A PATH ANALYSIS MODEL EXAMINING PARENT PERCEPTION, DIETING, AND FOOD BEHAVIORS ON BMI AMONG PREDOMINATELY HISPANIC FAMILIES WITH PRESCHOOL CHILDREN

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A Path Analysis Model Examining Parent Perception, Dieting, and Food Behaviors on BMI Among Predominately Hispanic Families with Preschool Children

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ABSTRACT

Children and adults continue to suffer from obesity, which poses a great public health threat. This research focused on protective factors for its prevention. Parent's perception of a healthy child's body size, parent dieting, child dieting, and food behaviors influence on Hispanic preschool children's weight (assessed by BMI *z*-scores and raw BMI) was examined in 534 mother-child dyads. A hypothesized model was constructed and tested through a secondary analysis of baseline data collected in fall 2018 from the South Texas Early Prevention Study Project. All data except BMI, were collected via self-administered questionnaires completed by the parents (or guardians).

Path analysis was conducted to identify relationships. The conceptual model consisted of various simple and mediated models (i.e., the age model, the perception model, the parent model, and the child model). Inside each of these models, several paths were found to be statistically significant. Within the parent-mediated model, perception of a healthy child's body size and parent's dieting had a statistically significant effect on raw BMI. Within the full model, age, parent's dieting, and child's dieting had the greatest effects on child's BMI *z*-score. As a result, children whose mothers were currently dieting are significantly more likely to diet and gain weight. This effect increased with age. Mothers are crucial to the development of children, and a great deal of research has confirmed this. Perceptions of weight, shape, and appearance are sociocultural values passed on by mothers. Therefore, it is critical to ensure that parents have healthy behaviors not only for themselves but for the sake of their children. As the population of Hispanics increases in the United States, it is important to continue to examine this area in this population.

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DEDICATION

To my mentors who have been a strong presence in my education and career.

Dr. Beth Senne-Duff

Dr. Roberto Trevino

Dr. Mark Green

Dr. Malcolm Ree

Dr. Esther Gergen

Dr. Nora Garza

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LIST OF ABBREVIATIONS

50PT..50th Percentile Tracking

60PT..60th Percentile Tracking

BIA..Bioelectrical Impedance Analysis

BMI ....Body Mass Index

BRFSS...Behavioral Risk Factor Surveillance System

BSSS ....Body Shape Satisfaction Scale

CBIS..Children's Body Image Scale

CDC ....Centers for Disease Control and Prevention

chEAT ....Children Eating Attitude Survey

COVID-19...Coronavirus disease of 2019

CFRS...Collins Figure Rating Scale

CVD ....Cardiovascular Disease

DDPC..Downward Percentile Crossing

DEBQ..Dutch Eating Behavior Questionnaire

DEXA ....Dual Energy X-Ray Absorptiometry

DHHS..Department of Health & Human Services

DM1 ....Type 1 Diabetes Mellitus

DM2 ....Type 2 Diabetes Mellitus

EAT...Eating Among Teens

ECLS...Early Childhood Longitudinal Study

EDF ....Energy Dense Foods

EDI..Eating Disorder Inventory

EFNEP ....Expanded Food and Nutrition Education Program

FJV..Fruit, Juice & Vegetable Intake

FFM...Fat-Free Mass

FSI...Figure Satisfaction Index

HHANES ....Hispanic Health & Nutrition Examination Survey

ID ....Identification Number

IRB...Institutional Review Board

KEDS ....Kids' Eating Disorders Survey

LDL..Low Density Lipoprotein

LMS ....Values used within the Cole's LMS Method

NCES ....National Center for Education Statistics

NCHS...National Center for Health Statistics

NDSU...North Dakota State University

NLSAH ....National Longitudinal Study of Adolescent Health

NHANES ....National Health & Nutrition Examination Survey

PARM ....Parental Modeling of Eating Behaviors Scale

Pre-K..Pre-Kinder

PIR ....Poverty Index Ratio

PDMS...Parental Dietary Modeling Scale

Project EAT ....Project Eating Among Teens

SCT ....Social Cognitive Theory

SBFRS..Stunkard's Body Figure Rating Scale

SES...Social Economic Status

STEPS Pre-K ....South Texas Early Prevention Study Pre-K Project

TBF ....Total Body Fat

UPC..Upward Percentile Crossing

U.S ....United States

UTRGV..University of Texas at the Rio Grande Valley

USDA...U.S. Department of Agriculture

VLED...Very-Low-Energy Diet

WHO..World Health Organization

YEDEQ..Youth Eating Disorder Examination Questionnaire

YRBSS...Youth Risk Behavioral Surveillance System

LIST OF DEFINITIONS

Abdominal (waist) circumferences ....An anthropometric measurement taken by using a non-stretchable tape around the waist to determine body composition (Coulston et al., 2001).

