then fsi_pre = 1;

fffi_pre= .;
if fffi_pre1 < 2 then fffi_pre = 0;
if fffi_pre1 >= 2 then fffi_pre = 1;

fdi_post= .;
if fdi_post1 < 2 then fdi_post = 0;
if fdi_post1 >= 2 then fdi_post = 1;

fsi_post= .;
if fsi_post1 < 2 then fsi_post = 0;
if fsi_post1 >= 2 then fsi_post = 1;

fffi_post= .;
if fffi_post1 < 2 then fffi_post = 0;
```

```
if fffi_post1 >= 2 then fffi_post = 1;

fbmigrp_precat= .;
if fbmigrp_pre = 2 or fbmigrp_pre = 3 then fbmigrp_precat = 0;
if fbmigrp_pre = 4 then fbmigrp_precat = 1;

run;

proc freq data= father_long;
tables fbmigrp_precat fbmigrp_pre fffi_post fffi_post1;
run;

proc print data= father_long;
run;

proc contents data= father_long;
run;

proc print data= father_long;
run;

proc freq data= father_long;
tables  fdi_pre1 fsi_pre1 fffi_pre1;
run;

proc freq data= father_long;
tables fdi_post1 fsi_post1 fffi_post1;
run;

proc freq data= father_long;
tables  fdi_pre fsi_pre fffi_pre;
run;

proc freq data= father_long;
tables fdi_post fsi_post fffi_post;
run;

proc freq data= father_long;
where fgroup = 'I' ;
tables mattend fattend mattend*fattend m_inv m_grp;
run;
proc freq data= father_long;
tables mattend fattend mattend*fgroup;
run;

*******Table 1 descriptive statistics
*********************************************;
proc print data=father_long;
run;

proc freq data = father_long;
tables fsite  frandom*fgroup cage ffm1_pre ffm2_pre f_int_dose;
title 'Dataset description';
run;

proc means data= father_long n mean stddev median q1 q3 min max maxdec
= 2;
```

```
where fgroup = 'I';
var totalsessions mattend fattend f_int_dose;
run;
proc means data= father_long n mean stddev median q1 q3 min max maxdec
= 2;
where fgroup = 'C';
var totalsessions mattend fattend f_int_dose;
run;

proc freq data= father_long;
where fgroup = 'I';
tables totalsessions;
run;

proc freq data = father_long;
tables csex fincc fmarc feduc fempc fusc flanc
fbmigrp_pre ffinc ffs fnsc;
title 'Table 1 All';
run;

proc means data =father_long n mean stddev median Q1 Q3 min max maxdec
= 2;
var cage fage fch fad n_hh;
run;

proc freq data = father_long;
tables (csex fincc fmarc feduc fempc fusc flanc
fbmigrp_pre fbmigrp_precat ffinc ffs fnsc)*fgroup/chisq exact;
title 'Table 1 by group';
run;

proc means data= father_long n mean stddev median min max maxdec=2 ;
class fgroup;
var cage fage fch fad n_hh;
run;

proc ttest data =father_long plots = none;
class fgroup;
var cage fage fch fad n_hh;
run;

proc npar1way wilcoxon;
class fgroup;
var cage fage fch fad n_hh;
run;
*******Table 2 intake, PA, ST **********************************;

proc means data = father_long n mean stddev median q1 q3 min max maxdec
= 2;
var ffi_pre fvi_pre fpa_pre fmvpa_pre fstd_imp_pre fbmi_pre ;
title 'Table 2 for All';
run;

proc means data = father_long n mean stddev median Q1 Q3 min max maxdec
= 2;
class fgroup;
var ffi_pre fvi_pre fpa_pre fmvpa_pre fstd_imp_pre fbmi_pre;
```

```
title 'Table 2 by group';
run;

proc ttest data = father_long plots = none;
class fgroup;
var ffi_pre fvi_pre fpa_pre fmvpa_pre fstd_imp_pre fbmi_pre;
title 'Table 2 group comparisons';
run;

proc npar1way wilcoxon data = father_long;
class fgroup;
var ffi_pre fvi_pre fmildpa_pre fmpa_pre fvpa_pre fpa_pre fmvpa_pre
fsw_imp_pre fstd_imp_pre fbmi_pre;
title 'Table 2 group comparisons';
run;

proc freq data= father_long;
tables fdi_pre fsi_pre fffi_pre;
Title 'table 2 SSB, snack, fast food intake';
run;

proc freq data= father_long;
tables (fdi_pre fsi_pre fffi_pre)*fgroup/chisq;
Title 'table 2 pre SSB, snack, fast food intake by group';
run;

proc corr data = father_long;
var ffi_pre ffi_post fvi_pre fvi_post fdi_pre fdi_post fsi_pre fsi_post
fffi_pre fffi_post fvgsc_pre fvgsc_post
fpa_pre fpa_post fmvpa_pre fmvpa_post fsw_imp_pre fsw_imp_post
fstd_imp_pre fstd_imp_post fbmi_pre fbmi_post;
run;

proc freq data= father_long;
tables fid csex cage feduc fbmigrp_pre fbmigrp_precat fbmigrp_post
fsite;
run;

proc means data= father_long maxdec = 2;
var ffi_pre ffi_post fvi_pre fvi_post fdi_pre fdi_post fsi_pre fsi_post
fffi_pre fffi_post fvgsc_pre fvgsc_post
fpa_pre fpa_post fmvpa_pre fmvpa_post fsw_imp_pre fsw_imp_post
fstd_imp_pre fstd_imp_post fbmi_pre fbmi_post;
run;

proc means data = father_long;
var fbmi_post fbmi_pre fbmi_delta;
run;

proc print data= father_long;
where fbmi_delta = .;
var fbmi_pre fbmi_post ;
run;

Proc print data = father_long;
where fstd_imp_delta = .;
var fid fstd_imp_delta fstd_imp_post fstd_imp_pre;
```

```
run;

******Unadjusted paired and two sample t-tests
****************************;
proc means data= father_long n mean stddev median stderr t prt maxdec =
3;
var ffi_delta fvi_delta
fpa_delta fstd_imp_delta fbmi_delta;
title 'Paired t-tests for overall change in EBRB outcomes';
run;

proc means data= father_long n mean stddev median stderr t prt maxdec =
3;
class fgroup;
var ffi_delta fvi_delta
fpa_delta fstd_imp_delta fbmi_delta;
title 'Paired t-tests for change by group';
run;

proc means data= father_long  n mean stddev maxdec = 2;
class fgroup;
var ffi_delta fvi_delta fvgsc_delta
fpa_delta fmvpa_delta fsw_imp_delta fstd_imp_delta fbmi_delta;
title 'Mean (SD) for each group';
run;

proc ttest data= father_long plots = none;
class fgroup;
var ffi_delta fvi_delta fvgsc_delta
fpa_delta fmvpa_delta fsw_imp_delta fstd_imp_delta fbmi_delta;
title 'Differences in mean change';
run;

********basic adjusted models for EBRBs
*********************************************;
proc glm data = father_long;
class fgroup csex;
model ffi_delta = fgroup cage csex /solution;
run;

proc glm data = father_long;
class fgroup csex;
model fvi_delta = fgroup cage csex /solution;
run;

proc glm data = father_long;
class fgroup csex;
model fpa_delta = fgroup cage csex /solution;
run;

proc glm data = father_long;
class fgroup csex;
model fstd_imp_delta = fgroup cage csex /solution;
run;

proc glm data = father_long;
class fgroup csex;
```

```
model fbmi_delta = fgroup cage csex /solution;
lsmeans fgroup;
run;

*****McNemar test for Pre Post change within each group
**********************************;
proc sort data = father_long;
by fgroup;
run;

proc freq data= father_long;
by fgroup;
tables fdi_pre*fdi_post fsi_pre*fsi_post fffi_pre*fffi_post/agree;
title 'McNemar chi-square for change in SSB, snack and fast food intake
by Intervention and Control';
run;

proc freq data= father_long;
tables fbmigrp_precat fbmigrp_pre;
run;

*********Logistic regression models for Post adjusting for Pre measure,
group, child age and covariates****;
**********Run these models first to confirm that Porc glimmix models
are estimating results correctly*********;

proc logistic descending data = father_long order = internal;
class fgroup (ref = 'C') csex fdi_pre(ref = '1')/param = ref;
model fdi_post = fdi_pre fgroup cage csex ;
run;

proc logistic descending data = father_long order = internal;
class fgroup (ref = 'C') csex fsi_pre (ref = '1') /param = ref;
model fsi_post = fsi_pre fgroup cage csex ;
run;

proc logistic descending data = father_long order = internal;
class fgroup (ref = 'C') csex fffi_pre (ref = '1')/param = ref;
model fffi_post = fffi_pre fgroup cage csex ;
run;

*********Generalized linear mixed models for binary data
******************************;
*********These models include a random intercept for site to account
for clustering ***;
*********Proc glimmix with binary distribution, default is logit link
*****************;
********Results are consistent with results from logistic regression
models ***********;

*SSB intake;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fdi_pre (ref = '1') fsite;
model fdi_post (event = '1') = fdi_pre fgroup cage csex /dist = binary
solution oddsratio (label);
```

```
random intercept /subject = fsite;
run;

proc glimmix data = father_long;
class f_int_dose (ref = '1') csex (ref = 'Female')
fdi_pre (ref = '1') fsite;
model fdi_post (event = '1') = fdi_pre f_int_dose cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = fsite;
*Intervention dose was significant (p=0.049);
run;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fdi_pre (ref = '1') fsite;
model fdi_post (event = '1') = fdi_pre fgroup cage csex
cage*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was not significant;
run;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fdi_pre (ref = '1') fsite;
model fdi_post (event = '1') = fdi_pre fgroup cage csex
csex*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was not significant;
run;

*Snack intake;
proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fsi_pre (ref = '1') fsite;
model fsi_post (event = '1') = fsi_pre fgroup cage csex /dist = binary
solution oddsratio (label);
random intercept /subject = fsite;
run;

proc glimmix data = father_long;
class f_int_dose (ref = '1') csex (ref = 'Female')
fsi_pre (ref = '1') fsite;
model fsi_post (event = '1') = fsi_pre f_int_dose cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = fsite;
*Intervention dose was significant (p=0.026);
run;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fsi_pre (ref = '1') fsite;
model fsi_post (event = '1') = fsi_pre fgroup cage csex
cage*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was not significant;
run;
```

```
proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fsi_pre (ref = '1') fsite;
model fsi_post (event = '1') = fsi_pre fgroup cage csex
csex*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was not significant;
run;

*Fast food intake;
proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fffi_pre (ref = '1') fsite;
model fffi_post (event = '1') = fffi_pre fgroup cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = fsite;
run;

proc glimmix data = father_long;
class f_int_dose (ref = '1') csex (ref = 'Female')
fffi_pre (ref = '1') fsite;
model fffi_post (event = '1') = fffi_pre f_int_dose cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = fsite;
*Intervention dose was significant (p=0.043);
run;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fffi_pre (ref = '1') fsite;
model fffi_post (event = '0') = fffi_pre fgroup cage csex
cage*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was marginally significant (p=0.057);
run;

proc glimmix data = father_long;
class fgroup (ref = 'C') csex (ref = 'Female')
fffi_pre (ref = '1') fsite;
model fffi_post (event = '0') = fffi_pre fgroup cage csex
csex*fgroup/dist = binary solution oddsratio (label);
random intercept /subject = fsite;
*Interaction was not significant;
run;

**********Proc mixed with random effect for fsite
************************;
******need long format for proc
mixed*************************************;

data post_long_all;
set father_long;
time= 2;

ffi = ffi_post;
fvi = fvi_post;
fpa = fpa_post;
```

```
fmvpa = fmvpa_post;
fsw_imp = fsw_imp_post;
fstd_imp = fstd_imp_post;
fbmi = fbmi_post;
fbmigrp = fbmigrp_post;

keep famid fid fsite time cage csex fgroup mattend menroll frandom
totalsessions fattend f_int_dose mattend menroll m_inv m_grp
father_pre f_pre_pp father_post father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp
pre_post m_inv m_grp ffi fvi fpa fmvpa
fsw_imp fstd_imp fbmi fbmigrp f_int_dose fattend;
format csex sex. fbmigrp bmi_f.;
run;

data pre_long_all;
set father_long;
time = 1;

ffi = ffi_pre;
fvi = fvi_pre;
fpa = fpa_pre;
fmvpa = fmvpa_pre;
fsw_imp = fsw_imp_pre;
fstd_imp = fstd_imp_pre;
fbmi = fbmi_pre;
fbmigrp = fbmigrp_pre;

keep famid fid time fsite csex  mattend menroll m_inv m_grp fgroup
f_int_dose fattend frandom fgroup totalsessions mattend menroll m_inv
m_grp
father_pre f_pre_pp father_post father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp
pre_post
ffi fvi fpa fmvpa fsw_imp fstd_imp fbmi fbmigrp fnsc ffinc cage
cagec fagec flanc fusc ffs fempc feduc fincc;
format cagec age_c. csex sex. fagec age_f. fincc inc. ffs secure. feduc
educ.
fusc yrs_us. flanc lang. fmarc mar. fempc emp. fnsc safe.
ffinc assist. fbmigrp bmi_f.;
run;

proc freq data= pre_long_all;
tables f_int_dose*fgroup;
run;

proc format;
value pre 1 = 'Pre' 2 = 'Post';
value grp 0 = 'Control' 1 = 'Intervention';
run;

data ebrb_long;
set pre_long_all post_long_all;
```

```
group = .;
if fgroup = 'C' then group = 0;
if fgroup = 'I' then group = 1;
label
ffi= 'Father fruit intake--serving per day'
 fvi= 'Father vegetable intake--serving per day'
 fpa ='Father weekly PA: mild, mod, vigorous'
 fmvpa = 'Father weekly mod/vigorous PA'
 fsw_imp = 'father screen time weekly'
 fstd_imp = 'father daily screentime topcoded at 10 hrs'
 fbmi = 'Father BMI'
 fbmigrp = 'Father BMI group';
********create intervention dose mother attendance variables
**************************;
******this is the intervention dose mother attendance variable for
final results ******;
****** Per Dec e-mail correspondence from Marla
***************************************;
m_int_dose7 = .;
if m_grp = 0 and f_int_dose = 1 then m_int_dose7 = 1;
if f_int_dose = 2 then m_int_dose7 = 2;
if f_int_dose = 3 and mattend <= 6 then m_int_dose7 = 3;
if f_int_dose = 3 and mattend >= 7 then m_int_dose7 = 4;
********no reported results for this intervention mother attendance
variable *******;
m_int_dose6 = .;
if m_grp = 0 and f_int_dose = 1 then m_int_dose6 = 1;
if f_int_dose = 2 then m_int_dose6 = 2;
if f_int_dose = 3 and mattend <= 5 then m_int_dose6 = 3;
if f_int_dose = 3 and mattend >= 6 then m_int_dose6 = 4;

format time pre. group grp. ;
run;

proc contents data = ebrb_long;
run;
proc print data = ebrb_long;
run;

data pre_demo;
set ebrb_long;
where father_pre=1;
pre_f_bmigrp=fbmigrp;
keep fid pre_f_bmigrp;
format pre_f_bmigrp bmi_f.;
run;

proc print data = pre_demo;
run;

proc sort data = ebrb_long;
by fid;
run;

proc sort data= pre_demo;
by fid;
run;
```

```
data ebrb_long_all;
merge ebrb_long pre_demo;
by fid;
run;

proc print data = ebrb_long_all;
run;

*******Plot by group ***********************************;
proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = ffi x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = fvi x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = fpa x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = fmvpa x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = fstd_imp x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long_all;
panelby group/columns = 2 novarname;
reg y = fbmi x = time;
colaxis integer;
run;

proc contents data = ebrb_long_all;
run;

proc sort data= ebrb_long_all;
by fid time;
run;

proc print data= ebrb_long_all;
run;

proc freq data= ebrb_long_all;
```

```
tables csex fgroup fsite cage fage fus fusc time;
run;

proc freq data = ebrb_long_all;
table f_int_dose m_inv m_grp m_int_dose6 m_int_dose7;
run;

******empty model to calculate ICC***************;
*******ICC = intercept/(intercept + residual) ***;
proc mixed data = ebrb_long_all method = REML;
class fid;
model ffi = /solution;
random int / subject = fid;
run;

*****Proc mixed with random intercept for site and random intercept for
subject nested in site****;
*******default covariance matrix - does not need to be specified with
only random int model *****;
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup ;
model ffi = time|fgroup / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;

******adjust for gender and age ***************************;
*******fruit servings **************************************;
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex;
model ffi = fgroup|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup f_int_dose csex ;
model ffi = fgroup|time cage csex f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*int dose doesn not have a significant fixed effect;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup f_int_dose csex ;
model ffi = f_int_dose|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Int dose*time not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_grp;
model ffi = m_grp|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
```

```
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose7 ;
model ffi = m_int_dose7|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose6 ;
model ffi = m_int_dose6|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

******vegetables ***************************;
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex ;
model fvi = fgroup|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup f_int_dose csex ;
model fvi = fgroup|time cage f_int_dose csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*int dose doesn not have a significant fixed effect;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup f_int_dose csex ;
model fvi = f_int_dose|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Int dose*time not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_grp (ref = '18.5 - <25 Normal');
model fvi = m_grp|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose7 ;
model fvi = m_int_dose7|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;
```

```
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose6 ;
model fvi = m_int_dose6|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

******all PA ************************************;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex ;
model fpa = fgroup|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup f_int_dose csex;
model fpa = fgroup|time cage f_int_dose csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*int dose have a significant fixed effect (p= 0.0012);
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite f_int_dose csex;
model fpa = f_int_dose|time cage csex/ solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Int dose*time not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_grp ;
model fpa = m_grp|time csex cage f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose7 ;
model fpa = m_int_dose7|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose6 ;
model fpa = m_int_dose6|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;
```

```
***************Screentime *************************;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex ;
model fstd_imp = fgroup|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex f_int_dose ;
model fstd_imp = fgroup|time cage csex f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*int dose have not a significant fixed effect;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite f_int_dose csex ;
model fstd_imp = f_int_dose|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Int dose*time not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_grp ;
model fstd_imp = m_grp|time csex cage f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose7 ;
model fstd_imp = m_int_dose7|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose6 ;
model fstd_imp = m_int_dose6|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

*******************BMI ********************************;
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex ;
model fbmi = fgroup|time cage csex / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
run;
```

```
proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex f_int_dose ;
model fbmi = fgroup|time csex cage f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*int dose doesn not have a significant fixed effect;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite csex f_int_dose ;
model fbmi = f_int_dose|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Int dose*time not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_grp ;
model fbmi = m_grp|time csex cage f_int_dose / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose7 ;
model fbmi = m_int_dose7|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc mixed data = ebrb_long_all method = REML;
class time fid fsite fgroup csex m_int_dose6 ;
model fbmi = m_int_dose6|time csex cage / solution;
random int / subject = fsite;
random int /subject = fid(fsite);
*Not significant;
run;

proc contents data = ebrb_long_all;
run;
```

Adolescent Energy Balance Related Behaviors

```
**********************************************************************
**;
**********************************************************************
**;
******Program to evaluate Pre Post changes in Youth EBRB outcomes
*******;
*********Limit this analysis to sample fc_pre_dyad_cpost_pp = 1
*********;
************Includes Father Child Pre dyads and child post data
*********;
************Excluding 2 Intervention group with no attendance
***********;
***********Keep analysis variables and rename for Post
******************;
***********to compare Pre-Post demographics
*****************************;
***********Use long form for Mixed models to account for site clusters
**;
**********************************************************************
**;
***********cf_EBRB.sas
*************************************************;
**********************************************************************
**;