Adiposity rebound curve................................A rise in body fat storage and BMI occurring typically between the ages of 4 and 7 (T. J. Cole, 2004).

Air displacement plethysmography (BodPod©) ....Measurement of body composition using whole-body densitometry. Rather than submerging the body in water, air displacement is employed (Coulston et al., 2001).

Bioelectrical Impedance Analysis (BIA).......An anthropometric measurement used to evaluate body composition using a low-intensity electrical current to assess body fatness (Coulston et al., 2001).

Body acceptance ....Approval, appreciation, and respect for one's body (National Eating Disorders Collaboration, 2021).

Body composition ....The amount of fat (body fat and fat-free), bone, water, and muscle in the body. Includes body fat and fat-free mass (Coulston et al., 2001).

Body dissatisfaction.......................................Negative feelings towards one's weight, shape, and body size (National Eating Disorders Collaboration, 2022).

Body fat..The percentage of adipose tissue compared to lean tissues (Coulston et al., 2001).

Body image ....Emotional attitudes, beliefs, and perceptions of one's body, ranging between positive and negative experiences or a combination of both (Academy for Eating Disorders, 2021).

Body image concerns………………………The thoughts and feelings that one has about their body (The Academy for Eating Disorders, 2021).

Body Mass Index (BMI)................................An anthropometric measurement used to evaluate nutritional status based on a person's weight in kilograms divided by the square of height in meters (Centers for Disease Control and Prevention, 2021).

Body Mass Index (BMI) *z*-scores ....Measures of relative weight adjusted for child age and sex (T. Cole, 1990). Also referred to as BMI standard deviation scores.

Dietary restraint ....The purposeful restriction of food intake to prevent weight gain or to promote weight loss (Academy for Nutrition & Dietetics, 2021).

Dieting...Managing food intake with the intent to lose, gain, or maintain weight (Academy for Nutrition & Dietetics, 2021).

Disordered eating .... Eating behaviors used to control and/or maintain weight gain (The Academy for Eating Disorders, 2021).

Dual Energy X-ray Absorptiometry (DEXA)..Measure of body composition that estimates bone mineral, body fat, and fat-free mass through a whole-body scanner (Coulston et al., 2001).

Eating disorder ....The clinical diagnosis of a psychological disorder characterized by abnormal or disturbed eating habits. Anorexia nervosa, bulimia nervosa, and binge eating disorder are examples of eating disorders (Academy for Eating Disorders, 2021).

Endogenous variable......................................The dependent variable (Sarwono, 2017).

Exogenous variable..The independent variable (Sarwono, 2017).

Familism ....Cultural value among the Hispanic population, characterized by a strong connection to the family unit as a source of respect, support, and responsibility (Diaz & Niño, 2019).

Familial weight acceptance............................Closeness and connectedness, where weight, body shape, and size can be openly discussed and viewed positively.

Familial weight messaging ....Direct communication between family members about weight, shape, or size.

Family connectedness ....A sense of closeness and support (Foster et al., 2017).

Fat-free mass/lean body mass ....Includes all body components, bone, organs (heart, brain, liver, kidneys, and the GI tract), and muscle content, except fat (Coulston et al., 2001).

Growth charts..A diagram used to follow an infant's, child's, or adolescent's growth over time and compare it with normal ranges by age group (CDC, 2022c).

Health Hispanic Advantage ....A proposed theory that Hispanics exhibit better physical and mental health due to their stronger orientations toward the family (Diaz & Niño, 2019).

Hispanic/Latino..A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race (U.S. Census, 2022).

Hispanic Health Paradox
(Epidemiological Paradox) ....A proposed theory that states Latinos and/or Hispanics sustain a health advantage over non-Hispanic whites (Diaz & Niño, 2019).

Mexican American...Americans of Mexican ancestry.

Obesity ....Obesity in adults is defined as having a BMI greater than 30 kg/m². Obesity in children is defined by having a BMI ≥ 85th percentile on the Growth Charts (Center for Disease and Control, 2022).

Overweight..Overweight status in adults is defined as having a BMI ≥ 25 kg/m². Overweight status in youths is defined as having a Body Mass Index (BMI) ≥ 85th percentile on the Growth Charts (Centers for Disease Control and Prevention, 2022b).

Path analysis.. A technique used for providing explanations of possible causal relationships among a set of variables (Sarwono, 2017).

Protective factors .... Conditions that promote health and well-being in children and families (Centers for Disease Control and Prevention, 2021).

Skinfold thickness..Using calibrated calipers at defined body sites, anthropometric measurements are used to estimate subcutaneous fat as a measure of body composition (Coulston et al., 2001).

Thin ideal internalization .... The unrealistic standard of beauty emphasizes the desirability of thinness (Romo & Mireles-Rios, 2016a).

Unhealthy weight control behaviors .... Food and dieting behaviors such as restrictive eating, disordered eating, and eating disorders (The Academy for Eating Disorders, 2021).

Ultrasound technology .... Body composition assessment using sound, imaging, and a prediction equation to estimate fat-free mass and body fat mass inside the body and convert to body fat percentages (Ehrman et al., 2017).

Underwater weighing/
hydrostatic body composition analysis/
hydrodensitometry .... The gold standard of body composition assessments using whole-body densitometry to determine body composition (Coulston et al., 2001).

Weight stigmas.. Discrimination or stereotyping based on a person's weight, body, and size. Also referred to as sizeism, weight/size oppression, weightism, weight/size bias, and weight-based discrimination (The Academy for Eating Disorders, 2021).

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INTRODUCTION

1.1. Obesity & Health

The prevalence of obesity among adults has reached epidemic proportions in the United States. According to the Centers for Disease Control and Prevention (CDC), obesity rates in adults have increased 234% in the past 40 years (CDC, 2022b). Obesity in adults is defined as having a Body Mass Index (BMI) greater than 30 kg/m² and severe obesity as a BMI greater than or equal to 40 kg/m². As determined by the 1976–1980, 1988–1994, and 2001–2002 National Health and Nutrition Examination Surveys (NHANES), obesity prevalence among adults has increased from 12.7% to 22.9% to 30.5%, respectively, (Ogden & Carroll, 2015). Additional recent upward trends were documented in NHANES data from 1999–2000 to 2017–2018 with obesity rates among adults increasing from 30.5% to 42.4%, and the prevalence of severe obesity increasing from 4.7% to 9.2% (CDC, 2022b).

Currently, U.S. Hispanic adults have the highest prevalence of obesity (47%) compared to all other race and ethnic groups (State of Childhood Obesity, 2022). In 2019, the Hispanic population was the largest minority group in the U.S. and accounted for a total of 60.57 million people (Statista, 2022). California (*n* = 15,574,880), followed by Texas (*n* = 11,524,840) and then Florida (*n* = 5,663,630) has the greatest Hispanic populations. Texas, the nation's fastest-growing state, has one of the highest Hispanic populations. In 2019, approximately 39.7% of Texas residents identified as Hispanic (U.S. Census Bureau, 2018). In California and Florida, about 39.4% and 24%, respectively, of their residents identify as Hispanic. The term "*Hispanics*" is used as a collective term when discussing literature pertaining to any person who is Cuban, Mexican, Puerto Rican, South or Central American, or of Spanish culture or origin, regardless of race. Other researchers, however, may use terms such as Latino/a, Latinx, Latindad, Latin@, and Chicano/a, etc.

Currently, 35.9% and 31.9% of Texas adults are overweight (BMI > 25 kg/m^2) and obese (BMI > 30.0 kg/m^2), respectively (CDC, 2022b). In 2016–2018, Texas was one of nine states where the prevalence of self-reported obesity among Hispanic adults was greater than 35% (Texas Department of State Health Services, 2018). In 2016–2018, the Rio Grande Valley of Texas (located at the southernmost point of Texas) had higher obesity rates than the state of Texas. In fact, in 2019, McAllen, Texas (Texas city in the Rio Grande Valley area) ranked 1^{st} as the fattest city in America (Alfonso, 2019). Hispanics make up more than 91% of the Rio Grande Valley population (Galvin, 2018).

With the prevalence of adult obesity continuing to rise, childhood obesity has become a public health issue. Child obesity status differs from that of adult BMI categories. By using growth charts, BMI-for-age weight status categories are assigned, along with corresponding percentiles. BMI-for-age plotted at the 85^{th} percentile to less than the 95^{th} percentile is identified as overweight. BMI-for-age plotted at the 95^{th} percentile or greater is identified as obese. According to the 1999–2000 NHANES, an estimated 13.9% of youth aged 2 to 19 years were obese. Fifteen years later (NHANES 2015–2016), the prevalence of childhood obesity continues to be high as 18.5% of youth aged 2 to 19 years are obese (State of Childhood Obesity, 2022). Youths of Hispanic origin have an obesity rate of 25.8%, which is higher than any other race and ethnic group (State of Childhood Obesity, 2022).