PROC IMPORT OUT= WORK.fc_long
            DATAFILE=  "C:\Users\balta026\Desktop\New
analysis\fc_prepost_long_112020.xlsx"
            DBMS= xlsx replace;
     GETNAMES=YES;
      *guessingrows = 200;
RUN;

proc contents data= fc_long order = varnum;
run;

/*
****some data checks **********************;
proc print data = fc_long;
where pre_post = 1 and cstd = .;
var cid cstd csw cswk1 - cswk4 cswd1 - cswd4;
run;

proc freq data= fc_long;
tables pre_post*(menroll mattend);
run;

proc freq data= fc_long;
where pre_post = 1;
tables menroll*mattend;
run;

proc print data = fc_long;
where pre_post = 1 and menroll = . and mattend >= 0;
```

```
var cid menroll mattend;
run;

proc freq data = fc_long;
where pre_post = 1;
tables mattend;
run;

proc print data= fc_long;
var cpa cvpa cmpa cmildpa;
run;

proc freq data= fc_long;
tables fattend menroll mattend;
run;
*/

data fc_longb;
set fc_long;
******create imputed screen time for those missing 1 - 2 of 8
items*****;
*****add this to cf_pre_post.SAS code
***********************************;
cswk_imp= sum(cswk1,cswk2,cswk3,cswk4); *screen time hours on a typical
weekday;
cswd_imp= sum(cswd1,cswd2,cswd3,cswd4); *screen time hours on a typical
weekend day;
csw_imp= sum(cswk_imp*5,cswd_imp*2); *weekly screen time hours;
cstd_imp = csw_imp/7;
if cstd_imp > 10 then cstd_imp = 10;
******create intervention dose variable with cutpoint at median
attendance in intervention group**;
******code 1 to 3 so that it matches group values in proc mixed
lsmestimate statements************;
int_dose = .;
if cattend = 0 and fattend = 0 then int_dose = 1;
if (0 < cattend <= 6) or (0 < fattend <= 6) then int_dose = 2;
if (7 <= cattend <= 8) and (7 <= fattend <= 8) then int_dose = 3;
if cgroup = 'C' then int_dose = 1;
m_inv = .;
if mattend = 0 or mattend = . then m_inv = 0;
if mattend >= 1 then m_inv = 1;
if cgroup = 'C' then m_inv = 0;
*******create a variable to account for mother involvement in Int group
********;
m_grp = .;
if m_inv = 0 then m_grp = 0;
if m_inv = 0 and cgroup = 'I' then m_grp = 1;
if m_inv = 1 and cgroup = 'I' then m_grp = 2;
*******create a combined dose effect variable that includes mother
involvement*****;
run;

proc freq data= fc_longb;
where pre_post = 1;
tables m_inv m_inv*mattend;
run;
```

```
proc freq data= fc_longb;
where pre_post = 1;
tables m_inv*cgroup m_grp;
run;

proc contents data = fc_longb;
run;

proc format;
value age_c 0 = '8 - 12' 1= '>= 13';
value sex 1= 'Male' 2 = 'Female';
value age_f 0 = '21-40' 1 = '>40';
value inc 1 = '<$25K' 2 = '$25K -<$50K' 3 = '>= 50K';
value secure 0 = 'No food insecurity' 1 = 'food insecure';
value educ 1 = 'Middle school or less' 2 = 'HS grad or GRE'
             3 = 'College or Technical school';
value yrs_us 0 = '<10' 1 = '10 - <20' 2 = '20-<30' 3 = '>= 30';
value lang 0 = 'More Span than Eng' 1 = 'Equal Span & Eng' 2 = 'More
English';
value mar 1 = 'Married' 2 = 'Living with Partner' 3 =
'single/widow/divorced/separated';
value emp 1 = 'self-employed' 2 = 'unemployed/homemaker' 3 = 'PT' 4 =
'FT';
value safe 1 = 'safe n-hood' 2 = 'Unsafe n-hood';
value assist 0 = 'no financial assistance' 1 = 'Any assistance';
value bmi_f 1 = '< 18.5 Underwt' 2 = '18.5 - <25 Normal' 3 = '25 - <30
Overwt' 4 = '>= 30 Obese';
value bmi_c 1 = '<5%tile underwt' 2= '5-<85%tile Normal' 3 = '85-
95%tile Overwt' 4 = '>=95%tile Obese';
run;

*******keep analysis data set and variables for analysis
*****************;
data fc_var;
set fc_longb;
label
 pre_post = 'Pre Post indicator'
 cagec = 'Child age group'
 csex = 'Child sex'
 fagec = 'Father age group'
 fincc = 'Father income group'
 ffs = 'Food security (from 2 questions)'
 feduc = 'Father education group'
 fusc = 'Father years in US'
 flanc = 'Father language group'
 fmarc = 'Father marital status'
 fempc = 'Father employment group'
 fnsc = 'Neighborhood safety (from 2 questions)'
 ffinc = 'Financial assistance'
 cbmigrp = 'Child weight group'
 fbmigrp = 'Father weight group'
 cvpa = 'child weekly vigorous PA'
 cmpa = 'Child weekly moderate PA'
 cmildpa = 'Child weekly mild PA'
 cmvpa = 'Child weekly mod/vigorous PA'
 cpa ='Child weekly PA: mild, mod, vigorous'
```

```
 csw = 'Child weekly screen time'
 cdpa = 'Child daily PA topcoded at 2 hrs'
 cdmvpa = 'Child daily MVPA topcoded at 2 hrs'
 cstd = 'Child daily screentime topcoded at 10 hrs'
 bmi = 'Child BMI'
 bmiz = 'Child BMI z-score'
 bmipct = 'Child BMI percentile from CDC code';
keep famid cid fid csite fsite crandom frandom cgroup fgroup
totalsessions cattend fattend int_dose
mattend menroll m_inv m_grp
c_pre_miss_ndsr c_pre_miss_survey c_post_miss_ndsr c_post_miss_survey
child_pre c_pre_pp c_pre_miss_ndsr c_pre_miss_survey child_post
c_post_pp c_post_miss_ndsr c_post_miss_survey
child_pre_post child_pre_post_pp father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp
pre_post cage cagec cage_elig csex
fage fagec fsex fre fch fad ffm2
finc fincc ffs feduc fus fcob fusc flan flanc
fmarc fempc fnsc ffin ffinc n_hh fbmi fbmigrp cvpa cmpa cmildpa
cmvpa cpa csw rcnt ndf ndv ndd nds ndfa cdpa cdmvpa cstd cstd_imp bmi
bmiz bmipct cbmigrp cwt1 cwt2 cht1 cht2 cbda;
format cagec age_c. csex sex. fagec age_f. fincc inc. ffs secure. feduc
educ.
fusc yrs_us. flanc lang. fmarc mar. fempc emp. fnsc safe.
ffinc assist. cbmigrp bmi_c. fbmigrp bmi_f.;
run;

*******set the dataset for this analysis
****************************************;
data fc_dyad_long;
********for primary PP analysis use this dataset
*******************************;
set fc_var;
where fc_pre_dyad_cpost_pp = 1;
*******for sensitivity ITT (Intention to treat) analysis use this
dataset ***************************;
*where fc_pre_dyad_cpost = 1;
run;

proc contents data= fc_dyad_long;
run;
proc print data= fc_dyad_long;
run;

/*EXPORT INTO EXCEL FILE TO COMBINE WITH THE LARGE DATASET*/
proc export
data=fc_dyad_long
dbms=xlsx
outfile="C:\Users\balta026\Desktop\cf_EBRB_youth.xlsx"
replace;
run;

proc freq data= fc_dyad_long;
where cgroup = 'I' and pre_post = 1;
tables cattend fattend cattend*fattend;
```

```
run;

proc freq data= fc_dyad_long;
where pre_post = 1;
tables mattend m_inv m_inv*mattend;
run;

proc freq data= fc_dyad_long;
where pre_post = 1;
tables m_inv*cgroup m_grp;
run;

proc means data = fc_dyad_long;
where pre_post = 1 and m_grp = 2;
var mattend;
run;

proc freq data = fc_dyad_long;
where pre_post = 1;
tables m_inv*menroll;
run;

proc freq data= fc_dyad_long;
where pre_post = 1;
tables int_dose*m_inv;
run;


 *******Table 1 descriptive statistics
*********************************************;

data fc_pre;
set fc_dyad_long;
where pre_post = 1;
run;

proc contents data = fc_pre;
run;


proc freq data = fc_pre;
tables csite fsite cgroup crandom*cgroup cage ffm2 int_dose;
title 'Dataset description';
run;

proc means data= fc_pre n mean stddev median q1 q3 min max maxdec = 2;
where cgroup = 'I';
var totalsessions cattend fattend;
run;

proc freq data= fc_pre;
 where cgroup = 'I';
 tables totalsessions;
 run;

proc freq data = fc_pre;
tables csex cbmigrp fincc fmarc feduc fempc fusc flanc
```

```
  fbmigrp ffinc ffs fnsc;
  title 'Table 1 All';
 run;

 proc means data =fc_pre n mean stddev median Q1 Q3 min max maxdec = 2;
 var cage bmipct fage fch fad n_hh;
 run;

proc freq data = fc_pre;
tables (csex cbmigrp fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc)*cgroup/chisq exact;
title 'Table 1 by group';
run;

 proc means data= fc_pre n mean stddev median min max maxdec=2 ;
 class cgroup;
 var cage bmipct fage fch fad n_hh;
 run;

 proc ttest data =fc_pre plots = none;
 class cgroup;
 var cage bmipct fage fch fad n_hh;
 run;

proc npar1way wilcoxon;
class cgroup;
var cage fage fch fad n_hh;
 run;

proc means data = fc_pre n mean stddev median q1 q3 min max maxdec = 2;
var rcnt ndf ndv ndd nds ndfa cdpa cdmvpa cstd cstd_imp bmipct ;
title 'Table 2 for All';
run;

proc means data = fc_pre n mean stddev median Q1 Q3 min max maxdec = 2;
class cgroup;
var rcnt ndf ndv ndd nds ndfa cdpa cdmvpa cstd cstd_imp bmipct;
title 'Table 2 by group';
run;

proc ttest data = fc_pre plots = none;
class cgroup;
var rcnt ndf ndv ndd nds ndfa cdpa cdmvpa cstd cstd_imp bmipct;
title 'Table 2 group comparisons';
run;

proc npar1way wilcoxon data = fc_pre;
class cgroup;
var rcnt ndf ndv ndd nds ndfa cdpa cdmvpa cstd cstd_imp bmipct;
title 'Table 2 group comparisons';
run;

proc freq data = fc_pre;
tables cbmigrp*cgroup/chisq exact;
run;
```

```
********Unadjusted tests of Pre -Post change
*********************************;
********create a Pre dataset
*************************************************;
proc contents data= fc_pre;
run;

data pre;
set fc_pre;
keep famid cid cgroup csite
rcnt ndf ndv ndd nds ndfa heix1-heix13 cdpa cdmvpa cstd cstd_imp bmi
bmiz bmipct cbmigrp csex cage cwt1 cwt2
cht1 cht2 cbda feduc fbmigrp;
run;

proc contents data = pre;
run;

******create a post dataset and rename variables
********************************;
data post;
set fc_dyad_long;
where pre_post = 2;
rcnt_post = rcnt;
ndf_post = ndf;
ndv_post = ndv;
ndd_post = ndd;
nds_post = nds;
ndfa_post = ndfa;
cdpa_post = cdpa;
cdmvpa_post = cdmvpa;
cstd_post = cstd;
cstd_imp_post = cstd_imp;
bmi_post= bmi;
bmiz_post = bmiz;
bmipct_post = bmipct;
cbmigrp_post = cbmigrp;
cwt1_post = cwt1;
cwt2_post = cwt2;
cht1_post = cht1;
cht2_post = cht2;
cbda_post = cbda;

keep famid cid rcnt_post ndf_post ndv_post ndd_post nds_post ndfa_post
cdpa_post cdmvpa_post
cstd_post cstd_imp_post bmi_post bmiz_post bmipct_post cbmigrp_post
cwt1_post cwt2_post cht1_post
cht2_post cbda_post;
format cbmigrp_post bmi_c. fbmigrp_post bmi_f. cbda_post mmddyy10.;
run;

proc contents data = post;
run;

proc sort data = pre;
by cid;
run;
```

```
proc sort data = post;
by cid;
run;

data ebrb;
 merge post pre;
 by cid;
 ndf_delta = ndf_post - ndf;
 ndv_delta = ndv_post - ndv;
 ndd_delta = ndd_post - ndd;
 nds_delta = nds_post - nds;
 ndfa_delta = ndfa_post - ndfa;
 cdpa_delta = cdpa_post - cdpa;
 cdmvpa_delta = cdmvpa_post- cdmvpa;
 cstd_delta = cstd_post -cstd;
 cstd_imp_delta= cstd_imp_post - cstd_imp;
 *****Note bmi and bmiz not as informative for youth as BMIpct********;
 bmi_delta = bmi_post - bmi;
 bmiz_delta = bmiz_post - bmiz;
 bmipct_delta = bmipct_post - bmipct;

 ******2 outlier BMI deltas were checked and corrected ******;
 ****cid c116 had missing post Height so post BMI missing ****;
 **** cid c216 had height and weight interchanged and were corrected
****;
 run;

 proc contents data= ebrb;
 run;

 proc means data = ebrb;
 var bmi_post bmi bmi_delta;
 run;

 proc print data= ebrb;
 where bmi_delta = .;
 var bmi bmi_post cwt1_post cwt2_post cht1_post cht2_post;
 run;

Proc print data = ebrb;
where cstd_imp_delta = .;
var cid cstd_imp_delta cstd_imp_post cstd_imp;
run;

nds_delta = nds_post - nds;
 ndfa_delta = ndfa_post - ndfa;
 cdpa_delta = cdpa_post - cdpa;
 cdmvpa_delta = cdmvpa_post- cdmvpa;
 cstd_delta = cstd_post -cstd;
 cstd_imp_delta= cstd_imp_post - cstd_imp;
 *****Note bmi and bmiz not as informative for youth as BMIpct********;
 bmi_delta = bmi_post - bmi;
 bmiz_delta = bmiz_post - bmiz;
 bmipct_delta = bmipct_post - bmipct;

 proc corr data = ebrb;
```

```
 var ndf ndf_post ndv ndv_post ndd ndd_post nds nds_post ndfa
ndfa_post;
 run;

 proc corr data = ebrb;
 var hei2015 hei_post cdpa cdpa_post cdmvpa cdmvpa_post
 cstd_imp cstd_imp_post bmipct bmipct_post;
 run;


 /*
 proc print data = ebrb;
 where cid = 'c116' or cid = 'c216';
 var bmipct bmipct_post bmipct_delta;
 title 'check these after sept 2020 data corrections';
 run;
*/

 proc freq data= ebrb;
 tables cid csex cage feduc rcnt rcnt_post cbmigrp cbmigrp_post csite;
 run;

 /*
 *******most extreme BMI delta values *************;
 *******sent for data checks and corrections ******;
 proc print data = ebrb;
 by cgroup;
 where BMIpct_delta > 10 or -30 < bmipct_delta < -10.0;
 var cid cage csex cht1 cht2 cht1_post cht2_post cwt1 cwt2 cwt1_post
cwt2_post  bmipct bmipct_post bmipct_delta;
 run;
 */

 proc means data= ebrb maxdec = 2;
 var ndf ndf_post ndv ndv_post  ndd ndd_post nds nds_post ndfa
ndfa_post cdpa cdpa_post cdmvpa cdmvpa_post
 cstd cstd_post cstd_imp cstd_imp_post bmi bmi_post bmiz bmiz_post
bmipct bmipct_post hei_post;
 run;


 ******Unadjusted paired and two sample t-tests
****************************;
 proc means data= ebrb n mean stddev median stderr t prt maxdec = 3;
 var ndf_delta ndv_delta ndd_delta nds_delta ndfa_delta hei_delta
cdpa_delta cdmvpa_delta
cstd_delta cstd_imp_delta bmi_delta bmiz_delta bmipct_delta;
title 'Paired t-tests for overall change in EBRB outcomes';
run;

proc means data= ebrb n mean stddev median stderr t prt maxdec = 3;
class cgroup;
 var ndf_delta ndv_delta ndd_delta nds_delta ndfa_delta hei_delta
cdpa_delta cdmvpa_delta
cstd_delta cstd_imp_delta bmi_delta bmiz_delta bmipct_delta;
title 'Paired t-tests for change by group';
run;
```

```
proc means data= ebrb n mean stddev maxdec = 2;
class cgroup;
 var ndf_delta ndv_delta ndd_delta nds_delta ndfa_delta hei_delta
cdpa_delta cdmvpa_delta
cstd_delta cstd_imp_delta bmipct_delta;
title 'Mean (SD) for each group';
run;

proc ttest data= ebrb plots = none;
class cgroup;
 var ndf_delta ndv_delta ndd_delta nds_delta ndfa_delta hei_delta
cdpa_delta cdmvpa_delta
cstd_delta cstd_imp_delta bmi_delta bmiz_delta bmipct_delta;
title 'Differences in mean change';
run;

*******basic adjusted models for EBRBs
*********************************************;
proc glm data = ebrb;
class cgroup csex;
model ndf_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model ndv_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model ndd_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model nds_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model ndfa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cdpa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cdmvpa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cstd_delta = cgroup cage csex/solution;
```

```
run;

proc glm data = ebrb;
class cgroup csex;
model cstd_imp_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model bmipct_delta = cgroup cage csex/solution;
lsmeans cgroup;
run;

**********Proc mixed with random effect for csite
************************;
******need long format for proc
mixed************************************;
******cage is missing in Post data so need to Post data with***;
*******demo data to have these variables in all records
*******************;

data post_long;
set fc_dyad_long;
where pre_post = 2;
keep famid cid csite csex cgroup ndf ndv ndd nds ndfa
cdpa cdmvpa cstd cstd_imp bmi bmiz bmipct cbmigrp int_dose m_inv m_grp
mattend;
run;

proc freq data= post_long;
tables int_dose m_inv m_grp mattend;
run;


data pre_demo;
set fc_dyad_long;
where pre_post = 1;
keep famid cid cage fus flanc fusc;
run;



proc print data = pre_demo;
run;

proc sort data = post_long;
by cid;
run;

proc sort data= pre_demo;
by cid;
run;

data post_long_demo;
merge post_long pre_demo;
by cid;
time = 2;
```

```
run;

proc print data = post_long_demo;
run;

data pre_long_all;
set fc_dyad_long;
where pre_post = 1;
time = 1;
keep famid cid csite time csex cgroup int_dose m_inv m_grp mattend ndf
ndv ndd nds ndfa
cdpa cdmvpa cstd cstd_imp bmi bmiz bmipct cbmigrp
cage flanc fus fusc;
run;

proc freq data= pre_long_all;
tables int_dose (int_dose m_grp)*cgroup;
run;



proc format;
value pre 1 = 'Pre' 2 = 'Post';
value grp 0 = 'Control' 1 = 'Intervention';
run;


data ebrb_long;
set pre_long_all post_long_demo;
group = .;
if cgroup = 'C' then group = 0;
if cgroup = 'I' then group = 1;
label
ndf = 'NDSR fruit servings per day'
ndv = 'NDSR vegetable servings per day'
ndd = 'NDSR SSB servings per day'
nds = 'NDSR sweet/salty snack servings per day'
ndfa = 'NDSR fast food servings per day'
cdpa = 'PA hours per day'
cdmvpa = 'Moderate/Vigorous PA hours per day'
cstd_imp = 'Screentime hours per day'
bmipct = 'BMI percentile';
********create intervention dose mother attendance variables
*************************;
******this is the intervention dose mother attendance variable for
final results ******;
****** Per Dec e-mail correspondence from Marla
***************************************;
m_int_dose7 = .;
if m_grp = 0 and int_dose = 1 then m_int_dose7 = 1;
if int_dose = 2 then m_int_dose7 = 2;
if int_dose = 3 and mattend <= 6 then m_int_dose7 = 3;
if int_dose = 3 and mattend >= 7 then m_int_dose7 = 4;
********no reported results for this intervention mother attendance
variable *******;
m_int_dose6 = .;
if m_grp = 0 and int_dose = 1 then m_int_dose6 = 1;
```