In Texas, 20.3% of youth ages 10 to 17 are obese, giving Texas an obesity ranking of 8 out of 51 for this age group among all states and the District of Columbia (State of Childhood Obesity, 2021). In 2017–2018, more than 430,000 youth lived in the Rio Grande Valley

(Cameron, Hidalgo, Starr, and Willacy counties). In 2020, the South Texas Early Prevention Study Pre-K Project (STEPS Pre-K) noted that 19.2% and 16.8% of pre-kinder boys and girls (M = 4.7 years), respectively, were obese (Treviño-Peña et al., 2021). Childhood obesity is of concern because it may influence the onset of adult diseases and persist into adulthood. The immediate health concerns of children who are obese include increased risk factors for cardiovascular diseases (CVD) and type 2 diabetes mellitus (DM2) among other health conditions (CDC, 2021b). The continued increase in the prevalence of adult and child obesity highlights the need for more research on factors that contribute to childhood obesity, as well as *protective factors* for its prevention. Protective factors, as opposed to risk factors, are conditions that promote health and well-being in children and families (CDC, 2022d).

1.1.1. Societal Standards for Beauty

Society makes it clear that if a person is obese and/or overweight it is physically undesirable. The "unrealistic standard of beauty emphasizes the desirability of thinness". (Romo & Mireles-Rios, 2016 p.18). Despite public health movements like *Health at Every Size*, mass media communications continue to define the ideal body weight as being "thin", which lauds physical attractiveness. Consequently, "*thin-ideal internalization*" can lead to psychological problems. Thin-ideal internalization occurs when an individual identifies with the cultural ideal that thinness is synonymous with attractiveness. "Someone who has high levels of thin-ideal internalization would agree with statements such as, "I wish my body looked more like the bodies of women I see on TV and in magazines" or "I compare my body to the bodies of actresses on TV"(J. Suisman & Klump, 2012). Obese children have an increased risk of greater body image dissatisfaction than normal-weight peers (Ricciardelli & McCabe, 2001), diminished self-esteem (F. Wang et al., 2009), depression (Goldfield et al., 2010; Johnson & Wardle, 2005; Rawana et al., 2010; Rierdan & Koff, 1997), and severe dieting (J. L. Suisman et al., 2012).

1.1.2. Body Satisfaction

As childhood obesity rates continue to increase, it is important to "understand the degree to which a child is satisfied with their body size" as body dissatisfaction is a risk factor for many psychological and physical problems (A. Fisher et al., 2005). The term *body (image) dissatisfaction* (also known as *negative image dissatisfaction*) refers to the feeling that one has negative emotions or thoughts about his or her body (National Eating Disorders Collaboration, 2022). The opposite of this is having positive thoughts or feelings about one's body (*positive body image*). In both adults and children, perceived and actual overweight (and/or obese) status has been linked to increased body dissatisfaction (Erickson et al., 2000; Robinson et al., 2001). Unfortunately, body dissatisfaction has been found to emerge in children as young as five years (Lowes & Tiggemann, 2003). Additionally, body dissatisfaction among children is prevalent across sex, race/ethnicity, and socioeconomic class (A. Fisher et al., 2005). This is concerning as there are many consequences of body dissatisfaction, including those that are emotional (i.e., decreased sense of worth, self-esteem, and quality of life). In fact, body dissatisfaction has been found to predict low self-esteem in children and adolescents (F. Wang et al., 2009). Notably, satisfaction with one's body weight, shape, and size are not limited to the influence of societal standards of beauty. Body image is also influenced by one's culture and family. (Romo et al., 2016).

1.1.3. The Role of the Family

The family plays a role in the transmission of information on health and nutrition. It is within the family environment that children have their first experiences with food and weight.

“Humans, from birth until death, grow in the family” (Rezeai-Dehagani et al., 2015, p. 371). Children’s (and adolescents’) health is significantly influenced by the role of the family, which can model and encourage (or discourage) certain eating habits and health perceptions (Blissett, 2011; Larsen et al., 2015; Lydecker & Grilo, 2018; Palfreyman et al., 2014; Patrick et al., 2005; Pearson et al., 2009; Savage et al., 2007; Vaughn et al., 2018; Y. Wang et al., 2011). *Family connectedness* (also known as *connectedness to parents* and *parent engagement*) is defined as a sense of closeness and support (Foster et al., 2017). This sense of openness may protect children from negative experiences as weight, body shape, and size can be openly discussed. A promising factor to examine family connectedness as it relates to food behavior is the concept of *familism*.

Familism, which emphasizes the needs of the family over the needs of the individual, is an established social cultural norm seen in Hispanic communities. Over the years, there have been many adaptations to the theory of familism. Most current work focuses on three dimensions: (a) behavioral, which stresses active engagement with immediate and extended family through social, emotional, and financial support; (b) structural, which highlights attitudes concerning family cohesion; and (c) demographic, which emphasizes family size and intactness (Arce, 1978; Burgess, 1945; Sabogal et al., 2016). A recent addition to this multidimensional construct has been family conflict and connectedness (Almeida et al., 2009; Cook et al., 2009). A family-centered explanation has been offered for the *Hispanic Health Paradox* in explaining why Hispanics have better health outcomes than non-White Hispanics as well as any other racial or ethnic group in the United States. Data shows U.S. Hispanics have a life expectancy of 81.8 years, compared with 78.5 years for whites and 74.9 years for blacks (Kristof, 2020). Diaz and Nino (2019) theorized the *Hispanic Health Advantage,* “Hispanics tend to have stronger orientations toward the family, which may contribute to their greater health outcomes" (Diaz & Niño, 2019, p. 274).

Hispanics are known for having strong family ties that go beyond nuclear households. In fact, "Hispanics are more likely to exhibit close relationships with extended family members than any other racial/ethnic groups do" (Katiria Perez & Cruess, 2014, p. 95). This is a relationship-enhancing benefit within Hispanic families as it may build a sense of community and belonging, which may contribute to better health. Additionally, these close relationships may help mitigate the risk of obesity in children by allowing the children more space to process direct comments about their weight and to observe positive familial interactions regarding weight acceptance. As a result, belonging and social support are enhanced. Whereas teasing and weight commenting are negatively viewed in Western society (and by mostly European American families), as it has been shown to have detrimental effects on the development of self (Eisenberg et al., 2011; J. A. Lydecker et al., 2018), among Hispanic families, these types of weight comments do not carry negative intent. This research identifies *familial weight acceptance* as closeness and connectedness, where weight, body shape, and size can be openly discussed and viewed positively. These family-oriented attitudes and relationships may create a different social environment for the interactions of food and weight perceptions on obesity and comorbid conditions in members of the Hispanic community. This warrants further investigation as the obesity trajectory may vary by cultural group.

1.2. Social Cognitive Theory

Bandura's (1986) *Social Cognitive Theory* (SCT) is defined as the dynamic interactions between people (personal factors), their behavior, and their environments (Bandura, 1998). It is one of the most popular theories for studying an individual's motivation to change health behavior due to its many key components: self-efficacy, behavioral capability, expectations, self-control, observational learning, and reinforcement. Familism, as described above, fits well within the context of SCT as it encompasses the continuous dynamics and interactions between the child and their immediate environment, the family. Familism is the immediate physical and social setting in which health and well-being behavior is developed among the Hispanic population. This research is based on SCT because it places much importance on the role of the immediate environment, including the family, on the individual. Vygotsky's (1978) *Sociocultural Theory* will also be used to examine how individuals interact with each other based on their cultural backgrounds (Vygotsky, 1978). In this theory, parents, caregivers, peers, and society and culture play an important role in the development of higher psychological functions. In other words, the social interaction between members of the family unit and the wider community is the primary method of acquiring behaviors and cognitive processes that are relevant to their culture (Cherry, 2022).

1.3. Statement of the Problem

Obesity is detrimental to the health of both adults and children. There is concern about obesity in children since it tends to persist into and throughout adulthood. While the exact causes of DM2 are still not fully understood, it is known that a risk factor includes being overweight and/or obese (American Diabetes Association, 2022). Additionally, obesity is a risk factor for other chronic diseases, such as heart disease, cancer, hypertension, etc. Additionally, a person's psychosocial well-being can be adversely affected by excess weight and social stigmas associated with obesity. The overemphasis on thinness has contributed to weight stigmas. An experiment conducted in the 1950s showed that young children (aged 10-11 years) ranked six images according to their "favorite child". The six images included: (a) 'normal' weight child;

(b) an ‘obese’ child, a child in a wheelchair; (c) a child with crutches and a leg brace; (d) a child missing hand; and (e) a child with a facial disfigurement. Across six samples of varying social, economic, and racial/ethnic backgrounds from across the United States, the child with obesity was ranked last (Richardson et al., 1961).

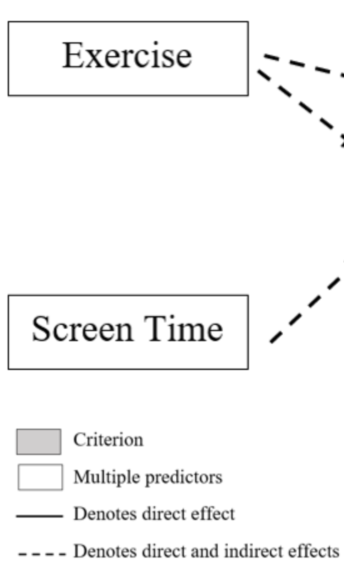
Society heavily influences what is perceived as an acceptable and non-acceptable weight. Parents’ perception of what is healthy may be the image of a thin child. Maybe it’s the image of a “not so thin” or a fuller child. Nonetheless, these perceptions may influence not only their dietary behavior, but also their food parenting practices. Thus, either directly or indirectly, intentional, or not intentional, knowing, or unknowing, parents model dieting behaviors based on what they perceive as healthy. It is proposed that both health perception and parental diet modeling ultimately impact children’s food intake and child’s overall weight. However, attitudes and beliefs regarding one’s weight, shape, and size are perceived differently among racially and ethnically diverse populations. Hispanics uphold strong family ties that use “familial weight acceptance” messages, which may include weight comments and/or teasing, to uplift, reassure, support, and empower. As the population of Hispanics increases in the U.S., it is important to explore the role of sociocultural variables as protective factors against childhood obesity. This study proposed to answer its research questions using *path analysis*.