```
if int_dose = 2 then m_int_dose6 = 2;
if int_dose = 3 and mattend <= 5 then m_int_dose6 = 3;
if int_dose = 3 and mattend >= 6 then m_int_dose6 = 4;

run;

proc contents data = ebrb_long;
run;

proc freq data= ebrb_long;
tables m_int_dose7;
run;

/*
*******data checks
*******************************************************************;
proc freq data= ebrb_long;
where time = 1;
tables m_int_dose7 (int_dose mattend m_grp)*m_int_dose7;
run;
proc freq data= ebrb_long;
where time = 1;
tables m_int_dose6 (int_dose mattend m_grp)*m_int_dose6;
run;
proc freq data= ebrb_long;
where time = 1;
tables m_int_dose7 m_int_dose6;
run;
*/


*******Plot by group *************************************;
proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = ndf x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = ndv x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = ndd x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = nds x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
```

```
panelby group/columns = 2 novarname;
reg y = ndfa x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = cdpa x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = cdmvpa x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = cstd_imp x = time;
colaxis integer;
run;

proc sgpanel data = ebrb_long;
panelby group/columns = 2 novarname;
reg y = bmipct x = time;
colaxis integer;
run;

proc contents data = ebrb_long;
run;

proc sort data= ebrb_long;
by cid time;
run;

proc print data= ebrb_long;
run;

proc freq data= ebrb_long;
tables csex cgroup csite cage fus fusc time;
run;

proc sort data = ebrb_long;
by csite;
run;

******empty model to calculate ICC***************;
*******ICC = intercept/(intercept + residual) ***;
proc mixed data = ebrb_long method = REML;
class cid;
model ndf = /solution;
random int / subject = cid;
run;

*****Proc mixed with random intercept for site and random intercept for
subject nested in site****;
```

```
*******default covariance matrix - does not need to be specified with
only random int model *****;
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup;
model ndf = time|cgroup / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

******adjust for gender and age **************************;
*******fruit servings *************************************;
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model ndf = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndf = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndf = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model ndf = m_grp|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model ndf = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model ndf = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;


******vegetables **************************;
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
```

```
model ndv = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndv = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndv = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model ndv = m_grp|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model ndv = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model ndv = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

/*
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model ndv = cgroup time csex cage cgroup*time*csex / solution;
random int / subject = csite;
random int /subject = cid(csite);
title '3 way interaction with child sex not significant';
run;
*/

*************************SSB models ******************************;
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model ndd = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;
```

```
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndd = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndd = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model ndd = m_grp|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model ndd = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model ndd = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;


*********snacks *****************************;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model nds = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model nds = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML order = internal;
class int_dose time cid csite csex;
model nds = int_dose|time csex cage / solution;
random int / subject = csite;
```

```
random int /subject = cid(csite);
LSMEANS Time int_dose int_dose*time/pdiff adj=tukey;
*********the order of lsmestimate statements is the order of the class
statement ******;
*********Check that these match the LSMEANS table to confirm correct
interpretation****;
lsmestimate int_dose*time 'Post minus pre dose 3' [1,3 2] [-1,3 1];
lsmestimate int_dose*time 'Post minus pre dose 1' [1,1 2] [-1,1 1];
lsmestimate int_dose*time 'Post minus pre dose 2' [1,2 2] [-1,2 1];

lsmestimate int_dose*time 'Post minus pre for dose 3 vs dose 1' [1,3 2]
[-1,3 1] [-1,1 2] [1,1 1];
lsmestimate int_dose*time 'Post minus pre for dose 3 vs dose 2' [1,3 2]
[-1,3 1] [-1,2 2] [1,2 1];
lsmestimate int_dose*time 'Post minus pre for dose 2 vs dose 1' [1,2 2]
[-1,2 1] [-1,1 2] [1,1 1];
run;



proc format;
 value dose 1 = 'Control' 2 = 'Int: 1-6 sessions' 3 = 'Int: 7-8
sessions';
 run;


proc sgpanel data = ebrb_long;
panelby int_dose/columns = 3 novarname;
reg y = nds x = time;
colaxis integer;
format int_dose dose.;
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model nds = m_grp|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model nds = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model nds = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;


*****************fast food ************************;
```

```
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model ndfa = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model ndfa = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML order = internal;
class int_dose time cid csite csex ;
model ndfa = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
LSMEANS Time int_dose int_dose*time/pdiff adj=tukey;
lsmestimate int_dose*time 'Post minus pre dose 3' [1,3 2] [-1,3 1];
lsmestimate int_dose*time 'Post minus pre dose 1' [1,1 2] [-1,1 1];
lsmestimate int_dose*time 'Post minus pre dose 2' [1,2 2] [-1,2 1];

lsmestimate int_dose*time 'Post minus pre for dose 3 vs dose 1' [1,3 2]
[-1,3 1] [-1,1 2] [1,1 1];
lsmestimate int_dose*time 'Post minus pre for dose 3 vs dose 2' [1,3 2]
[-1,3 1] [-1,2 2] [1,2 1];
lsmestimate int_dose*time 'Post minus pre for dose 2 vs dose 1' [1,2 2]
[-1,2 1] [-1,1 2] [1,1 1];
run;


proc sgpanel data = ebrb_long;
panelby int_dose/columns = 3 novarname;
reg y = ndfa x = time;
colaxis integer;
format int_dose dose.;
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model ndfa = m_grp|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

*******remember to include order = internal for lemestimate statements
*******************;
*******also the order of the bracketed terms is based on order in class
statement ********;
**** See  https://support.sas.com/resources/papers/proceedings11/351-
2011.pdf ************;

proc mixed data = ebrb_long method = REML order = internal;
class m_int_dose7 time cid csite csex;
model ndfa = m_int_dose7|time csex cage / solution;
```

```
random int / subject = csite;
random int /subject = cid(csite);
LSMEANS Time m_int_dose7 m_int_dose7*time/pdiff adj=tukey;

lsmestimate m_int_dose7*time 'Post minus pre dose 1' [1,1 2] [-1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 2' [1,2 2] [-1,2 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 3' [1,3 2] [-1,3 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 4' [1,4 2] [-1,4 1];

lsmestimate m_int_dose7*time 'Post minus pre for dose 2 vs Control'
[1,2 2] [-1,2 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 3 vs Control'
[1,3 2] [-1,3 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs Control'
[1,4 2] [-1,4 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs dose 2' [1,4
2] [-1,4 1] [-1,2 2] [1,2 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs dose 3' [1,4
2] [-1,4 1] [-1,3 2] [1,3 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 3 vs dose 2' [1,3
2] [-1,3 1] [-1,2 2] [1,2 1];
run;

proc sgpanel data = ebrb_long;
panelby m_int_dose7/columns = 4 novarname;
reg y = ndfa x = time;
colaxis integer;
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model ndfa = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

******all PA ************************************;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model cdpa = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model cdpa = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite csex int_dose;
model cdpa = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
```

```
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model cdpa = m_grp|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model cdpa = m_int_dose7|time csex cage / solution;
random int / subject = csit
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model cdpa = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

****************Screentime *************************;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model cstd_imp = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model cstd_imp = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite csex int_dose;
model cstd_imp = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model cstd_imp = m_grp|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model cstd_imp = m_int_dose7|time csex cage / solution;
random int / subject = csite;
```

```
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model cstd_imp = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

*******************BMI Percent ********************************;
proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex;
model bmipct = cgroup|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex int_dose;
model bmipct = cgroup|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite csex int_dose;
model bmipct = int_dose|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_grp;
model bmipct = m_grp|time csex cage int_dose / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose7;
model bmipct = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc mixed data = ebrb_long method = REML order = internal;
class m_int_dose7 time cid csite csex;
model bmipct = m_int_dose7|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
LSMEANS Time m_int_dose7 m_int_dose7*time/pdiff adj=tukey;

lsmestimate m_int_dose7*time 'Post minus pre dose 1' [1,1 2] [-1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 2' [1,2 2] [-1,2 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 3' [1,3 2] [-1,3 1];
lsmestimate m_int_dose7*time 'Post minus pre dose 4' [1,4 2] [-1,4 1];
```

```
lsmestimate m_int_dose7*time 'Post minus pre for dose 2 vs Control'
[1,2 2] [-1,2 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 3 vs Control'
[1,3 2] [-1,3 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs Control'
[1,4 2] [-1,4 1] [-1,1 2] [1,1 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs dose 2' [1,4
2] [-1,4 1] [-1,2 2] [1,2 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 4 vs dose 3' [1,4
2] [-1,4 1] [-1,3 2] [1,3 1];
lsmestimate m_int_dose7*time 'Post minus pre for dose 3 vs dose 2' [1,3
2] [-1,3 1] [-1,2 2] [1,2 1];
run;

proc sgpanel data = ebrb_long;
panelby m_int_dose7/columns = 4 novarname;
reg y = bmipct x = time;
colaxis integer;
run;

proc mixed data = ebrb_long method = REML;
class time cid csite cgroup csex m_int_dose6;
model bmipct = m_int_dose6|time csex cage / solution;
random int / subject = csite;
random int /subject = cid(csite);
run;

proc sgpanel data = ebrb_long;
panelby m_int_dose6/columns = 4 novarname;
reg y = bmipct x = time;
colaxis integer;
run;

proc contents data = ebrb_long;
run;

data ebrb_plot;
set ebrb_long;
label
ndf = 'NDSR fruit servings'
ndv = 'NDSR vegetable servings';
format time pre. cgroup $grp.;
run;

proc sort data= ebrb_plot;
by csite;
run;

proc sgpanel data = ebrb_plot;
panelby csite;
vbox ndf / category = time;
run;

proc sort data= ebrb_plot;
by cgroup;
run;
```

```
proc sgpanel data = ebrb_plot;
panelby cgroup;
vbox ndf / category = time;
run;


*******example code *******************************;
proc mixed data = ebrb_long method = REML covtest noclprint;
class cid time cgroup csite csex;
model ndf = time cgroup time*cgroup cage csex/residual solution;
random csite;
random int /solution subject = cid(csite) type = UN;
ods output solutionR =eblupsdat; ods exclude solutionR;
run;

******vegetable servings *****************************;
proc sort data= ebrb_plot;
by cgroup;
run;

proc sgpanel data = ebrb_plot;
panelby cgroup;
vbox ndv / category = time;
run;

proc sort data= ebrb_long;
by csite;
run;

*******example code *******************************;
proc mixed data = ebrb_long method = REML covtest noclprint;
class cid time cgroup csite csex;
model ndv = time cgroup time*cgroup cage csex/residual solution;
random csite;
random int /solution subject = cid(csite) type = UN;
run;


***************BMI z*************************************;
proc mixed data = ebrb_long method = REML;
class time cid cgroup;
model bmiz = time|cgroup / solution;
random int /subject = cid;
LSMEANS Time cgroup Time*cgroup/pdiff adj=tukey;
run;

proc mixed data = ebrb_long method = REML;
class cid time cgroup csite;
model bmiz = time|cgroup cage csex /solution;
random int/subject = csite type = VC;
random int/subject = cid(csite) type = UN;
run;

proc mixed data = ebrb_long method = REML;
class cid time cgroup csite;
model bmiz = time|cgroup cage csex /solution;
```

```
random int/subject = csite type = VC;
random int/subject = cid(csite) type = UN;
LSMEANS Time cgroup Time*cgroup/pdiff adj=tukey;
run;


proc mixed data = ebrb_long method = REML;
class cid time cgroup csite;
model bmiz = time|cgroup /solution;
random int/subject = csite type = VC;
random int/subject = cid(csite) type = UN;
run;

*****************cdst ********************;
proc mixed data = ebrb_long method = REML;
class time cid cgroup;
model cstd = time|cgroup / solution;
random int /subject = cid;
run;

proc mixed data = ebrb_long method = REML;
class cid time cgroup csite;
model cstd = time|cgroup /solution;
random int/subject = csite type = VC;
random int/subject = cid(csite) type = UN;
run;



PROC MIXED data = ebrb_long;
CLASS Time csite cgroup cid;
MODEL ndf=Time|cgroup/ddfm=satterthwaite ;
random csite;
REPEATED Time/Subject=cid(csite) Type=UN R;
RUN;

proc mixed method = reml data = ebrb_long;
class cid cgroup csite time;
model ndf = Time|cgroup/solution;
random int/subject = csite type = VC;
repeated Time/subject = cid(csite) type = UN;
run;



proc mixed data = ebrb_long noclprint noitprint covtest;
class csite;
model ndf = /solution;
random intercept /subject =csite;
run;

proc sgpanel data=ebrb_long;
panelby cgroup/columns=2;
reg y=ndf x=time/group=cid lineattrs=( pattern=1 thickness=1);
run;

proc sgpanel data=ebrb_long;
```

```
panelby cgroup/columns=2;
reg y=ndv x=time/group=cid lineattrs=( pattern=1 thickness=1);
run;

proc sgpanel data=ebrb_long;
panelby cgroup/columns=2;
reg y=ndd x=time/group=cid lineattrs=( pattern=1 thickness=1);
run;



proc means data = ebrb;
class csite;
var ndf ndf_post ndf_delta;
run;


proc glm data = ebrb;
class cgroup csex;
model ndv_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model ndd_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model nds_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model ndfa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cdpa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cdmvpa_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cstd_delta = cgroup cage csex/solution;
run;

proc glm data = ebrb;
class cgroup csex;
model cstd_imp_delta = cgroup cage csex/solution;
run;
```

```
proc glm data = ebrb;
class cgroup csex;
model bmi_delta = cgroup cage csex/solution;
lsmeans cgroup;
run;

proc glm data = ebrb;
class cgroup csex;
model bmiz_delta = cgroup cage csex/solution;
lsmeans cgroup;
run;

proc glm data = ebrb;
class cgroup csex;
model bmipct_delta = cgroup cage csex/solution;
lsmeans cgroup;
run;
```

Appendix F. Supplementary tables for Chapter 3

Table S1. Padres Preparados, Jóvenes Saludables of session structure, content, and participants.

Food preparation and family meal (all participants) Side dish recipes included veggie sticks and dip, mango salsa, guacamole, fruit-infused water, veggie toppings, fruit kabobs
Introduction to lesson activities (all participants)
Interactive segment part 1 (parents and youth separately) Parents - hopes and dreams for adolescents, parenting styles and practices, parenting across multiple cultures, adolescent developmental concepts, communication skills, rules, conflict management, monitoring and supervision, parent-adolescent connection (parents) Adolescents - hopes and dreams, how multiple cultures affect lifestyle choices, decision-making, communication skills, rules and choices, peer influence, family connection
Physical activity (all participants) Indoor cardio, dance, chair yoga, relays, agility ladder
Interactive segment part 2 (all participants) Parents and adolescents – energy balance concepts, recommendations and choices around fruit and vegetables, sugar sweetened beverages, sweets/salty snacks, fast food, physical activity and screen time, identifying and addressing barriers to healthy choices, label reading, marketing, meal and snack planning, purchasing healthy foods
Interactive segment part 3 (parents and youth separately) Parents – apply parenting practices to adolescent EBRBs (setting expectations, role modeling, making healthy choices available) through role play, scenarios Adolescents – activities to further interact with lesson content around healthy food and activity behaviors
Review and goal setting (all participants)

Table S2. Padres Preparados, Jóvenes Saludables session topics and objectives.

Topics	Adolescent objectives	Parent objectives
Session 1 Positive parenting and healthy habits	Articulate why maintaining a healthy lifestyle and healthy self-image is important. Reflect on their current eating and physical activity behaviors. Recognize the influence of eating and physical activity behaviors on energy balance. Value youth and parent roles in healthy lifestyle as a family.	Assess family use of energy balance-related behaviors (EBRBs) to support health. Describe importance of EBRBs for adolescent health goals. Identify key elements of a positive parenting style that will help parents encourage EBRBs. Recognize and reflect on how parenting styles influence adolescent EBRBs.
Session 2 Multiple cultures and active lifestyles	Recognize the benefits of navigating multiple worlds and having a strong family connection. Explain how physical activity contributes to energy balance and the importance of meeting recommendations. Identify strategies with parent involvement to be physically active. Set and monitor goals for meeting physical activity recommendations with parents.	Reflect upon immigrant experience and implications for adolescent health and physical activity. Appreciate and identify attitudes and skills associated with navigating across different cultures and effects on EBRBs. Explain the recommendations for and benefits of physical activity and contribution to energy balance. Apply parenting practices to increase adolescent physical activity.
Session 3 Adolescent development and healthy eating	Reflect on decision-making processes to make healthy eating and physical activity decisions. Explain how fruits and vegetables contribute to energy balance and the importance of increasing fruit and vegetable intake. Identify strategies with parent involvement to increase fruit and vegetable consumption. Set and monitor goals to meet recommendations for fruit and vegetable consumption with parents.	Reflect on experience as adolescents and how adolescents are experiencing adolescence. Explain teen brain development and function, how it differs from adults, and implications for parenting practices. Explain the three stages of adolescent development, the purpose of adolescence and impact of family stress. Identify the benefits of eating fruits / vegetables, recommended portion sizes, and daily intake. Apply parenting practices to increase adolescent fruit and vegetable intake.

Session 4 Communication and limiting screen time	Apply positive communication skills. Explain how screen time influences energy balance and the importance of reducing screen time. Apply strategies with parent involvement to manage screen time. Set and monitor goals of screen time activities with parents.	Explain specific positive communication skills that promote mutual respect and trust between parents and adolescents. Explain the benefits of reducing and limiting screen time for parents and adolescents. Identify strategies to help teens reduce and limit screen time using parenting practices. Role play the use of active listening skills and "I" messages when reducing and limiting screen time with adolescents.
Session 5 Family rules and healthy beverages	Explain how sugary drinks influence energy balance and the importance of reducing intake of sugary drinks. Select healthy beverages in different settings. Identify and apply strategies with parent involvement to overcome barriers to reducing sugary drink consumption. Set and monitor goals of limiting sugary drink consumption with parents.	Explain the importance of establishing clear negotiable and non-negotiable rules for adolescents. Distinguish between punishment and discipline. Describe how to use positive reinforcement as a tool for discipline and relationship building. Explain the benefits of limiting sugar sweetened beverages for parents and adolescents and set goals to limit intake. Use sugar sweetened beverage label information and parenting practices to influence adolescent and parent beverage selection.
Session 6 Managing conflicts and healthy snacks	Recognize the importance of setting and following rules in families. Explain how sweets and salty snacks influence energy balance and the importance of eating healthy alternatives. Identify and apply strategies with parent involvement to select healthy snack options in different settings. Set and monitor goals of limiting sugary snacks.	View conflict as a normal part of adolescent growth and parenting. Develop collaborative conflict/anger management strategies. Explain the health benefits of limiting sweets and salty snacks for parents and adolescents. Use information on food labels to make healthy snack choices. Apply key parenting practices to limit intake of sweets/salty snacks.

Session 7 Supervision and fast food	Manage peer influence to support healthy behaviors. Explain how fast food influences energy balance and the importance of reducing fast food intake. Identify and apply strategies with parent involvement to overcome barriers to reducing fast food consumption. Set goals and monitor the consumption of fast food with parents.	Define and explain the importance of monitoring and supervising teenager's time and behavior. Distinguish the levels of supervision based on age, environment and personality. Identify health benefits of limiting fast food and portion sizes. Apply key parenting practices and monitoring strategies to limit and reduce fast food intake. Identify strategies for teens to handle peer pressure to eat at fast food restaurants and/or make unhealthy food choices.
Session 8 Family connection and family meals	Explain importance of family meals and how family meals contribute to energy balance. Appreciate importance of achieving energy balance via healthy lifestyle. behaviors with parent involvement. Recognize youth's role in leading healthy lifestyles in the family.	Describe the importance of parent-adolescent bonding and how to overcome barriers to strong bonds. Practice skills for bonding with adolescents and responding to their bid for connection. Explain health benefits of increasing family meal frequency. Describe "healthy" family meals and plan menus for 3 family meals for next week. Apply key parenting practices to increase frequency of family meals.

Table S3. Father baseline outcome measures.

Outcomes	All n = 103	Control n = 52	Intervention n = 51	p-value
Diet outcomes, mean (SD)				
Fruit intake, serving/day	2.22 (1.02)	2.08 (0.87)	2.36 (1.14]	0.203[a] 0.296[b]
Vegetable intake, serving/day	2.02 (1.09)	1.90 (1.04)	2.13 (1.13)	0.305[a] 0.449[b]
Diet outcomes, n (%)				
SSB[c] intake				
<2	31 (30.0)	19 (36.5)	12 (23.5)	0.150[d]
≥2	72 (70.0)	33 (63.5)	39 (76.5)	
Sweets and salty snack[c] intake				
<2	20 (19.4)	10 (19.2)	10 (19.6)	0.961[d]
≥2	83 (80.6)	42 (80.8)	41 (80.4)	
Fast food[c] intake				
<2	11 (10.7)	5 (9.6)	6 (11.8)	0.724[d]
≥2	92 (89.3)	47 (90.4)	45 (88.2)	
Weekly times per week of physical activity[e] and daily screen time[f] outcomes, mean (SD)				
Physical activity, times/week	5.97 (4.09)	5.16 (3.60)	6.79 (4.43)	0.050[a] 0.100[b]
Screen time, hours/day	3.02 (2.17)	3.04 (2.26)	3.00 (2.10)	0.913[a] 0.073[b]
BMI outcomes, mean (SD)				
Father BMI	29.91 (3.68)	29.98 (3.45)	29.84 (3.93)	0.847[a] 0.677[b]

[a] two-sample t-test of difference in means; [b] non-parametric Wilcoxon rank sum test of difference in distributions; [c] Response options (1=no, 2=yes, sometimes, 3= yes, usually, 4=yes, always) were dichotomized as less than 2 and more than and equal to 2; [d] Chi square test; [e] More than 15 minutes counts 1 time; [f] Top coded at 10 hours / day, screen time hours for 3 was calculated from 6-7 items missing 1-2 of 8 item.

Table S4. Adolescent baseline outcome measures.

Outcomes	All n = 110	Intervention n = 54	Control n = 56	p-value
Number of NDSR[c] diet recalls, mean (SD)	2.4 (0.8)	2.4 (0.8)	2.4 (0.8)	0.976[a] 0.979[b]
Diet outcomes, mean (SD)				
Fruit intake, NDSR serving/day	1.47 (1.41)	1.71 (1.75]	1.24 (0.95)	0.083[a] 0.325[b]
Vegetable intake, NDSR serving/day	1.63 (1.32)	1.81 (1.46)	1.46 (1.15)	0.166[a] 0.245[b]
SSB intake, NDSR serving/day	0.45 (0.60)	0.46 (0.58)	0.45 (0.63)	0.905[a] 0.748[b]
Sweets/salty snack intake, NDSR serving/day	1.74 (1.42)	1.72 (1.35)	1.76 (1.50)	0.879[a] 0.889[b]
Fast food intake, NDSR serving/day	0.43 (0.77)	0.54 (0.90)	0.33 (0.60)	0.161[a] 0.514[b]
Daily hours of physical activity[d] and screentime[e] outcomes, mean (SD)				
Physical activity, hours/day	0.64 (0.57)	0.69 (0.57)	0.58 (0.57)	0.314[a] 0.130[b]
Screen time, hours/day	4.71 (3.05)	5.18 (3.02)	4.24 (3.03)	0.106[a] 0.073[b]
BMI outcome, mean (SD)				
BMI percentile	78.6 (23.9)	80.5 (21.0)	76.7 (26.4)	0.403[a] 0.941[b]

[a] two-sample t-test of difference in means; [b] non-parametric Wilcoxon rank sum test of difference in distributions; [c] NDSR= Nutrition Data System for Research; [d] Top coded at 2 hours / day; [e] Top coded at 10 hours / day, screen time hours for 3 was calculated from 6-7 items missing 1-2 of 8 items.

Appendix G. Post-Hoc Power and Sample Size Calculation Table for Chapter 4

Table S1. Adolescent-reported parenting practices mean (SD) for groups and post-hoc power and sample size calculations.

	Baseline		**Post**		**Post-baseline change, mean (SD)**							
Adolescent-reported paternal parenting practices	**N**	**All mean (SD)**	**N**	**All mean (SD)**	**N for change (n=110)**	**All mean (SD)**	**N for Int.[a] (n=54)**	**Int.[a] mean (SD)**	**N for control[a] (n=56)**	**Control[a] mean (SD)**	**Power to detect mean change difference as significant**	**Sample size per group needed for 80% power**
Setting expectations/limits												
Fruit	83	2.33 (0.75)	92	2.48 (0.80)	77	0.14 (0.85)	39	0.28 (0.89)	38	0 (0.81)	29%	147
Vegetable	90	2.4 (0.83)	92	2.61 (0.66)	81	0.19 (0.84)	42	0.24 (1.03)	39	0.13 (0.57)	9%	901
SSB[b]	96	1.75 (1.04)	94	1.63 (1.07)	86	-0.09 (1.01)	41	-0.05 (1.02)	45	-0.13 (1.01)	6%	2,529
Sweets/salty snack[b]	93	1.84 (1.08)	93	1.62 (0.95)	84	-0.20 (1.03)	39	-0.31 (0.95)	45	-0.11 (1.09)	14%	412
Fast food[b]	96	1.46 (0.83)	96	1.43 (0.82)	89	0.02 (0.94)	43	0 (1.02)	46	0.04 (0.87)	5%	8,822
Physical activity	85	2.64 (0.97)	93	2.55 (1.08)	80	-0.06 (1.08)	44	-0.23 (1.14)	36	0.14 (0.99)	33%	132
Screen time[b]	90	2.56 (1.08)	83	2.48 (0.99)	74	-0.06 (1.08)	36	-0.25 (0.81)	38	0.21 (0.96)	59%	60
Role modeling												
Fruit	106	3.00 (1.23)	106	2.93 (1.04)	102	-0.05 (1.00)	52	-0.02 (1.09)	50	-0.08 (0.91)	6%	4399
Vegetable	108	3.21 (1.07)	107	3.20 (1.03)	105	-0.005 (1.00)	53	0.05 (1.14)	52	-0.06 (0.84)	8%	1303

SSB	109	2.20 (0.98)	106	1.92 (0.90)	105	-0.28 (0.91)	52	-0.48 (0.91)	53	-0.08 (0.91)	60%	83
Sweets/salty snack	108	1.74 (0.73)	107	1.69 (0.67)	105	-0.05 (0.71)	51	-0.19 (0.63)	54	0.07 (0.77)	46%	116
Fast food	109	1.93 (0.82)	108	1.88 (0.85)	107	-0.07 (0.72)	53	-0.15 (0.65)	54	0.02 (0.78)	22%	282
Physical activity	108	3.17 (1.05)	108	3.15 (0.96)	106	-0.04 (0.84)	53	-0.09 (0.89)	53	0.01 (0.78)	9%	1101
Screen time	108	3.01 (1.09)	108	2.97 (1.02)	106	-0.04 (1.24)	54	-0.06 (1.43)	52	-0.02 (1.02)	5%	15,143
Availability												
Fruit	109	3.35 (1.05)	107	3.50 (1.01)	106	0.13 (0.81)	53	0.09 (0.81)	53	0.17 (0.82)	7%	1631
Vegetable	108	3.20 (1.14)	108	3.38 (1.16)	106	0.16 (0.90)	53	0.29 (1.01)	53	0.03 (0.76)	31%	187
SSB	109	1.92 (0.79)	108	1.81 (0.74)	107	-0.11 (0.73)	53	-0.20 (0.75)	54	-0.03 (0.72)	21%	295
Sweets/salty snack	110	2.01 (0.82)	108	1.94 (0.79)	108	-0.08 (0.79)	54	-0.17 (0.74)	54	0.01 (0.83)	21%	301
Fast food	110	1.87 (0.74)	108	1.90 (0.74)	108	0.03 (0.64)	54	-0.07 (0.55)	54	0.14 (0.71)	39%	145
Physical activity	110	3.38 (1.10)	108	3.32 (1.06)	108	-0.08 (0.99)	54	-0.02 (0.99)	54	-0.15 (0.99)	10%	912
Screen time	110	2.95 (1.13)	108	2.85 (1.17)	108	-0.08 (1.31)	54	-0.19 (1.21)	54	0.02 (1.39)	13%	606

[a] Int. = Intervention group, control= delayed-treatment control group; [b]77=as much as I can option was coded as the highest level before 77=as much as I can option for the SSB, sweets/salty snacks, fast food, and screen time. 66= I don't know was coded as missing.

Table S2. Father-reported parenting practices mean (SD) for groups and post-hoc power and sample size caluclations.

	Baseline		Post		Post-baseline change, mean (SD)							
Father-reported paternal parenting practices	**N**	**All, mean (SD)**	**N**	**All mean (SD)**	**N for change (n=96)**	**All mean (SD)**	**N for Int.[a] (n=47)**	**Int.[a] mean (SD)**	**N for control[a] (n=49)**	**Control[a] mean (SD)**	**Power to detect mean change difference as significant**	**Sample size per group needed for 80% power**
Setting expectations/limits												
Fruit[b]	95	2.12 (0.84)	96	2.32 (0.84)	95	0.21 (0.97)	46	0.15 (0.99)	49	0.27 (0.95)	9%	1,028
Vegetable[b]	92	2.18 (0.89)	94	2.36 (0.88)	90	0.19 (1.09)	44	0 (1.03)	46	0.37 (1.12)	36%	134
SSB[b]	93	1.74 (1.24)	93	1.43 (1.18)	90	-0.34 (1.35)	43	-0.56 (1.53)	47	-0.15 (1.14)	29%	172
Sweets/salty snack[b]	94	1.72 (1.09)	95	1.45 (0.83)	93	-0.27 (1.27)	45	-0.36 (1.33)	48	-0.19 (1.21)	9%	880
Fast food[b]	95	1.20 (0.92)	92	1.10 (0.71)	91	-0.08 (0.93)	44	-0.05 (0.75)	47	-0.11 (1.09)	6%	3.820
Physical activity[b]	91	2.81 (1.08)	94	2.77 (1.16)	89	-0.06 (1.38)	43	0 (1.57)	46	-0.11 (1.20)	6%	2.536
Screen time[b]	92	2.60 (1.08)	94	2.40 (1.08)	90	-0.18 (1.04)	43	-0.26 (1.16)	47	-0.11 (0.94)	10%	779
Role modeling												
Fruit	90	3.21 (0.94)	87	3.32 (0.95)	81	0.15 (0.93)	40	0.40 (1.04)	41	-0.09 (0.75)	66%	55
Vegetable	94	3.20 (0.95)	92	3.31 (0.96)	90	0.11 (1.07)	46	0.07 (0.05)	44	0.15 (1.10)	7%	1490
SSB	96	2.33 (1.03)	93	1.99 (0.92)	93	-0.33 (1.01)	45	-0.39 (1.08)	48	-0.27 (0.95)	8%	1130

Sweets/salty snack	96	1.92 (0.88)	95	1.83 (0.80)	95	-0.09 (0.86)	47	-0.22 (0.91)	48	0.04 (0.80)	30%	172
Fast food	94	1.86 (0.72)	94	1.75 (0.67)	92	-0.11 (0.67)	44	-0.24 (0.74)	48	0 (0.59)	39%	124
Physical activity	92	2.69 (1.11)	96	2.79 (0.93)	92	0.08 (0.95)	47	0.20 (0.99)	45	-0.04 (0.90)	22%	246
Screen time	95	2.84 (1.07)	94	2.90 (1.01)	93	0.06 (1.21)	46	-0.25 (1.16)	47	0.35 (1.18)	68%	61
Availability												
Fruit	96	4.05 (0.73)	95	4.03 (0.79)	95	-0.03 (0.70)	47	0.04 (0.69)	48	-0.10 (0.70)	16%	389
Vegetable	95	3.92 (0.85)	96	3.95 (0.77)	95	0.03 (0.83)	47	-0.01 (0.88)	48	0.06 (0.80)	6%	2268
SSB	95	1.79 (0.59)	96	1.70 (0.70)	95	-0.09 (0.66)	46	-0.19 (0.66)	49	0.01 (0.66)	30%	172
Sweets/salty snack	96	1.82 (0.65)	96	1.68 (0.72)	96	-0.14 (0.91)	47	-0.30 (0.72)	49	0.02 (1.04)	41%	124
Fast food	96	1.91 (0.64)	96	1.99 (0.70)	96	0.08 (0.69)	47	-0.13 (0.58)	49	0.28 (0.73)	85%	42
Physical activity	94	3.77 (0.92)	95	3.81 (0.83)	93	0.04 (0.76)	47	0.07 (0.82)	46	0.01 (0.71)	6%	2568
Screen time	94	3.09 (1.09)	96	2.99 (0.91)	94	-0.07 (1.18)	46	-0.11 (1.32)	48	-0.04 (1.05)	5%	4560

[a]Int. = Intervention group, control= delayed-treatment control group; [b]77=as much as I can option was coded as the highest level before 77=as much as I can option for all of the expectation/limit items.

Appendix H. SAS Codes for Statistical Analysis in Chapter 4

Father-reported paternal parenting practices

```
**********************************************************************
**;
**********************************************************************
**;
******Program to evaluate Pre Post changes in parent practice****
*******;
*********Limit this analysis to sample fc_pre_dyad_cpost_pp = 1
*********;
************Includes Father Child Pre dyads and child post data
*********;
************Excluding 2 Intervention gr families with no attendance
*****;
***********Keep analysis variables and rename for Post
******************;
***********to compare Pre-Post demographics
*****************************;
***********Use long form for Mixed models to account for site clusters
**;
**********************************************************************
**;
***********cf_parent_practice.sas
***************************************;
**********************************************************************
**;
*******This analysis is limited to 96 with Pre and Post father data
*****;
**********************************************************************
**;

PROC IMPORT OUT= WORK.fc_long
            DATAFILE=  "C:\Users\balta026\Desktop\New
analysis\fc_prepost_long_112020.xlsx"
            DBMS= xlsx replace;
     GETNAMES=YES;
      *guessingrows = 200;
RUN;

proc contents data= fc_long order = varnum;
run;

***Flow chart numbers;
proc freq data = fc_long;
where pre_post = 1 and father_pre = 1;
tables fgroup fattend;
run;

proc freq data = fc_long;
where pre_post = 1 and father_pre = 1;
tables fgroup*fattend;
run;
```

```
proc freq data = fc_long;
where pre_post = 1 and father_pre = 1;
tables fgroup*fattend;
run;
proc freq data = fc_long;
where pre_post = 1 ;
tables fgroup fattend;
run;

proc freq data = fc_long;
where pre_post = 1 and fc_pre_dyad_pp = 1 ;
tables fgroup fattend;
run;

****data checks of variables for parenting scales
**********************;
proc freq data = fc_long;
where pre_post = 1;
tables ff1 fv1 fd1 fs1 fff1 fp1 fst1;
title 'Pre tables of father expectations';
title2 'code 77 is for As much as they want';
run;

*******Pre medians from this data to set High/Low cutpoints
**************************;
proc means data = fc_long n median;
where pre_post = 1;
var ff1 fv1 fd1 fs1 fff1 fp1 fst1 ff2 ff3 fv2 fv3 fd2 fd3 fs2 fs3 fff2
fff3 fp2 fp3 fst2 fst3
ff6 ff7 ff9 fv6 fv7 fv9 fd6 fd7 fd8 fs6 fs7 fs8 fff6 fff7 fff8 fp6 fp7
fp8 fst6;
title 'check median values for cutpoints of High and Low';
run;

proc freq data = fc_long;
where pre_post = 2;
tables ff1 fv1 fd1 fs1 fff1 fp1 fst1;
title 'Post tables of father expectations';
title2 'code 77 is for As much as they want';
run;

********Behavior modeling variables ******************************;
proc freq data= fc_long;
tables ff2 ff3 fv2 fv3 fd2 fd3 fs2 fs3 fff2 fff3 fp2 fp3 fst2 fst3;
run;

******check how consistent the two items are before averaging *******;
proc freq data = fc_long;
tables ff2*ff3 fv2*fv3 fd2*fd3 fs2*fs3 fff2*fff3 fp2*fp3 fst2*fst3;
run;

*******Availability variables
*******************************************************;
proc freq data= fc_long;
tables ff6 ff7 ff9 fv6 fv7 fv9 fd6 fd7 fd8 fs6 fs7 fs8 fff6 fff7 fff8
fp6 fp7 fp8 fst6;
run;
```

```
*********Father youth communication items
********************************************;
***********openness
******************************************************************;
proc freq data= fc_long;
where pre_post = 1;
tables fc2 fc4 fc5 fc8 fc9 fc10 fc13 fc14 fc15 fc16 fc17;
run;

proc corr alpha data = fc_long;
where pre_post = 1;
var fc2 fc4 fc5 fc8 fc9 fc10 fc13 fc14 fc15 fc16 fc17;
********Cronbach alpha for openness scale = 0.90
***************************************;
run;

*********satisfaction
*******************************************************************;
proc freq data= fc_long;
where pre_post = 1;
tables fc6 fc18 fc19 fc20;
run;

proc corr alpha data= fc_long;
where pre_post = 1;
var fc6 fc18 fc19 fc20;
*********Cronbach alpha = 0.83
**********************************************;
run;

*********************comm_prob
**********************************************;
proc freq data= fc_long;
where pre_post = 1;
tables fc1 fc3 fc7 fc11 fc12;
run;

proc corr alpha data= fc_long;
where pre_post = 1;
var fc1 fc3 fc7 fc11 fc12;
*******Cronbach alpha = 0.70 ***********************************;
run;

********Responsibility and involvement items
***********************************************;
*********check data
***********************************************************************
*;
proc freq data= fc_long;
where pre_post = 1;
tables fr1 fr2 fr3 fr4 fr5 fr6 fr7 fin1 fin2 fin3;
*****************all are 1 - 5
**********************************************;
run;

proc corr alpha data = fc_long;
```

```
where pre_post = 1;
var fr1 fr2 fr3 fr4 fr5;
*********Cronbach alpha for 5 food resp items = 0.83
********************;
run;

proc corr alpha data = fc_long;
where pre_post = 1;
var fin1 fin2 fin3;
*********Cronbach alpha for 3 food inv items = 0.80
********************;
run;

data fc_long_check;
set fc_long;
food_resp = mean(fr1, fr2, fr3, fr4, fr5);
food_inv = mean(fin1, fin2, fin3);
comm_open = mean(fc2, fc4, fc5, fc8, fc9, fc10, fc13, fc14, fc15, fc16,
fc17);
comm_sat = mean(fc6, fc18, fc19, fc20);
comm_prob = mean( fc1, fc3, fc7, fc11, fc12);
run;