Path analysis is a “technique used for providing explanations of possible causal relationships among a set of variables” (Sarwono, 2017). Sewall Wright developed path analysis in 1918 but did not provide a detailed description until 1921. As an extension of multiple linear regression, path analysis analyzes relationships among measured variables when the *exogenous variable* affects the *endogenous variable* not only directly, but indirectly. The variables that are being explained (i.e., effect) by the model are defined as endogenous variables (i.e., dependent variables). The variables that are not being explained (i.e., the causes) are defined as exogenous variables (i.e., independent variables). The terms independent and dependent variables are not used in path analysis.

Relationships have either direct or indirect effect. A direct effect is a directional relation between the exogenous variable and endogenous variable. An indirect effect (also called mediation) is the effect of the exogenous variable and endogenous variable through one or more intervening variables. It must be noted that multiple exogenous variables can serve as the intervening variables in the model. This is one main difference from that of regression analysis where variables can be either independent or dependent. Additionally, there can be multiple endogenous variables within the model. An example of a path model can be found below.

Figure 1

Example of a Path Model



The direct influence of an exogenous variable on an endogenous variable in a path model is measured by path coefficients (also called β weights). Path coefficients range from 0 to 1, the higher the value the greater the effect. Path coefficient values of < .10, .30, and >.50 are identified as having a "*small*", "*medium*" and "*large*" effect, respectively (Cohen, 1988). Unexplained influence of all unmeasured exogenous variables is termed "error" and/or "residual error" (identified as "*e*"). This is calculated as $1 - r^2$. When assessing the statistical significance of the path coefficients, the terms *full model* vs. *reduced model* are used. As the name suggests, a "full model" vs. a "reduced model" indicates whether all variables of interest (paths) are included or excluded from the model, respectively. A full model includes all possible paths using all variables of interest. A model is "reduced" (omits paths from the proposed model) when the *p*-value(s) for path coefficient(s) are found to be non-significant. The reduced model omits nonsignificant paths from the model.

There are four models in path analysis. These include a multiple linear regression model, a mediation model, a joint (combined) model, and a complex model. Path models differ in the chain model of the effect of the exogenous variable(s) on the endogenous variable. Ultimately, path analysis identifies the influence of independent (and mediating) variables on the dependent variable. It evaluates the contribution of any path (or combination of paths) to the overall fit of the model. It also assists with identifying indirect paths. However, it is non-recursive, having a one-way direction only. Furthermore, it cannot be used to decide between alternative structural models or to test causality. The causal effect (also known as causal relationship) is defined as findings that change in one variable leads to change in another variable. The three criteria for establishing a causal effect are: (a) empirical association (there is a correlation between the independent and dependent variable); (b) the time order of the independent variable (the cause must come before the effect); and (c) nonspuriousness (no external variables).

There are five steps in path analysis. The first step involves the researcher developing a diagram with arrows connecting variables and depicting the direction of cause and effect (model specification). This diagram, a pictorial representation of a model, is transformed into a set of equations (model identification). The set of equations is solved simultaneously to test model fit and estimate parameters (model fit and coefficient estimates). Last, model re-specification is needed, if necessary. Using path analysis, the following questions are explored:

1.4. Research Questions

1.4.1. Parent's Perception

1. Is there a significant relationship between parent's perception of a healthy child's body size and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families? See Proposed Model, **path A**.
2. Is there a significant relationship between parent's perception of a healthy child's body size and child's dieting behaviors in predominately Hispanic families? See Proposed Model, **path B**.
3. Is there a significant relationship between parent's perception of a healthy child's body size and parent's dieting behaviors in predominately Hispanic families? See Proposed Model**, path C**.
4. Is there a significant relationship between parent's perception of a healthy child's body size and child's food behaviors in predominately Hispanic families? See Proposed Model, **path D**.
5. Is there a significant relationship between parent's perception of a healthy child's body size and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic

families, indirectly using mediating variables (parent's dieting behaviors, child's dieting behaviors, and child's food behaviors)?

1.4.2. Parent's Dieting Behaviors

6. Is there a relationship between parent's dieting behavior and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families? See Proposed Model, **path E**.
7. Is there a relationship between parent's dieting behaviors and child's dieting behaviors in predominately Hispanic families? See Proposed Model, **path E**.
8. Is there a relationship between parent's dieting behaviors and child's food behaviors in predominately Hispanic families? See Proposed Model, **path E**.
9. Is there a significant relationship between parent's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families, indirectly using mediating variables (child's dieting behaviors, and child's food behaviors)?