***************median values for food_meal_resp sum PA and ST resp
items *****;
proc means n mean median data = fc_long_check;
var food_resp food_inv fr6 fr7 comm_open comm_sat comm_prob;
******median food_resp = 3.6, food_inv = 3.0, PA_resp (fr6) = 3.0,
(fr7) = 4.0********;
*******median comm_open = 3.9, comm_sat = 4.0, comm_prob = 1.8
***********************;
******Define High resp as >= 4 Most of the time - Almost always or
always ************;
******Define High involvement as >= 3 Sometimes to Almost always or
always ***********;
*******Define High comm_open and comm_sat  as >= 4 Often to almost
always or always **;
*******Define High comm_prob as >=2 Rarely to Almost always or always
*****************;
*********Low communication prob is Almost never or never and less than
rarely ********;
*******High Low variables are defined below in fc_longb
******************************;
run;

/*
********check missing data in analysis data set
******************************;
data check;
set fc_long;
where fc_pre_dyad_cpost_pp = 1;
run;

proc print data = check;
where fd3 = 23 or fs3 = 66;
var famid fd3 fs3;
```

```
*********these 2 values were set to missing
*******************************************************;
run;

proc print data = check;
where pre_post = 1;
var famid ff1 fv2 fd1 fs1 fff1 fp1 fst1
ff2 fv2 fd2 fs2 fff2 fp2 fst2
ff3 fv3 fd3 fs3 fff3 fp3 fst3
ff6 fv6 fd6 fs6 fff6 fp6 fst6
ff7 fv7 fd7 fs7 fff7 fp7
ff9 fv9 fd8 fs8 fff8 fp8;
*******none are missing Pre father data by definition of dataset
**********************************;
run;

proc print data = check;
where pre_post = 2;
var famid ff1 fv2 fd1 fs1 fff1 fp1 fst1
ff2 fv2 fd2 fs2 fff2 fp2 fst2
ff3 fv3 fd3 fs3 fff3 fp3 fst3
ff6 fv6 fd6 fs6 fff6 fp6 fst6
ff7 fv7 fd7 fs7 fff7 fp7
ff9 fv9 fd8 fs8 fff8 fp8;
********all fathers with missing post outcome data are missing ff1
**********************************;
run;
*/

data fc_longb;
set fc_long;
*******create binary variables for father expectations, modeling and
availability ******;
*******code Low = 0 and High = 1
*******************************************************;
*******Cutpoints for Low and High are calculated from median
values******; **********************;
**********See code above for cutpoints and cronbach alphas
*****************************;
frt_exp2 = .;
if 0 <= ff1 <= 1 then frt_exp2 = 0;
if ff1 >= 2 then frt_exp2 = 1;
veg_exp2 = .;
if 0 <= fv1 <= 1 then veg_exp2 = 0;
if fv1 >= 2 then veg_exp2 = 1;
ssb_exp2 = .;
if fd1 >= 3 then ssb_exp2 = 0;
if 0 <= fd1 <= 2 then ssb_exp2 = 1;
snack_exp2 = .;
if fs1 >= 3 then snack_exp2 = 0;
if 0 <= fs1 <= 2 then snack_exp2 = 1;
ff_exp2 = .;
if fff1 >= 2 then ff_exp2 = 0;
if 0 <= fff1 <= 1 then ff_exp2 = 1;
********cutpoint for pa_exp2 changed from Table 5 because FP1 median =
3 **********;
pa_exp2 = .;
```

```
if 0 <= fp1 <= 2 then pa_exp2 = 0;
if fp1 >= 3 then pa_exp2 = 1;
st_exp2 = .;
if fst1 >= 4 then st_exp2 = 0;
if 0 <= fst1 <= 3 then st_exp2 = 1;
***********create behavior modeling variables
*********************************************;
********average of the two items for each outcome is coded as High = 1
or Low = 0 **********;
*********if one of the two items is missing the outcome is
missing*****;
*******2 items set to missing because codes were >5
****************************************;
if fd3 = 23 then fd3 = .;
if fs3 = 66 then fs3 = .;
frt_mod_avg = (ff2+ff3)/2;
frt_mod2 = .;
if frt_mod_avg > 3 then frt_mod2 = 1;
if 1 <= frt_mod_avg <= 3 then frt_mod2 = 0;

veg_mod_avg = (fv2+fv3)/2;
veg_mod2 = .;
if veg_mod_avg > 3 then veg_mod2 = 1;
if 1 <= veg_mod_avg <= 3 then veg_mod2 = 0;

ssb_mod_avg = (fd2+fd3)/2;
ssb_mod2 = .;
if ssb_mod_avg > 2 then ssb_mod2 = 1;
if 1 <= ssb_mod_avg <= 2 then ssb_mod2 = 0;

snack_mod_avg = (fs2+fs3)/2;
snack_mod2 = .;
if snack_mod_avg > 2 then snack_mod2 = 1;
if 1 <= snack_mod_avg <= 2 then snack_mod2 = 0;

ff_mod_avg = (fff2+fff3)/2;
ff_mod2 = .;
if ff_mod_avg > 2 then ff_mod2 = 1;
if 1 <= ff_mod_avg <= 2 then ff_mod2 = 0;

pa_mod_avg = (fp2+fp3)/2;
pa_mod2 = .;
if pa_mod_avg > 3 then pa_mod2 = 1;
if 1 <= pa_mod_avg <= 3 then pa_mod2 = 0;

st_mod_avg = (fst2+fst3)/2;
st_mod2 = .;
if st_mod_avg > 3 then st_mod2 = 1;
if 1 <= st_mod_avg <= 3 then st_mod2 = 0;

***********Availability and Accessibility variables
*********************************;
*********all availability items are coded 0- 5
**************************************;
*******used average of 2 items if 1 is missing ************;
frt_av_avg = (ff6+ff7+ff9)/3;
if ff6 = . then frt_av_avg = (ff7+ff9)/2;
```

```
if ff7 = . then frt_av_avg = (ff6+ff9)/2;
if ff9 = . then frt_av_avg = (ff6+ff7)/2;
frt_av2 = .;
if frt_av_avg >= 4 then frt_av2 = 1;
if 1 <= frt_av_avg < 4 then frt_av2 = 0;

veg_av_avg = (fv6+fv7+fv9)/3;
if fv6 = . then veg_av_avg = (fv7+fv9)/2;
if fv7 = . then veg_av_avg = (fv6+fv9)/2;
if fv9 = . then veg_av_avg = (fv6+fv7)/2;
veg_av2 = .;
if veg_av_avg >= 4 then veg_av2 = 1;
if 1 <= veg_av_avg < 4 then veg_av2 = 0;

ssb_av_avg = (fd6+fd7+fd8)/3;
if fd6 = . then ssb_av_avg = (fd7+fd8)/2;
if fd7 = . then ssb_av_avg = (fd6+fd8)/2;
if fd8 = . then ssb_av_avg = (fd6+fd7)/2;
ssb_av2 = .;
if ssb_av_avg > 2 then ssb_av2 = 1;
if 1 <= ssb_av_avg <= 2 then ssb_av2 = 0;

snack_av_avg = (fs6+fs7+fs8)/3;
if fs6 = . then snack_av_avg = (fs7+fs8)/2;
if fs7 = . then snack_av_avg = (fs6+fs8)/2;
if fs8 = . then snack_av_avg = (fs6+fs7)/2;
snack_av2 = .;
if snack_av_avg > 2 then snack_av2 = 1;
if 1 <= snack_av_avg <= 2 then snack_av2 = 0;

ff_av_avg = (fff6+fff7+fff8)/3;
if fff6 = . then ff_av_avg = (fff7+fff8)/2;
if fff7 = . then ff_av_avg = (fff6+fff8)/2;
if fff8 = . then ff_av_avg = (fff6+fff7)/2;
ff_av2 = .;
if ff_av_avg > 2 then ff_av2 = 1;
if 1 <= ff_av_avg <= 2 then ff_av2 = 0;

pa_av_avg = (fp6+fp7+fp8)/3;
if fp6 = . then pa_av_avg = (fp7+fp8)/2;
if fp7 = . then pa_av_avg = (fp6+fp8)/2;
if fp8 = . then pa_av_avg = (fp6+fp7)/2;
pa_av2 = .;
if pa_av_avg >= 4 then pa_av2 = 1;
if 1 <= pa_av_avg < 4 then pa_av2 = 0;

*******screentime availability based on 1 item only
*******************************************;
st_av2 = .;
if fst6 >= 3 then st_av2 = 1;
if 1 <= fst6 < 3 then st_av2 = 0;

**********3 father youth communication outcomes
**************************************;
**********based on 20 communication items
*******************************************************;
```

```
comm_open = mean(fc2, fc4, fc5, fc8, fc9, fc10, fc13, fc14, fc15, fc16,
fc17);
comm_open2 = .;
if comm_open >= 4 then comm_open2 = 1;
if 1 <= comm_open <4 then comm_open2 = 0;

comm_sat = mean(fc6, fc18, fc19, fc20);
comm_sat2 = .;
if comm_sat >= 4 then comm_sat2 = 1;
if 1 <= comm_sat <4 then comm_sat2 = 0;

comm_prob = mean( fc1, fc3, fc7, fc11, fc12);
comm_prob2 = .;
if comm_prob >= 2 then comm_prob2 = 1;
if 1 <= comm_prob <2 then comm_prob2 = 0;

*********add High Low food_resp, pa_resp, st_resp, food_inv variables
************;
food_resp = mean(fr1, fr2, fr3, fr4, fr5);
food_resp2 = .;
if food_resp >= 4 then food_resp2 = 1;
if 1 <= food_resp <4 then food_resp2 = 0;

pa_resp2 = .;
if fr6 >= 4 then pa_resp2 = 1;
if 1<= fr6 <= 3 then pa_resp2 = 0;

st_resp2 = .;
if fr7 >= 4 then st_resp2 = 1;
if 1 <= fr7 <= 3 then st_resp2 = 0;

food_inv = mean(fin1, fin2, fin3);
food_inv2 = .;
if food_inv >= 3 then food_inv2 = 1;
if 1 <= food_inv <3 then food_inv2 = 0;

run;

proc format;
value age_c 0 = '8 - 12' 1= '>= 13';
value sex 1= 'Male' 2 = 'Female';
value age_f 0 = '21-40' 1 = '>40';
value inc 1 = '<$25K' 2 = '$25K -<$50K' 3 = '>= 50K';
value secure 0 = 'No food insecurity' 1 = 'food insecure';
value educ 1 = 'Middle school or less' 2 = 'HS grad or GRE'
             3 = 'College or Technical school';
value yrs_us 0 = '<10' 1 = '10 - <20' 2 = '20-<30' 3 = '>= 30';
value lang 0 = 'More Span than Eng' 1 = 'Equal Span & Eng' 2 = 'More
English';
value acc 1 = 'Low: 0-1' 2 = 'Moderate: 2' 3= 'High: 3-5';
value mar 1 = 'Married' 2 = 'Living with Partner' 3 =
'single/widow/divorced/separated';
value emp 1 = 'self-employed' 2 = 'unemployed/homemaker' 3 = 'PT' 4 =
'FT';
value safe 1 = 'safe n-hood' 2 = 'Unsafe n-hood';
value assist 0 = 'no financial assistance' 1 = 'Any assistance';
```

```
value bmi_f 1 = '< 18.5 Underwt' 2 = '18.5 - <25 Normal' 3 = '25 - <30
Overwt' 4 = '>= 30 Obese';
value high 1= 'High' 0 = 'Low';
run;

*******keep analysis data set and variables for father outcomes
analysis *****************;
data f_var;
set fc_longb;
label
 pre_post = 'Pre Post indicator'
 cagec = 'Child age group'
 csex = 'Child sex'
 fagec = 'Father age group'
 fincc = 'Father income group'
 ffs = 'Food security (from 2 questions)'
 feduc = 'Father education group'
 fusc = 'Father years in US'
 flanc = 'Father language group'
 fmarc = 'Father marital status'
 fempc = 'Father employment group'
 fnsc = 'Neighborhood safety (from 2 questions)'
 ffinc = 'Financial assistance'
 cbmigrp = 'Child weight group'
 fbmigrp = 'Father weight group'
 cvpa = 'child weekly vigorous PA'
 cmpa = 'Child weekly moderate PA'
 cmildpa = 'Child weekly mild PA'
 cmvpa = 'Child weekly mod/vigorous PA'
 cpa ='Child weekly PA: mild, mod, vigorous'
 csw = 'Child weekly screen time'
 cdpa = 'Child daily PA topcoded at 2 hrs'
 cdmvpa = 'Child daily MVPA topcoded at 2 hrs'
 cstd = 'Child daily screentime topcoded at 10 hrs'
 bmi = 'Child BMI'
 bmiz = 'Child BMI z-score'
 bmipct = 'Child BMI percentile from CDC code'
 frt_exp2 = 'father fruit expectation'
 veg_exp2 = 'father veg expectation'
 ssb_exp2 = 'father SSB expectation'
 snack_exp2 = 'father snack expectation'
 ff_exp2 = 'father Fast food expectation'
 pa_exp2 = 'father PA expectation'
 st_exp2 = 'father ST expectation'
 frt_mod2 = 'father fruit modeling'
 veg_mod2 = 'father vsg modeling'
 ssb_mod2 = 'father SSB modeling'
 snack_mod2 = 'father snack modeling'
 ff_mod2 = 'father Fast Food modeling'
 pa_mod2 = 'father PA modeling'
 st_mod2 = 'father ST modeling'
 frt_av2 = 'father frt availability'
 veg_av2 = 'father veg availability'
 ssb_av2 = 'father SSB availability'
 snack_av2 = 'father snack availability'
 ff_av2 = 'father Fast Food availability'
 pa_av2 = 'father PA availability'
```

```
 st_av2 = 'father ST availability'
 comm_open2 = 'f-y open communication'
 comm_sat2 = 'f-y satis communication'
 comm_prob2 = 'f-y communication problem'
 food_resp2 = 'father food meal responsibility'
 pa_resp2 = 'father PA responsibility'
 st_resp2 = 'father ST responsibility'
 food_inv2 = 'father food meal involvement';

keep famid cid fid csite fsite crandom frandom cgroup fgroup
totalsessions cattend fattend ff1 fv1 fd1 fs1 ff1 fp1 fst1
c_pre_miss_ndsr c_pre_miss_survey c_post_miss_ndsr c_post_miss_survey
child_pre c_pre_pp c_pre_miss_ndsr c_pre_miss_survey child_post
c_post_pp c_post_miss_ndsr c_post_miss_survey
child_pre_post child_pre_post_pp father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp
pre_post cage cagec cage_elig csex
fage fagec fsex fre fch fad ffm2
finc fincc ffs feduc fus fcob fusc flan flanc
fmarc fempc fnsc ffin ffinc n_hh fbmi fbmigrp frt_exp2 veg_exp2
ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
food_resp2 food_inv2 pa_resp2 st_resp2
comm_open2 comm_sat2 comm_prob2;
format cagec age_c. csex sex. fagec age_f. fincc inc. ffs secure. feduc
educ.
fusc yrs_us. flanc lang. fmarc mar. fempc emp. fnsc safe.
ffinc assist.  fbmigrp bmi_f.
frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2 food_resp2
food_inv2 pa_resp2 st_resp2
comm_open2 comm_sat2 comm_prob2 high.;
run;


/*
proc freq data= fc_var;
where pre_post = 1;
tables frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2;
title 'Pre parent behavior variables in full data ';
run;

proc freq data= fc_var;
where pre_post = 2;
tables frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2;
title 'Post parent behavior variables in full data';
run;
*/
```

```
*******set per protocol  analysis data set***********
***************************************;
data fc_dyad_long;
********for primary PP analysis use this dataset
******************************;
set f_var;
where fc_pre_dyad_cpost_pp = 1;
*******for sensitivity ITT analysis use this dataset
***************************;
*where fc_pre_dyad_cpost = 1;
run;

***********IDs with non-missing Post data
*****************************************************;
***********Run this to merge with Per Protocol data to identify
analysis dat of N = 96 *******;
data father_post;
set fc_dyad_long;
where pre_post = 2 and ff1 ne .;
post_ind = 1;
keep famid post_ind;
*********there are 96 observations with post father data
***************************************;
*********limit the effective analysis to N = 96
************************************************;
run;

*******Now limit this data set to 96 fathers with both Pre and Post
data *********************;

proc sort data = fc_dyad_long;
by famid;
run;

proc sort data = father_post;
by famid;
run;

data father_dyad;
merge fc_dyad_long father_post;
by famid;
run;

data father_long;
set father_dyad;
where post_ind = 1;
********data father_long has 96 famids with Pre and Post record for
each *************;
run;

proc contents data= father_long;
run;

*********Father Pre-Post data overview statistics **************;
proc means data= father_long mean stddev median Q1 Q3 min max;
where cgroup = 'I' and pre_post = 1;
var fattend;
```

```
run;

proc freq data= father_long;
where pre_post = 1;
tables csite cgroup crandom*cgroup;
run;

data f_pre;
set father_long;
where pre_post = 1;
run;

proc contents data = f_pre;
run;

*******Table 1 is Pre data for N = 96 fathers in Pre-Post analysis ;

proc freq data = f_pre;
tables csex fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc;
title 'Table 1 All';
run;

proc means data =f_pre n mean stddev median Q1 Q3 min max maxdec = 2;
var cage fage fbmi fch fad n_hh;
run;

proc freq data = f_pre;
tables (csex fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc)*cgroup/chisq exact;
title 'Table 1 by group';
run;

proc means data= f_pre n mean stddev median min max maxdec=2 ;
class cgroup;
var cage fage fbmi fch fad n_hh;
run;

proc ttest data =f_pre plots = none;
class cgroup;
var cage fage fbmi fch fad n_hh;
run;

 *******Limit Pre Father outcome descriptive stats to N = 96 dataset
*************************;
proc freq data= f_pre;
tables  ff1 fv1 fd1 fs1 ff1 fp1 fst1;
title 'Pre Father variables ';
title2 'variable options';
run;

proc freq data= f_pre;
tables  frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
comm_open2 comm_sat2 comm_prob2 food_resp2 pa_resp2 st_resp2 food_inv2;
title 'Pre Father variables in analysis data set';
```

```
run;

proc freq data= f_pre;
tables (frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
comm_open2 comm_sat2 comm_prob2 food_resp2 pa_resp2 st_resp2
food_inv2)*cgroup/chisq;
title 'Pre father behavior variables by Control and Intervention in
analysis data set';
run;

proc freq data= father_long;
where pre_post = 2;
tables frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
comm_open2 comm_sat2 comm_prob2 food_resp2 pa_resp2 st_resp2 food_inv2;
title 'Post father behavior variables';
run;
*********Create the Pre and Post datasets for comparisons
************************;
data pre_practice;
set father_long;
where pre_post = 1;
frt_exp_pre = frt_exp2;
veg_exp_pre = veg_exp2;
ssb_exp_pre = ssb_exp2;
snack_exp_pre = snack_exp2;
ff_exp_pre = ff_exp2;
pa_exp_pre = pa_exp2;
st_exp_pre = st_exp2;
frt_mod_pre= frt_mod2;
veg_mod_pre = veg_mod2;
ssb_mod_pre = ssb_mod2;
snack_mod_pre = snack_mod2;
ff_mod_pre = ff_mod2;
pa_mod_pre = pa_mod2;
st_mod_pre = st_mod2;
frt_av_pre = frt_av2;
veg_av_pre = veg_av2;
ssb_av_pre = ssb_av2;
snack_av_pre = snack_av2;
ff_av_pre = ff_av2;
pa_av_pre = pa_av2;
st_av_pre = st_av2;
comm_open_pre = comm_open2;
comm_sat_pre = comm_sat2;
comm_prob_pre = comm_prob2;
food_resp_pre = food_resp2;
pa_resp_pre = pa_resp2;
st_resp_pre = st_resp2;
food_inv_pre = food_inv2;
format frt_exp_pre veg_exp_pre ssb_exp_pre snack_exp_pre
ff_exp_pre pa_exp_pre st_exp_pre
frt_mod_pre veg_mod_pre ssb_mod_pre snack_mod_pre
ff_mod_pre pa_mod_pre st_mod_pre
```

```
frt_av_pre veg_av_pre ssb_av_pre snack_av_pre
ff_av_pre pa_av_pre st_av_pre
comm_open_Pre comm_sat_pre comm_prob_pre
food_resp_pre pa_resp_pre st_resp_pre food_inv_pre high.;
keep famid cid cgroup csite
csex cage fage feduc frt_exp_pre veg_exp_pre ssb_exp_pre snack_exp_pre
ff_exp_pre pa_exp_pre st_exp_pre
frt_mod_pre veg_mod_pre ssb_mod_pre snack_mod_pre
ff_mod_pre pa_mod_pre st_mod_pre
frt_av_pre veg_av_pre ssb_av_pre snack_av_pre
ff_av_pre pa_av_pre st_av_pre
comm_open_Pre comm_sat_pre comm_prob_pre
food_resp_pre pa_resp_pre st_resp_pre food_inv_pre;
run;

data post_practice;
set father_long;
where pre_post = 2;
frt_exp_post = frt_exp2;
veg_exp_post = veg_exp2;
ssb_exp_post = ssb_exp2;
snack_exp_post = snack_exp2;
ff_exp_post = ff_exp2;
pa_exp_post = pa_exp2;
st_exp_post = st_exp2;
frt_mod_post= frt_mod2;
veg_mod_post = veg_mod2;
ssb_mod_post = ssb_mod2;
snack_mod_post = snack_mod2;
ff_mod_post = ff_mod2;
pa_mod_post = pa_mod2;
st_mod_post = st_mod2;
frt_av_post = frt_av2;
veg_av_post = veg_av2;
ssb_av_post = ssb_av2;
snack_av_post = snack_av2;
ff_av_post = ff_av2;
pa_av_post = pa_av2;
st_av_post = st_av2;
comm_open_post = comm_open2;
comm_sat_post = comm_sat2;
comm_prob_post = comm_prob2;
food_resp_post = food_resp2;
pa_resp_post = pa_resp2;
st_resp_post = st_resp2;
food_inv_post = food_inv2;
format frt_exp_post veg_exp_post ssb_exp_post snack_exp_post
ff_exp_post pa_exp_post st_exp_post
frt_mod_post veg_mod_post ssb_mod_post snack_mod_post
ff_mod_post pa_mod_post st_mod_post
frt_av_post veg_av_post ssb_av_post snack_av_post
ff_av_post pa_av_post st_av_post
comm_open_post comm_sat_post comm_prob_post
food_resp_post pa_resp_post st_resp_post food_inv_post high.;
keep famid cid frt_exp_post veg_exp_post ssb_exp_post snack_exp_post
ff_exp_post pa_exp_post st_exp_post
frt_mod_post veg_mod_post ssb_mod_post snack_mod_post
```

```
ff_mod_post pa_mod_post st_mod_post
frt_av_post veg_av_post ssb_av_post snack_av_post
ff_av_post pa_av_post st_av_post
comm_open_post comm_sat_post comm_prob_post
food_resp_post pa_resp_post st_resp_post food_inv_post;
run;

proc sort data = pre_practice;
by famid;
run;

proc sort data = post_practice;
by famid;
run;

data practice;
merge pre_practice post_practice;
by famid;
run;


proc sort data = practice;
by cgroup;
run;

*****McNemar test for Pre Post change within each group
**********************************;
proc freq data= practice;
by cgroup;
tables frt_exp_pre*frt_exp_post veg_exp_pre*veg_exp_post
ssb_exp_pre*ssb_exp_post
snack_exp_pre*snack_exp_post ff_exp_pre*ff_exp_post
pa_exp_pre*pa_exp_post
st_exp_pre*st_exp_post/agree;
title 'McNemar chi-square for change in parent expectations by
Intervention and Control';
run;

proc freq data= practice;
by cgroup;
tables frt_mod_pre*frt_mod_post veg_mod_pre*veg_mod_post
ssb_mod_pre*ssb_mod_post
snack_mod_pre*snack_mod_post ff_mod_pre*ff_mod_post
pa_mod_pre*pa_mod_post
st_mod_pre*st_mod_post/agree;
title 'McNemar chi-square for change in behavior modeling by
Intervention and Control';
run;

proc freq data= practice;
by cgroup;
tables frt_av_pre*frt_av_post veg_av_pre*veg_av_post
ssb_av_pre*ssb_av_post
snack_av_pre*snack_av_post ff_av_pre*ff_av_post pa_av_pre*pa_av_post
st_av_pre*st_av_post/agree;
title 'McNemar chi-square for change in availability by Intervention
and Control';
```

```
run;

proc freq data= practice;
by cgroup;
tables comm_open_pre*comm_open_post comm_sat_pre*comm_sat_post
comm_prob_pre*comm_prob_post/agree;
title 'McNemar Chi-square for change in communication';
run;

proc freq data= practice;
tables food_resp_pre*food_resp_post pa_resp_pre*pa_resp_post
st_resp_pre*st_resp_post food_inv_pre*food_inv_post/agree;
title 'McNemar Chi-square and Kappa for Pre Post agreement in
covariates';
run;

proc freq data= practice;
tables food_resp_pre food_resp_post pa_resp_pre pa_resp_post
st_resp_pre st_resp_post food_inv_pre food_inv_post;
run;

*********Logistic regression models for Post adjusting for Pre measure,
group, child age and sex father age and covariates****;
**********Run these models first to confirm that Porc glimmix models
are estimating results correctly*********;
*************These results are consistent with Proc glimmix results and
are not included in the summary document *****;
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_exp_pre food_resp_pre
food_inv_pre/param = ref;
model frt_exp_post = frt_exp_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;


proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_exp_pre food_resp_pre
food_inv_pre/param = ref;
model veg_exp_post = veg_exp_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex ssb_exp_pre food_resp_pre
food_inv_pre/param = ref;
model ssb_exp_post = ssb_exp_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex snack_exp_pre food_resp_pre
food_inv_pre/param = ref;
model snack_exp_post = snack_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre ;
run;

proc logistic descending data = practice order = internal;
```

```
class cgroup (ref = 'C') csex ff_exp_pre food_resp_pre
food_inv_pre/param = ref;
model ff_exp_post = ff_exp_pre cgroup fage cage csex food_resp_pre
food_inv_pre ;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex pa_exp_pre pa_resp_pre/param = ref;
model pa_exp_post = pa_exp_pre cgroup fage cage csex pa_resp_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex st_exp_pre st_resp_pre/param = ref;
model st_exp_post = st_exp_pre cgroup fage cage csex st_resp_pre;
run;

*******Modeling behaviors
***********************************************;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_mod_pre food_resp_pre
food_inv_pre/param = ref;
model frt_mod_post = frt_mod_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_mod_pre food_resp_pre
food_inv_pre/param = ref;
model veg_mod_post = veg_mod_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_mod_pre (ref =
'High') food_resp_pre food_inv_pre/param = ref;
model ssb_mod_post = ssb_mod_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High')
food_resp_pre food_inv_pre/param = ref;
model snack_mod_post = snack_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre ;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') food_resp_pre
food_inv_pre/param = ref;
model ff_mod_post = ff_mod_pre cgroup fage cage csex food_resp_pre
food_inv_pre ;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex pa_mod_pre pa_resp_pre/param = ref;
model pa_mod_post = pa_mod_pre cgroup fage cage csex pa_resp_pre;
```

```
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High')
st_resp_pre/param = ref;
model st_mod_post = st_mod_pre cgroup fage cage csex st_resp_pre;
run;

********Father availability models
************************************;
*********************************************************************;
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_av_pre food_resp_pre
food_inv_pre/param = ref;
model frt_av_post = frt_av_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_av_pre food_resp_pre
food_inv_pre/param = ref;
model veg_av_post = veg_av_pre cgroup fage cage csex food_resp_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') food_resp_pre food_inv_pre/param = ref;
model ssb_av_post = ssb_av_pre cgroup fage cage csex food_resp_pre
food_inv_pre ;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') food_resp_pre
food_inv_pre/param = ref;
model snack_av_post = snack_av_pre cgroup fage cage csex food_resp_pre
food_inv_pre ;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') food_resp_pre
food_inv_pre/param = ref;
model ff_av_post = ff_av_pre cgroup fage cage csex food_resp_pre
food_inv_pre ;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex pa_av_pre pa_resp_pre/param = ref;
model pa_av_post = pa_av_pre cgroup fage cage csex pa_resp_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High')
st_resp_pre/param = ref;
model st_av_post = st_av_pre cgroup fage cage csex st_resp_pre;
run;
```

```
**********Communication models ***************************************;
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex comm_open_pre (ref = 'Low')/param = ref;
model comm_open_post = comm_open_pre cgroup fage cage csex;
run;


proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex comm_sat_pre (ref = 'Low') /param = ref;
model comm_sat_post = comm_sat_pre cgroup fage cage csex;
run;



proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex comm_prob_pre (ref = 'High')/param = ref;
model comm_prob_post = comm_prob_pre cgroup fage cage csex;
run;

*********Generalized linear mixed models for binary data
*******************************;
*********These models include a random intercept for site to account
for clustering ***;
*********Proc glimmix with binary distribution, default is logit link
*****************;
********Results are consistent with results from logistic regression
models ***********;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc means data = practice n median;
var fage;
```

```
run;

*******father age stratified models have OR in diff directions but
neither sign ******;
proc glimmix data = practice;
where 28 <= fage <= 42;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
where fage > 42;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre  food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre  csex*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

*********significant child sex interaction but stratified models did
not both converge ***;
proc sort data = practice;
by csex;
run;

proc glimmix data = practice;
by csex;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup fage cage
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*******Model for Female did not converge **************************;
run;


proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup fage cage
csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup fage cage
csex
food_resp_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*******Models with interaction terms did not converge ****************;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
```

```
model snack_exp_post (event = 'High') = snack_exp_pre cgroup fage cage
csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*******Models with interaction terms did not converge ****************;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') pa_resp_pre
csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup fage cage csex
pa_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') pa_resp_pre
csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup fage cage csex
pa_resp_pre pa_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') pa_resp_pre
csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup fage cage csex
pa_resp_pre fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
```

```
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') st_resp_pre
csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup fage cage csex
st_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') st_resp_pre
csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup fage cage csex
st_resp_pre st_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') st_resp_pre
csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup fage cage csex
st_resp_pre cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
where 9 <= cage <= 11;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') st_resp_pre
csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup fage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
where cage >= 12;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') st_resp_pre
csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup fage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

****************************behavior modeling
************************************;
proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

*********food_inv_post*cgroup is significant ****************;
**********also food_resp_pre is signficant ******************;
*********Look at stratified models ***************************;

proc sort data= practice;
by food_inv_pre;
run;

proc glimmix data = practice;
by food_inv_pre;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') food_resp_post
food_inv_post csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup fage cage csex
 /dist = binary solution oddsratio (label);
random intercept /subject = csite;
*******stratified models by food_inv_pre do not have estimates for Int
effect ******;
run;

*******significant intervention effects in opposite directions
stratified by food_resp_pre **;
proc sort data= practice;
by food_resp_pre;
```

```
run;

proc glimmix data = practice;
by food_resp_pre;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') food_resp_post
food_inv_post csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup fage cage csex
 /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;


proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') food_resp_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_mod_pre (ref =
'High')
food_resp_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;
proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_mod_pre (ref =
'High')
food_resp_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup fage cage
csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;
```

```
proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup fage cage
csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup fage cage
csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;


proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') pa_resp_pre
csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup fage cage csex
pa_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') pa_resp_pre
csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup fage cage csex
pa_resp_pre pa_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') pa_resp_pre
csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup fage cage csex
pa_resp_pre fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') st_resp_pre
csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup fage cage csex
st_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') st_resp_pre
csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup fage cage csex
st_resp_pre st_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') st_resp_pre
csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup fage cage csex
st_resp_pre fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;


****************************Availability
*************************************************;
proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;
proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
```

```
random intercept /subject = csite;
run;

proc sort data= practice;
by food_resp_pre;
run;

******significant intervention effect for Low resp fathers ********;
proc glimmix data = practice;
by food_resp_pre;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup fage cage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;
proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High')
food_resp_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
```

```
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_av_post (event = 'High') = ssb_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_av_pre (ref = 'Low')
food_resp_pre food_inv_pre csite;
model ssb_av_post (event = 'High') = ssb_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup fage cage
csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup fage cage
csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup fage cage
csex
food_resp_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;
```

```
proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre food_resp_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High')
food_resp_pre food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup fage cage csex
food_resp_pre food_inv_pre fage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') pa_resp_pre
csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup fage cage csex
pa_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') pa_resp_pre
csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup fage cage csex
pa_resp_pre pa_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') pa_resp_pre
csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup fage cage csex
pa_resp_pre fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') st_resp_pre
csite;
model st_av_post (event = 'Low') = st_av_pre cgroup fage cage csex
st_resp_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') st_resp_pre
csite;
model st_av_post (event = 'Low') = st_av_pre cgroup fage cage csex
```

```
st_resp_pre st_resp_pre*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') st_resp_pre
csite;
model st_av_post (event = 'Low') = st_av_pre cgroup fage cage csex
st_resp_pre fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

********************Communication models
******************************;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_open_pre (ref = 'Low') csite;
model comm_open_post (event = 'High') = comm_open_pre cgroup
fage cage csex /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_open_pre (ref = 'Low') csite;
model comm_open_post (event = 'High') = comm_open_pre cgroup
fage cage csex fage*cgroup /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_sat_pre (ref = 'Low') csite;
model comm_sat_post (event = 'High') = comm_sat_pre cgroup
fage cage csex /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_sat_pre (ref = 'Low') csite;
model comm_sat_post (event = 'High') = comm_sat_pre cgroup
fage cage csex fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_prob_pre (ref = 'High') csite;
model comm_prob_post (event = 'Low') = comm_prob_pre cgroup
fage cage csex /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex comm_prob_pre (ref = 'High') csite;
model comm_prob_post (event = 'Low') = comm_prob_pre cgroup
fage cage csex fage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;
```

Adolescent-reported paternal parenting practices

```
**********************************************************************
**;
**********************************************************************
**;
******Program to evaluate Pre-Post changes in paternal parent
practice***;
*********Limit this analysis to sample fc_pre_dyad_cpost_pp = 1
*********;
************Includes Father Child Pre dyads and child post data
*********;
***********Keep analysis variables and rename for Post
******************;
***********to compare Pre-Post demographics
*****************************;
***********Use long form for Mixed models to account for site clusters
**;
**********************************************************************
**;
***********cf_parent_practice.sas
***************************************;
**********************************************************************
**;
*******This analysis is limited to 110 with Pre and Post child data
*****;
**********************************************************************
**;
PROC IMPORT OUT= WORK.fc_long
            DATAFILE=  "C:\Users\balta026\Desktop\New
analysis\fc_prepost_long_112020.xlsx"
            DBMS= xlsx replace;
     GETNAMES=YES;
      *guessingrows = 200;
RUN;

proc contents data= fc_long order = varnum;
run;

****data checks of variables for parenting
scales*********************;
proc freq data = fc_long;
where pre_post = 1;
tables cf1 cv1 cd1 cs1 cff1 cp1 cst1;
title 'Pre tables of father expectations-child reported';
title2 'code 77 is for As much as they want';
run;

*******check Pre medians from the data to set High/Low cutpoints
**************************;

proc means data = fc_long n median;
where pre_post = 1;
var cf1 cv1 cd1 cs1 cff1 cp1 cst1 cf2 cf3 cv2 cv3 cd2 cd3 cs2 cs3 cff2
cff3 cp2 cp3 cst2 cst3 cf6 cf7 cf9 cv6 cv7 cv9 cd6 cd7 cd8 cs6 cs7 cs8
cff6 cff7 cff8 cp6 cp7 cp8 cst6;
```

```
title 'check median values for cutpoints of High and Low';
run;

proc univariate data = fc_long;
where pre_post = 1;
var cf1 cv1 cd1 cs1 cff1 cp1 cst1 cf2 cf3 cv2 cv3 cd2 cd3 cs2 cs3 cff2
cff3 cp2 cp3 cst2 cst3
cf6 cf7 cf9 cv6 cv7 cv9 cd6 cd7 cd8 cs6 cs7 cs8 cff6 cff7 cff8 cp6 cp7
cp8 cst6;
title 'check median values for cutpoints of High and Low';
run;

proc freq data = fc_long;
where pre_post = 2;
tables cf1 cv1 cd1 cs1 cff1 cp1 cst1;
title 'Post tables of father expectations';
title2 'code 77 is for As much as they want';
run;

********Behavior modeling variables ******************************;
proc freq data= fc_long;
tables cf2 cf3 cv2 cv3 cd2 cd3 cs2 cs3 cff2 cff3 cp2 cp3 cst2 cst3;
run;

******check how consistent the two items are before averaging *******;
proc freq data = fc_long;
tables cf2*cf3 cv2*cv3 cd2*cd3 cs2*cs3 cff2*cff3 cp2*cp3 cst2*cst3;
run;

*******Availability variables
********************************************************;
proc freq data= fc_long;
tables cf6 cf7 cf9 cv6 cv7 cv9 cd6 cd7 cd8 cs6 cs7 cs8 cff6 cff7 cff8
cp6 cp7 cp8 cst6;
run;

******** family meals, and food involvement items
***********************************************;
*********check data
***********************************************************************
*;
proc freq data= fc_long;
where pre_post = 1;
tables cfm2 cin1 cin2 cin3;
run;

proc corr alpha data = fc_long;
where pre_post = 1;
var cfm2 cin1 cin2 cin3;
*********Cronbach alpha for 5 items = 0.76 ********************;
run;

proc corr alpha data = fc_long;
where pre_post = 1;
var cin1 cin2 cin3;
********Cronbach alpha for 3 food inv items = 0.82
********************;
```

```
run;

data fc_long_check;
set fc_long;
food_inv = mean(cin1,cin2, cin3);
run;

***************median values for family meals, food/meal
involvement*****;
proc means n mean median data = fc_long_check;
var food_inv cfm2;
******median food_inv = 3.0, meal_father = 3.0, ********;
*******median fam_meal = 3.0 ***********************;
******Define High involvement as >= 3 Most of the time - Almost always
or always ************;
******Define High fam_meal as >= 3 Sometimes to Almost always or always
***********;
run;