1.4.3. Child's Dieting Behaviors

10. Is there a significant relationship between a child's dieting behaviors and child's food behaviors in predominately Hispanic children? See Proposed Model, **path F**.
11. Is there a significant relationship between a child's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic children? See Proposed Model, **path G**.
12. Is there a significant relationship between a child's dieting behaviors and Diabetes in predominately Hispanic children? See Proposed Model, **path H**.

13. Is there a significant relationship between child's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families, indirectly using a mediating variable (child's food behaviors)?

1.4.4. Child's Food Behaviors

14. Is there a significant relationship between a child's food behaviors and in child's weight (BMI *z*-scores and raw BMI) predominately Hispanic children? See Proposed Model, **path I**.
15. Is there a significant relationship between child's food behaviors and Diabetes in predominately Hispanic children? See Proposed Model, **path J**.

1.4.5. Diabetes

16. Is there a significant relationship between child's weight (BMI *z*-scores and raw BMI) and Diabetes in predominately Hispanic children? See Proposed Model, **path K**.

1.5. Hypothesis

1.5.1. Parent's Perception

1. There is no relationship between parent's perception of a healthy child's body size and child's weight (BMI z-scores and raw BMI) in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.
2. There is no relationship between parent's perception of a healthy child's body size and child's dieting behaviors in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.
3. There is no relationship between parent's perception of a healthy child's body size and parent's dieting behaviors in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

4. There is no relationship between parent's perception of a healthy child's body size and child's food behaviors in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

5. There is no relationship between parent's perception of a healthy child's body size and child's weight (BMI z-scores and raw BMI) in predominately Hispanic families, indirectly using mediating variables (parent's dieting behaviors, child's dieting behaviors, and child's food behaviors)? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

1.5.2. Parent's Dieting Behaviors

6. There is no relationship between parent's dieting behavior and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

7. There is no relationship between parent's dieting behaviors and child's dieting behaviors in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

8. There is no relationship between parent's dieting behaviors and child's food behaviors in predominately Hispanic families? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

9. There is no relationship between parent's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families, indirectly using mediating variables (child's dieting behaviors, and child's food behaviors)? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

1.5.3. Child's Dieting Behaviors

10. There is no relationship between a child's dieting behaviors and child's food behaviors in predominately Hispanic children? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

11. There is no relationship between a child's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic children? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

12. There is no relationship between a child's dieting behaviors and Diabetes in predominately Hispanic children? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

13. There is no relationship between child's dieting behaviors and child's weight (BMI *z*-scores and raw BMI) in predominately Hispanic families, indirectly using a mediating variable (child's food behaviors)? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

1.5.4. Child's Food Behaviors

14. There is no relationship between a child's food behaviors and child's weight (BMI *z*-scores and raw BMI) predominately Hispanic children? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

15. There is no relationship between child's food behaviors and Diabetes in predominately Hispanic children? This will be tested in the path analysis. All hypotheses will be tested at $p < 0.05$.