********check missing data in analysis data set
*******************************;
data check;
set fc_long;
where fc_pre_dyad_cpost_pp = 1;
run;

proc print data = check;
where pre_post = 1;
var famid cf1 cv1 cd1 cs1 cff1 cp1 cst1
cf2 cv2 cd2 cs2 cff2 cp2 cst2
cf3 cv3 cd3 cs3 cff3 cp3 cst3
cf6 cv6 cd6 cs6 cff6 cp6 cst6
cf7 cv7 cd7 cs7 cff7 cp7
cf9 cv9 cd8 cs8 cff8 cp8;
*******some of the responses Pre child data were missing by definition
of dataset **********************************;
run;

proc print data = check;
where pre_post = 2;
var famid cf1 cv1 cd1 cs1 cff1 cp1 cst1
cf2 cv2 cd2 cs2 cff2 cp2 cst2
cf3 cv3 cd3 cs3 cff3 cp3 cst3
cf6 cv6 cd6 cs6 cff6 cp6 cst6
cf7 cv7 cd7 cs7 cff7 cp7
cf9 cv9 cd8 cs8 cff8 cp8;
********children c231 (didn't finsh survey but finished ht/wt, veggie
meter and NDSR)**********************************;
run;

data fc_longb;
set fc_long;
*******create binary variables for paternal expectations, modeling and
availability ******;
*******code Low = 0 and High = 1 by using median
values*******************************************************;
```

```
**********See code above for cutpoints and cronbach alphas
******************************;

* Set I don't know as missing for expectation variables;
if cf1=66 then cf1= .;
if cv1=66 then cv1= .;
if cd1=66 then cd1= .;
if cs1=66 then cs1= .;
if cff1=66 then cff1= .;
if cp1=66 then cp1= .;
if cst1=66 then cst1= .;

*Create ditchomoized paternal expectation varilables;

frt_exp2 = .;
if 0 <= cf1 < 3 then frt_exp2 = 0;
if cf1 >= 3 then frt_exp2 = 1;

veg_exp2 = .;
if 0 <= cv1 < 3 then veg_exp2 = 0;
if cv1 >= 3 then veg_exp2 = 1;

ssb_exp2 = .;
if cd1 > 2  then ssb_exp2 = 0;
if 0 <= cd1 <= 2 then ssb_exp2 = 1;

snack_exp2 = .;
if cs1 > 2 then snack_exp2 = 0;
if 0 <= cs1 <= 2 then snack_exp2 = 1;

ff_exp2 = .;
if cff1 > 1 then ff_exp2 = 0;
if 0 <= cff1 <= 1 then ff_exp2 = 1;

pa_exp2 = .;
if 0 <= cp1 < 3 then pa_exp2 = 0;
if cp1 >= 3 then pa_exp2 = 1;

st_exp2 = .;
if cst1 > 3 then st_exp2 = 0;
if 0 <= cst1 <= 3 then st_exp2 = 1;

***********create behavior modeling variables
***********************************************;
********average of the two items for each outcome is coded as High = 1
or Low = 0**********;
*********if one of the two items is missing the outcome is
missing*****;

frt_mod_avg = (cf2+cf3)/2;
frt_mod2 = .;
if frt_mod_avg >= 3 then frt_mod2 = 1;
if 1 <= frt_mod_avg < 3 then frt_mod2 = 0;

veg_mod_avg = (cv2+cv3)/2;
veg_mod2 = .;
if veg_mod_avg >= 3 then veg_mod2 = 1;
```

```
if 1 <= veg_mod_avg < 3 then veg_mod2 = 0;

ssb_mod_avg = (cd2+cd3)/2;
ssb_mod2 = .;
if ssb_mod_avg > 2 then ssb_mod2 = 1;
if 1 <= ssb_mod_avg <= 2 then ssb_mod2 = 0;

snack_mod_avg = (cs2+cs3)/2;
snack_mod2 = .;
if snack_mod_avg > 1.5 then snack_mod2 = 1;
if 1 <= snack_mod_avg <= 1.5 then snack_mod2 = 0;

ff_mod_avg = (cff2+cff3)/2;
ff_mod2 = .;
if ff_mod_avg > 2 then ff_mod2 = 1;
if 1 <= ff_mod_avg <= 2 then ff_mod2 = 0;

pa_mod_avg = (cp2+cp3)/2;
pa_mod2 = .;
if pa_mod_avg >= 3.5 then pa_mod2 = 1;
if 1 <= pa_mod_avg < 3.5 then pa_mod2 = 0;

st_mod_avg = (cst2+cst3)/2;
st_mod2 = .;
if st_mod_avg > 3 then st_mod2 = 1;
if 1 <= st_mod_avg <= 3 then st_mod2 = 0;

***********Availability and Accessibility variables
*********************************;
*********all availability items are coded 0- 5
*************************************;
******* used average of 2 items if 1 is missing ***********;

frt_av_avg = (cf6+cf7+cf9)/3;
if cf6 = . then frt_av_avg = (cf7+cf9)/2;
if cf7 = . then frt_av_avg = (cf6+cf9)/2;
if cf9 = . then frt_av_avg = (cf6+cf7)/2;
frt_av2 = .;
if frt_av_avg >= 3.3 then frt_av2 = 1;
if 1 <= frt_av_avg < 3.3 then frt_av2 = 0;

veg_av_avg = (cv6+cv7+cv9)/3;
if cv6 = . then veg_av_avg = (cv7+cv9)/2;
if cv7 = . then veg_av_avg = (cv6+cv9)/2;
if cv9 = . then veg_av_avg = (cv6+cv7)/2;
veg_av2 = .;
if veg_av_avg >= 3.3 then veg_av2 = 1;
if 1 <= veg_av_avg < 3.3 then veg_av2 = 0;

ssb_av_avg = (cd6+cd7+cd8)/3;
if cd6 = . then ssb_av_avg = (cd7+cd8)/2;
if cd7 = . then ssb_av_avg = (cd6+cd8)/2;
if cd8 = . then ssb_av_avg = (cd6+cd7)/2;
ssb_av2 = .;
if ssb_av_avg > 2 then ssb_av2 = 1;
if 1 <= ssb_av_avg <= 2 then ssb_av2 = 0;
```

```
snack_av_avg = (cs6+cs7+cs8)/3;
if cs6 = . then snack_av_avg = (cs7+cs8)/2;
if cs7 = . then snack_av_avg = (cs6+cs8)/2;
if cs8 = . then snack_av_avg = (cs6+cs7)/2;
snack_av2 = .;
if snack_av_avg > 2 then snack_av2 = 1;
if 1 <= snack_av_avg <= 2 then snack_av2 = 0;

ff_av_avg = (cff6+cff7+cff8)/3;
if cff6 = . then ff_av_avg = (cff7+cff8)/2;
if cff7 = . then ff_av_avg = (cff6+cff8)/2;
if cff8 = . then ff_av_avg = (cff6+cff7)/2;
ff_av2 = .;
if ff_av_avg > 1.7 then ff_av2 = 1;
if 1 <= ff_av_avg <= 1.7 then ff_av2 = 0;

pa_av_avg = (cp6+cp7+cp8)/3;
if cp6 = . then pa_av_avg = (cp7+cp8)/2;
if cp7 = . then pa_av_avg = (cp6+cp8)/2;
if cp8 = . then pa_av_avg = (cp6+cp7)/2;
pa_av2 = .;
if pa_av_avg >= 3.3 then pa_av2 = 1;
if 1 <= pa_av_avg < 3.3 then pa_av2 = 0;

*******screentime availability based on 1 item only
*******************************************;
st_av2 = .;
if cst6 > 3 then st_av2 = 1;
if 1 <= cst6 <= 3 then st_av2 = 0;

*********add High Low fam_meal, and food_inv variables ************;

fam_meal = .;
if cfm2 >= 3 then fam_meal = 1;
if 1 <= cfm2 < 3 then fam_meal = 0;

food_inv = mean(cin1, cin2, cin3);
food_inv2 = .;
if food_inv >= 3 then food_inv2 = 1;
if 1 <= food_inv <3 then food_inv2 = 0;

run;

proc means data = fc_long n median;
where pre_post = 1;
var cf1 cv1 cd1 cs1 cff1 cp1 cst1 ;
title 'check median values for cutpoints of High and Low';
title2 'setting expectations';
run;

proc format;
value age_c 0 = '8 - 12' 1= '>= 13';
value sex 1= 'Male' 2 = 'Female';
value age_f 0 = '21-40' 1 = '>40';
value inc 1 = '<$25K' 2 = '$25K -<$50K' 3 = '>= 50K';
value secure 0 = 'No food insecurity' 1 = 'food insecure';
value educ 1 = 'Middle school or less' 2 = 'HS grad or GRE'
```

```
             3 = 'College or Technical school';
value yrs_us 0 = '<10' 1 = '10 - <20' 2 = '20-<30' 3 = '>= 30';
value lang 0 = 'More Span than Eng' 1 = 'Equal Span & Eng' 2 = 'More
English';
value acc 1 = 'Low: 0-1' 2 = 'Moderate: 2' 3= 'High: 3-5';
value mar 1 = 'Married' 2 = 'Living with Partner' 3 =
'single/widow/divorced/separated';
value emp 1 = 'self-employed' 2 = 'unemployed/homemaker' 3 = 'PT' 4 =
'FT';
value safe 1 = 'safe n-hood' 2 = 'Unsafe n-hood';
value assist 0 = 'no financial assistance' 1 = 'Any assistance';
value bmi_f 1 = '< 18.5 Underwt' 2 = '18.5 - <25 Normal' 3 = '25 - <30
Overwt' 4 = '>= 30 Obese';
value bmi_c 1 = '<5%tile underwt' 2= '5-<85%tile Normal' 3 = '85-
95%tile Overwt' 4 = '>=95%tile Obese';
value high 1= 'High' 0 = 'Low';
run;

*******keep analysis data set and variables for father outcomes
analysis *****************;
data c_var;
set fc_longb;
label
 pre_post = 'Pre Post indicator'
 cagec = 'Child age group'
 csex = 'Child sex'
 fagec = 'Father age group'
 fincc = 'Father income group'
 ffs = 'Food security (from 2 questions)'
 feduc = 'Father education group'
 fusc = 'Father years in US'
 flanc = 'Father language group'
 fmarc = 'Father marital status'
 fempc = 'Father employment group'
 fnsc = 'Neighborhood safety (from 2 questions)'
 ffinc = 'Financial assistance'
 cbmigrp = 'Child weight group'
 fbmigrp = 'Father weight group'
 cvpa = 'child weekly vigorous PA'
 cmpa = 'Child weekly moderate PA'
 cmildpa = 'Child weekly mild PA'
 cmvpa = 'Child weekly mod/vigorous PA'
 cpa ='Child weekly PA: mild, mod, vigorous'
 csw = 'Child weekly screen time'
 cdpa = 'Child daily PA topcoded at 2 hrs'
 cdmvpa = 'Child daily MVPA topcoded at 2 hrs'
 cstd = 'Child daily screentime topcoded at 10 hrs'
 bmi = 'Child BMI'
 bmiz = 'Child BMI z-score'
 bmipct = 'Child BMI percentile from CDC code'
 frt_exp2 = 'child fruit expectation'
 veg_exp2 = 'child veg expectation'
 ssb_exp2 = 'child SSB expectation'
 snack_exp2 = 'child snack expectation'
 ff_exp2 = 'child Fast food expectation'
 pa_exp2 = 'child PA expectation'
 st_exp2 = 'child ST expectation'
```

```
 frt_mod2 = 'child fruit modeling'
 veg_mod2 = 'child vsg modeling'
 ssb_mod2 = 'child SSB modeling'
 snack_mod2 = 'child snack modeling'
 ff_mod2 = 'child Fast Food modeling'
 pa_mod2 = 'child PA modeling'
 st_mod2 = 'child ST modeling'
 frt_av2 = 'child frt availability'
 veg_av2 = 'child veg availability'
 ssb_av2 = 'child SSB availability'
 snack_av2 = 'child snack availability'
 ff_av2 = 'child Fast Food availability'
 pa_av2 = 'child PA availability'
 st_av2 = 'child ST availability'
 fam_meal = 'family meals'
 food_inv2 = 'father food meal involvement';

keep famid cid fid csite fsite crandom frandom cgroup fgroup
totalsessions cattend fattend
c_pre_miss_ndsr c_pre_miss_survey c_post_miss_ndsr c_post_miss_survey
child_pre c_pre_pp c_pre_miss_ndsr c_pre_miss_survey child_post
c_post_pp c_post_miss_ndsr c_post_miss_survey
child_pre_post child_pre_post_pp father_pre f_pre_pp father_post
f_post_pp father_pre_post father_pre_post_pp
fc_pre_dyad fc_pre_dyad_pp fc_pre_dyad_cpost fc_pre_dyad_cpost_pp
fc_pre_post_dyad fc_pre_post_dyad_pp pre_post
cage cagec cage_elig csex
fage fagec fsex fre fch fad ffm2
finc fincc ffs feduc fus fcob fusc flan flanc
fmarc fempc fnsc ffin ffinc n_hh fbmi fbmigrp cbmigrp cf1 cv1 cd1 cs1
cff1 cp1 cst1 cfm2 cin1 cin2 cin3 frt_exp2 veg_exp2 ssb_exp2 snack_exp2
ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
food_inv2 fam_meal;
format cagec age_c. csex sex. fagec age_f. fincc inc. ffs secure. feduc
educ.
fusc yrs_us. flanc lang. fmarc mar. fempc emp. fnsc safe.
ffinc assist.  fbmigrp bmi_f. cbmigrp bmi_c.
frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2 food_inv2
fam_meal high.;
 run;

*******set per protocol analysis data set***********
****************************************;
data fc_dyad_long;
********for primary PP analysis use this dataset
******************************;
set c_var;
where fc_pre_dyad_cpost_pp = 1;
 *******for sensitivity ITT analysis use this dataset
**************************;
*where fc_pre_dyad_cpost = 1;
run;
```

```
***********IDs with non-missing Post data
*****************************************************;
data child_post;
set fc_dyad_long;
where pre_post = 2 ;
post_ind = 1;
keep famid post_ind;

*********limit the effective analysis to N = 110
************************************************;
run;

*******Now limit this data set to 110 children with both Pre and Post
data ********************;

proc sort data = fc_dyad_long;
by famid;
run;

proc sort data = child_post;
by famid;
run;

data child_dyad;
merge fc_dyad_long child_post;
by famid;
run;

data child_long;
set child_dyad;
where post_ind = 1;
********data child_long has 110 famids with Pre and Post record for
each *************;
run;

proc contents data= child_long;
run;

*********Child Pre-Post data overview statistics **************;
proc means data= child_long mean stddev median Q1 Q3 min max;
where cgroup = 'I' and pre_post = 1;
var cattend;
run;

proc freq data= child_long;
where pre_post = 1;
tables csite cgroup crandom*cgroup;
run;

data c_pre;
set child_long;
where pre_post = 1;
run;

proc contents data = c_pre;
run;
```

```
********Table 1 is Pre data for N = 110 children in Pre-Post analysis ;

proc freq data = c_pre;
tables csex cbmigrp fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc;
title 'Table 1 All';
run;

proc means data =c_pre n mean stddev median Q1 Q3 min max maxdec = 2;
var cage fage fch fad n_hh;
run;

proc freq data = c_pre;
tables (csex cbmigrp fincc fmarc feduc fempc fusc flanc
fbmigrp ffinc ffs fnsc)*cgroup/chisq exact;
title 'Table 1 by group';
run;

proc means data= c_pre n mean stddev median min max maxdec=2 ;
class cgroup;
var cage fage fch fad n_hh;
run;

proc ttest data =c_pre plots = none;
class cgroup;
var cage fage fch fad n_hh;
run;

********Limit Pre children outcome descriptive stats to N = 110 dataset
*************************;

proc freq data= c_pre;
tables frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
fam_meal food_inv2;
title 'Pre children variables in analysis data set';
title2 'these are in Table 2 of analysis summary';
run;

proc univariate data= c_pre;
var cf1 cv1 cd1 cs1 cff1 cp1 cst1 cfm2;
title 'Pre children variables ';
title2 'summary options';
run;

proc freq data= c_pre;
tables (frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
fam_meal food_inv2)*cgroup/chisq;
title 'Pre children behavior variables by Control and Intervention in
analysis data set';
title2 'These are in Table 2 of analysis summary';
run;

proc freq data= child_long;
```

```
where pre_post = 2;
tables frt_exp2 veg_exp2 ssb_exp2 snack_exp2 ff_exp2 pa_exp2 st_exp2
frt_mod2 veg_mod2 ssb_mod2 snack_mod2 ff_mod2 pa_mod2 st_mod2
frt_av2 veg_av2 ssb_av2 snack_av2 ff_av2 pa_av2 st_av2
fam_meal food_inv2;
title 'Post children behavior variables';
run;

*********Create the Pre and Post datasets for comparisons
***********************;
data pre_practice;
set child_long;
where pre_post = 1;
frt_exp_pre = frt_exp2;
veg_exp_pre = veg_exp2;
ssb_exp_pre = ssb_exp2;
snack_exp_pre = snack_exp2;
ff_exp_pre = ff_exp2;
pa_exp_pre = pa_exp2;
st_exp_pre = st_exp2;
frt_mod_pre= frt_mod2;
veg_mod_pre = veg_mod2;
ssb_mod_pre = ssb_mod2;
snack_mod_pre = snack_mod2;
ff_mod_pre = ff_mod2;
pa_mod_pre = pa_mod2;
st_mod_pre = st_mod2;
frt_av_pre = frt_av2;
veg_av_pre = veg_av2;
ssb_av_pre = ssb_av2;
snack_av_pre = snack_av2;
ff_av_pre = ff_av2;
pa_av_pre = pa_av2;
st_av_pre = st_av2;
fam_meal_pre = fam_meal;
food_inv_pre = food_inv2
;
format frt_exp_pre veg_exp_pre ssb_exp_pre snack_exp_pre
ff_exp_pre pa_exp_pre st_exp_pre
frt_mod_pre veg_mod_pre ssb_mod_pre snack_mod_pre
ff_mod_pre pa_mod_pre st_mod_pre
frt_av_pre veg_av_pre ssb_av_pre snack_av_pre
ff_av_pre pa_av_pre st_av_pre
fam_meal_pre food_inv_pre high.;
keep famid cid cgroup csite
csex cage fage feduc frt_exp_pre veg_exp_pre ssb_exp_pre snack_exp_pre
ff_exp_pre pa_exp_pre st_exp_pre
frt_mod_pre veg_mod_pre ssb_mod_pre snack_mod_pre
ff_mod_pre pa_mod_pre st_mod_pre
frt_av_pre veg_av_pre ssb_av_pre snack_av_pre
ff_av_pre pa_av_pre st_av_pre
fam_meal_pre food_inv_pre;
run;

data post_practice;
set child_long;
where pre_post = 2;
```

```
frt_exp_post = frt_exp2;
veg_exp_post = veg_exp2;
ssb_exp_post = ssb_exp2;
snack_exp_post = snack_exp2;
ff_exp_post = ff_exp2;
pa_exp_post = pa_exp2;
st_exp_post = st_exp2;
frt_mod_post= frt_mod2;
veg_mod_post = veg_mod2;
ssb_mod_post = ssb_mod2;
snack_mod_post = snack_mod2;
ff_mod_post = ff_mod2;
pa_mod_post = pa_mod2;
st_mod_post = st_mod2;
frt_av_post = frt_av2;
veg_av_post = veg_av2;
ssb_av_post = ssb_av2;
snack_av_post = snack_av2;
ff_av_post = ff_av2;
pa_av_post = pa_av2;
st_av_post = st_av2;
fam_meal_post = fam_meal;
food_inv_post = food_inv2;
format frt_exp_post veg_exp_post ssb_exp_post snack_exp_post
ff_exp_post pa_exp_post st_exp_post
frt_mod_post veg_mod_post ssb_mod_post snack_mod_post
ff_mod_post pa_mod_post st_mod_post
frt_av_post veg_av_post ssb_av_post snack_av_post
ff_av_post pa_av_post st_av_post
fam_meal_post food_inv_post high.;
keep famid cid frt_exp_post veg_exp_post ssb_exp_post snack_exp_post
ff_exp_post pa_exp_post st_exp_post
frt_mod_post veg_mod_post ssb_mod_post snack_mod_post
ff_mod_post pa_mod_post st_mod_post
frt_av_post veg_av_post ssb_av_post snack_av_post
ff_av_post pa_av_post st_av_post fam_meal_post food_inv_post;
run;

proc sort data = pre_practice;
by famid;
run;

proc sort data = post_practice;
by famid;
run;

data practice;
merge pre_practice post_practice;
by famid;
run;

proc sort data = practice;
by cgroup;
run;

*****McNemar test for Pre Post change within each group
**********************************;
```

```
proc freq data= practice;
by cgroup;
tables frt_exp_pre*frt_exp_post veg_exp_pre*veg_exp_post
ssb_exp_pre*ssb_exp_post
snack_exp_pre*snack_exp_post ff_exp_pre*ff_exp_post
pa_exp_pre*pa_exp_post
st_exp_pre*st_exp_post/agree;
title 'McNemar chi-square for change in parent expectations by
Intervention and Control';
run;

proc freq data= practice;
by cgroup;
tables frt_mod_pre*frt_mod_post veg_mod_pre*veg_mod_post
ssb_mod_pre*ssb_mod_post
snack_mod_pre*snack_mod_post ff_mod_pre*ff_mod_post
pa_mod_pre*pa_mod_post
st_mod_pre*st_mod_post/agree;
title 'McNemar chi-square for change in behavior modeling by
Intervention and Control';
run;

proc freq data= practice;
by cgroup;
tables frt_av_pre*frt_av_post veg_av_pre*veg_av_post
ssb_av_pre*ssb_av_post
snack_av_pre*snack_av_post ff_av_pre*ff_av_post pa_av_pre*pa_av_post
st_av_pre*st_av_post/agree;
title 'McNemar chi-square for change in availability by Intervention
and Control';
run;

proc freq data= practice;
tables fam_meal_pre*fam_meal_post food_inv_pre*food_inv_post/agree;
title 'McNemar Chi-square and Kappa for Pre Post agreement in
covariates';
run;

*********Logistic regression models for Post adjusting for Pre measure,
group, child age and sex and covariates****;
**********Run these models first to confirm that Porc glimmix models
are estimating results correctly**********;
*************These results are consistent with Proc glimmix results and
are not included in the summary document *****;
***********************************************************************
************************************************;
***************with FAMILY MEALS AND FATHER FOOD/MEAL
INVOLVEMENT*****************************************************;
***********************************************************************
************************************************;
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_exp_pre fam_meal_pre
food_inv_pre/param = ref;
model frt_exp_post = frt_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;
```

```
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_exp_pre fam_meal_pre
food_inv_pre/param = ref;
model veg_exp_post = veg_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex ssb_exp_pre fam_meal_pre
food_inv_pre/param = ref;
model ssb_exp_post = ssb_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex snack_exp_pre fam_meal_pre
food_inv_pre/param = ref;
model snack_exp_post = snack_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex ff_exp_pre fam_meal_pre
food_inv_pre/param = ref;
model ff_exp_post = ff_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex fam_meal_pre food_inv_pre/param = ref;
model pa_exp_post = pa_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex fam_meal_pre food_inv_pre/param = ref;
model st_exp_post = st_exp_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

*******Modeling behaviors
************************************************;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_mod_pre fam_meal_pre
food_inv_pre/param = ref;
model frt_mod_post = frt_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_mod_pre fam_meal_pre
food_inv_pre/param = ref;
model veg_mod_post = veg_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;
```

```
proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_mod_pre (ref =
'High') fam_meal_pre food_inv_pre/param = ref;
model ssb_mod_post = ssb_mod_pre cgroup fage cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model snack_mod_post = snack_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model ff_mod_post = ff_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex pa_mod_pre fam_meal_pre
food_inv_pre/param = ref;
model pa_mod_post = pa_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model st_mod_post = st_mod_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

********Father availability models
*************************************;
**********************************************************************;
proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex frt_av_pre fam_meal_pre
food_inv_pre/param = ref;
model frt_av_post = frt_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex veg_av_pre fam_meal_pre
food_inv_pre/param = ref;
model veg_av_post = veg_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre/param = ref;
```

```
model ssb_av_post = ssb_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model snack_av_post = snack_av_pre cgroup cage csex  fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model ff_av_post = ff_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic descending data = practice order = internal;
class cgroup (ref = 'C') csex pa_av_pre fam_meal_pre food_inv_pre/param
= ref;
model pa_av_post = pa_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

proc logistic data = practice order = internal;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') fam_meal_pre
food_inv_pre/param = ref;
model st_av_post = st_av_pre cgroup cage csex fam_meal_pre
food_inv_pre;
run;

*********Generalized linear mixed models for binary
data************************************;
*************with FAMILY MEALS and FATHER FOOD/MEAL
INVOLVEMENT******************************;
*********These models include a random intercept for site to account
for clustering ***;
*********Proc glimmix with binary distribution, default is logit link
*****************;
********Results are consistent with results from logistic regression
models ***********;

*Fruit expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
```

```
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_exp_post (event = 'High') = frt_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Vegetable expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;
```

```
proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was significant (P=0.009);
run;

proc sort data = practice;
by csex;
run;

proc glimmix data = practice;
by csex;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*******Model for Female and male did not converge
***************************;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_exp_post (event = 'High') = veg_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
run;

*SSB expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
```

```
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not sinificant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ssb_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ssb_exp_post (event = 'High') = ssb_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Snack expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup cage csex
v cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model snack_exp_post (event = 'High') = snack_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*fast food expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
```

```
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_exp_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model ff_exp_post (event = 'High') = ff_exp_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Physical activity expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup cage csex /dist
= binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
**Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_exp_pre (ref = 'Low') csite;
model pa_exp_post (event = 'High') = pa_exp_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Screen time expectations;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup cage csex /dist
= binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_exp_pre (ref = 'Low') csite;
model st_exp_post (event = 'High') = st_exp_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;


****************************behavior modeling
************************************;
*Fruit modeling;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;
```

```
proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_mod_post (event = 'High') = frt_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Vegetable modeling;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_mod_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_mod_post (event = 'High') = veg_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
```

```
random intercept /subject = csite;
*Interaction was not significant;
run;

*SSB modeling;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') fam_meal_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') fam_meal_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') fam_meal_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') fam_meal_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female')
ssb_mod_pre (ref = 'High') fam_meal_pre food_inv_pre csite;
model ssb_mod_post (event = 'Low') = ssb_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Snack modeling;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was significant (p=0.015);
run;
proc sort data= practice;
by fam_meal_pre;
run;

proc glimmix data = practice;
by fam_meal_pre;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*******stratified models by fam_meal_pre have estimates for Int effect
with low family meals******;
run;


proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
```

```
model snack_mod_post (event = 'Low') = snack_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Fast food modeling;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;
proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_mod_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_mod_post (event = 'Low') = ff_mod_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Physical activity modeling;
```

```
proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup cage csex /dist
= binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_mod_pre (ref = 'Low') csite;
model pa_mod_post (event = 'High') = pa_mod_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Screen time modeling;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_mod_pre (ref = 'High') csite;
model st_mod_post (event = 'Low') = st_mod_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

****************************Availability
*************************************************;

*Fruit availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
```

```
model frt_av_post (event = 'High') = frt_av_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex frt_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model frt_av_post (event = 'High') = frt_av_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Vegetable availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup cage csex
fam_meal_pre food_inv_pre /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex veg_av_pre (ref = 'Low') fam_meal_pre
food_inv_pre csite;
model veg_av_post (event = 'High') = veg_av_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*SSB availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was significant (p=0.013);
```

```
run;

proc glimmix data = practice;
where 9 <= cage <= 11;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*This group was not significant;
run;

proc glimmix data = practice;
where cage >= 12;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*This groups was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex (ref = 'Female') ssb_av_pre (ref =
'High') fam_meal_pre food_inv_pre csite;
model ssb_av_post (event = 'Low') = ssb_av_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Snack availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
```

```
model snack_av_post (event = 'Low') = snack_av_pre cgroup cage csex
fam_meal_pre food_inv_pre/dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*INteraction was marginally significant (p=0.050);
run;

proc glimmix data = practice;
where 9 <= cage <= 11;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*This group was not significant;
run;

proc glimmix data = practice;
where cage >= 12;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup csex
/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*This groups was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
```

```
class cgroup (ref = 'C') csex snack_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model snack_av_post (event = 'Low') = snack_av_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*fast food availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup cage csex
fam_meal_pre food_inv_pre /dist = binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup cage csex
fam_meal_pre food_inv_pre cage*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup cage csex
fam_meal_pre food_inv_pre csex*cgroup/dist = binary solution oddsratio
(label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup cage csex
fam_meal_pre food_inv_pre fam_meal_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex ff_av_pre (ref = 'High') fam_meal_pre
food_inv_pre csite;
model ff_av_post (event = 'Low') = ff_av_pre cgroup cage csex
fam_meal_pre food_inv_pre food_inv_pre*cgroup/dist = binary solution
oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
```

```
run;

*Physical activity availbility;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex pa_av_pre (ref = 'Low') csite;
model pa_av_post (event = 'High') = pa_av_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

*Screen time availability;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') csite;
model st_av_post (event = 'High') = st_av_pre cgroup cage csex /dist =
binary solution oddsratio (label);
random intercept /subject = csite;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') csite;
model st_av_post (event = 'High') = st_av_pre cgroup cage csex
cage*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;

proc glimmix data = practice;
class cgroup (ref = 'C') csex st_av_pre (ref = 'High') csite;
model st_av_post (event = 'High') = st_av_pre cgroup cage csex
csex*cgroup/dist = binary solution oddsratio (label);
random intercept /subject = csite;
*Interaction was not significant;
run;
```

Appendix I. Supplementary tables for Chapter 4

Table S1. Father-reported paternal parenting practice and father-adolescent communication baseline outcomes and between group comparisons (n=96).

Father-reported paternal parenting practice outcomes[a]	**Levels**	**Intervention group n=47**	**Delayed-treatment control n=49**	**p-value**[b]
Paternal expectations/limits, n (%)				
Fruit, cups/day	Low intake (≤ 1 time/day)	14 (30)	12 (25)	0.516
	high intake (≥ 2 times/day)	32 (70)	37 (76)	
Vegetables, cups/day	Low intake (≤ 1 time/day)	8 (18)	15 (32)	0.118
	High intake (≥ 2 times/day)	37 (82)	32 (68)	
SSB[c], times/week	Low intake (≤ 1–3 times/week)	35 (76)	39 (83)	0.410
	High intake (≥ 4–6 times/week)	11 (24)	8 (17)	
Sweets & salty snacks, times/week	Low intake (≤ 1–3 times/week)	40 (87)	39 (81)	0.450
	High intake (≥ 4–6 times/week)	6 (6)	9 (10)	
Fast food, times/week	Low intake (≤less than 1 time/week)	35 (76)	36 (74)	0.769
	High intake (≥1–3 times/week)	11 (24)	13 (27)	
Physical activity, hours/day	Less hours (≤ 30 minutes to 1 hour)	20 (44)	19 (41)	0.762
	More hours (≥1 hour to 2 hours)	25 (56)	27 (59)	
Screen time, hours/day	Less hours (≤1 hour to 2 hours)	36 (80)	39 (83)	0.713
	More hours (≥ 2 hours or more)	9 (20)	8 (17)	
Paternal role modeling, n (%)				
Fruit, times/week	Less often (≤ 3)	29 (67)	22 (47)	**0.049**
	More often (> 3)	14 (33)	25 (53)	
Vegetables, times/week	Less often (≤ 3)	23 (49)	34 (72)	**0.020**
	More often (> 3).	24 (51)	13 (28)	
SSB[c], times/week	Less often (≤ 2)	27 (58)	23 (47)	0.303
	More often (> 2).	20 (43)	26 (53)	
Sweets & salty snacks, times/week	Less often (≤ 2)	35 (75)	38 (78)	0.724
	More often (> 2).	12 (26)	11 (23)	
Fast food, times/week	Less often (≤ 2)	37 (82)	37 (76)	0.427
	More often (> 2)	8 (18)	12 (25)	
Physical activity, times/week	Less often (≤ 3)	35 (75)	33 (73)	0.901
	More often (> 3)	12 (26)	12 (27)	
Screen time, times/week	Less often (≤ 3)	32 (68)	31 (65)	0.718
	More often (> 3)	15 (32)	17 (35)	

Availability at home, n (%)				
Fruit	Less often (< 4)	18 (38)	19 (39)	0.962
	More often (≥ 4)	29 (62)	30 (61)	
Vegetables	Less often (< 4)	17 (36)	22 (46)	0.338
	More often (≥ 4)	30 (64)	26 (54)	
SSB[c]	Less often (≤ 2)	35 (76)	35 (71)	0.606
	More often (> 2)	11 (24)	14 (29)	
Sweets & salty snacks	Less often (≤ 2)	34 (72)	39 (80)	0.405
	More often (> 2)	13 (28)	10 (20)	
Fast food	Less often (≤ 2)	28 (60)	34 (69)	0.315
	More often (> 2)	19 (40)	15 (31)	
Physical activity	Less often (< 4)	27 (58)	25 (53)	0.678
	More often (≥ 4)	20 (43)	22 (47)	
Screen time	Less often (< 3)	12 (26)	16 (33)	0.443
	More often (≥ 3)	34 (74)	32 (67)	
Father-adolescent communication outcomes, n (%)				
Openness	Low (< 4)	24 (51)	21 (43)	0.421
	High (≥ 4)	23 (49)	28 (57)	
Satisfaction	Low (< 4)	24 (51)	22 (45)	0.546
	High (≥ 4)	23 (49)	27 (55)	
Problems	Low (< 2)	22 (47)	33 (67)	**0.042**
	High (≥ 2)	25 (53)	16 (33)	

[a] High- and low-cut points for each outcome are based on Pre item medians in the study dataset; [b] Chi-square test of differences in proportion, *p*-value < 0.05; [c]SSB= sugar sweetened beverage.

Table S2. Adolescent-reported paternal parenting practice baseline outcomes and between group comparisons (n=110).

Adolescent-reported paternal parenting practice outcomes[a]	Levels	Intervention group n=54	Delayed-treatment control n=56	p-value[b]
Paternal expectations/limits, n (%)				
Fruit, times/day	Low intake (≤ 2 times/day)	21 (50)	24 (59)	0.435
	High intake (≥ 3 times/day or more)	21 (50)	17 (41)	
Vegetables, times/day	Low intake (≤ 2 times/day)	21 (46)	16 (36)	0.371
	High intake (≥ 3 times/day or more)	25 (54)	28 (64)	
SSB[c], times/week	Low intake (≤ 1–3 times/week)	39 (87)	43 (84)	0.745
	High intake (≥ 4–6 times/week)	6 (13)	8 (16)	
Sweets & salty snacks, times/week	Low intake (≤ 1–3 times/week)	34 (79)	43 (86)	0.377
	High intake (≥ 4–6 times/week)	9 (21)	7 (14)	
Fast food, times/week	Low intake (≤ less than 1 time/week)	30 (64)	32 (65)	0.880
	High intake (≥ 1–3 times/week)	17 (36)	17 (35)	
Physical activity, hours/day	Less hours (< 30 minutes to 1 hour)	18 (39)	20 (51)	0.262
	More hours (≥ 1 hour to 2 hours)	28 (61)	19 (49)	
Screen time, hours/day	Less hours (≤ 1 hour to 2 hours)	29 (67)	38 (81)	0.145
	More hours (≥ 2 hours or more)	14 (33)	9 (19)	
Paternal role modeling, n (%)				
Fruit, times/week	Less often (< 3)	21 (40)	27 (51)	0.242
	More often (≥ 3)	32 (60)	26 (49)	
Vegetables, times/week	Less often (< 3)	13 (25)	21 (38)	0.127
	More often (≥ 3)	40 (75)	34 (62)	
SSB[c], times/week	Less often (≤ 2)	30 (57)	32 (57)	0.955
	More often (> 2)	23 (43)	24 (43)	
Sweets & salty snacks, times/week	Less often (≤ 1.5)	28 (54)	30 (54)	0.977
	More often (> 1.5)	24 (46)	26 (46)	
Fast food, times/week	Less often (≤ 2)	42 (79)	44 (79)	0.931
	More often (> 2)	11 (21)	12 (21)	
Physical activity, times/week	Less often (< 3.5)	24 (45)	30 (55)	0.336
	More often (≥ 3.5)	29 (55)	25 (45)	

Screen time, times/week	Less often (≤ 3)	34 (63)	33 (61)	0.843
	More often (> 3)	20 (37)	21 (39)	
Availability at home, n (%)				
Fruit	Less often (< 3.3)	20 (38)	26 (46)	0.358
	More often (≥ 3.3)	33 (62)	30 (54)	
Vegetables	Less often (< 3.3)	26 (49)	25 (45)	0.708
	More often (≥ 3.3)	27 (51)	30 (55)	
SSB[c]	Less often (≤ 2)	35 (66)	41 (73)	0.415
	More often (> 2)	18 (34)	15 (27)	
Sweets & salty snacks	Less often (≤ 2)	31 (57)	41 (73)	0.081
	More often (> 2)	23 (43)	15 (27)	
Fast food	Less often (≤ 1.7)	28 (52)	30 (54)	0.857
	More often (> 1.7)	26 (48)	26 (46)	
Physical activity	Less often (< 3.3)	15 (28)	23 (41)	0.143
	More often (≥ 3.3)	39 (72)	33 (59)	
Screen time	Less often (≤ 3)	38 (70)	43 (77)	0.445
	More often (> 3)	16 (30)	13 (23)	

[a]High- and low-cut points for each outcome are based on Pre item medians in the study dataset; [b]Chi-square test of differences in proportion, p-value < 0.05; [c]SSB= sugar sweetened beverage.

Table S3. Adolescent-reported meals and father food/meal involvement baseline outcomes, and father-reported father food/physical activity/screen time responsibilities, and food/meal involvement baseline outcomes between group comparisons.

Father/adolescent reported outcomes[a]	**Levels**	**Intervention group**	**Delayed treatment control**	**p-value**[b]
Adolescent-reported outcomes				
Meals and paternal food/meal involvement, n (%)		**n= 54**	**n=56**	
Family meal	Less often (<3)	20 (38)	20 (37)	0.941
	More often (≥3)	33 (62)	34 (63)	
Paternal food/meal involvement	Less often (<3)	18 (33)	23 (41)	0.401
	More often (≥3)	36 (67)	33 (59)	
Father-reported outcomes				
Paternal responsibilities and food/meal involvement, n (%)		**n= 47**	**n=49**	
Paternal food responsibility	Less often (≤3)	29 (63)	27 (56)	0.502
	More often (≥4)	17 (37)	21 (44)	
Paternal physical activity responsibility	Less often (≤3)	28 (61)	21 (44)	0.097
	More often (≥4)	18 (39)	27 (56)	
Paternal screen time responsibility	Less often (≤3)	21 (46)	18 (38)	0.472
	More often (≥4)	25 (54)	29 (62)	
Paternal food/meal involvement	Less often (<3)	15 (32)	16 (33)	0.883
	More often (≥3)	32 (67)	32 (68)	

[a]High- and low-cut points for each outcome are based on Pre item medians in the study dataset as described above; [b]Chi-square test of differences in proportion, *p*-value < 0.05.