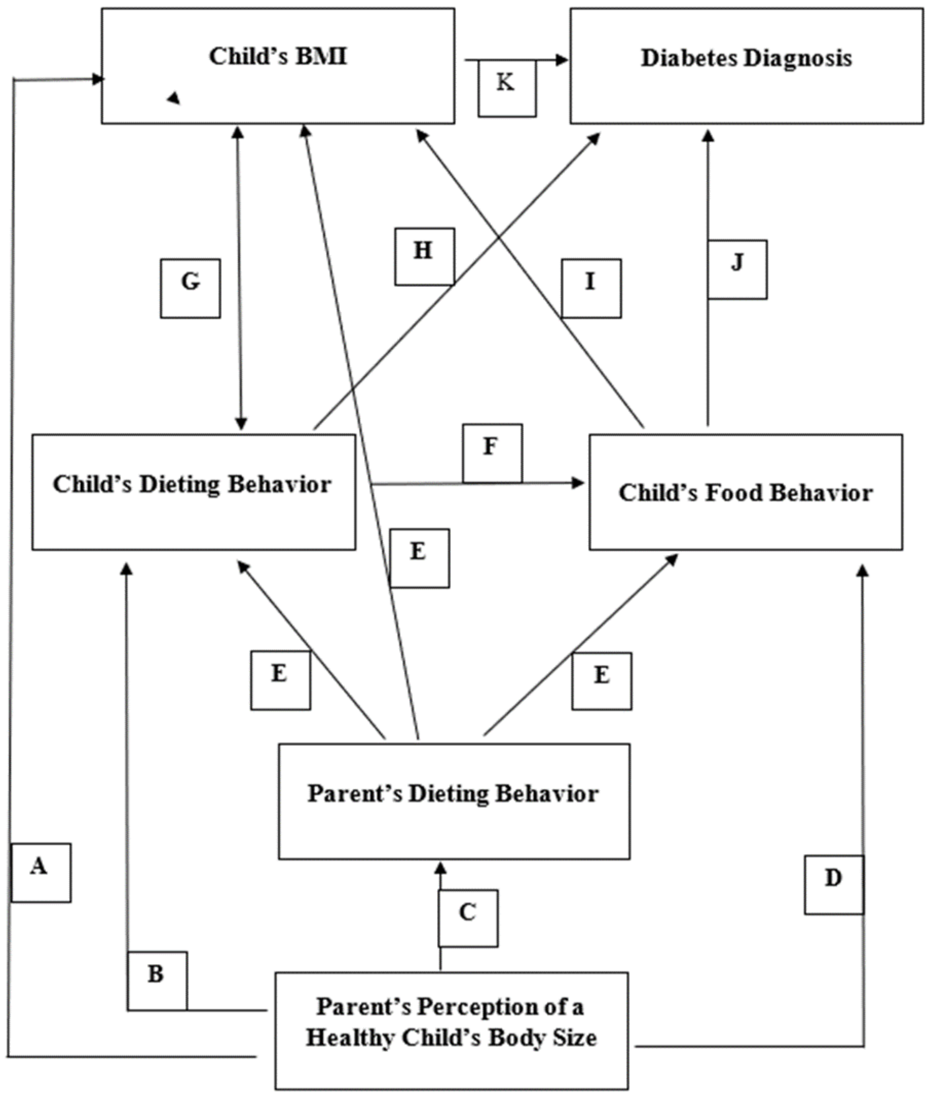
1.5.5. Diabetes

16. There is no relationship between child's weight (BMI *z*-scores and raw BMI) and Diabetes in predominately Hispanic children? This will be tested in the path analysis.

All hypotheses will be tested at $p < 0.05$.

Figure 2

Proposed Model



Note. A represents the direct effect of a parent's perception of a healthy child's body size to their child's BMI. B represents the direct effect of parent's perception of healthy child's body size to their child's dieting. C represents the direct effect of parent's perception of healthy child's body size to their dieting behavior. D represents the direct effect of parent's perception of a healthy child's body size on their child's food behavior. E represents the direct effects of parent's dieting behavior and their child's dieting, BMI, and food behavior. F represents the direct effect of child's dieting on their food behavior. G represents the bidirectional effect within two variables. H represents the direct effect of a child's dieting on their diagnosis of Diabetes. I represent the direct effect of a child's food behavior on their BMI. J represents the direct effect of a child's food behavior on BMI. K represents the direct effect of a child's BMI on Diabetes.

2. REVIEW OF LITERATURE

The prevalence of obesity in children and adolescents is of great concern because of its persistence into adulthood and its inability to effectively be reversed. Additionally, serious psychosocial consequences, including but not limited to depressive symptoms (Erickson et al., 2000; Goldfield et al., 2010; Lim et al., 2016; Zeller et al., 2012; Zeller & Modi, 2006), dieting (Eisenberg et al., 2005; Larson et al., 2009; Neumark-Sztainer et al., 2012), disordered eating (M. Fisher et al., 1995; Marchi & Cohen, 1990; Neumark-Sztainer et al., 2002; Rosen et al., 2010), decreased self-esteem (Johnson & Wardle, 2005; Strauss, 2000; F. Wang et al., 2009), negative quality of health (Lim et al., 2016; Ottova et al., 2012), increased body image dissatisfaction (Goldfield et al., 2010; Robinson et al., 2001; F. Wang et al., 2009), and poor academic performance (Falkner et al., 2001; Gill et al., 2021; Halfon et al., 2013) have been attributed to overweight and obese weight status. Parent's influence on weight-related behaviors is a topic of interest as past studies have shown that both direct behaviors (parental feedback such as weight teasing, weight criticism, and encouragement to diet) and indirect behaviors (parental self-dieting and self-weight dissatisfaction) are linked to unhealthy eating behaviors among children and adolescents (Byely et al., 2000; Eisenberg et al., 2011; Francis & Birch, 2005; Haines et al., 2008; Hanna & Bond, 2006; Hitti et al., 2020; J. A. Lydecker & Grilo, 2018).

However, these results have been contradicted in the Hispanic/Latino population as studies in this population have shown female adolescents to be more accepting of their physical appearance (body shape and size) with parental feedback (Romo et al., 2016). Thus, the sociocultural role of familism in modeling and shaping children's eating habits is relevant. Yet, few studies have examined familism and fewer studies have investigated if familial weight messaging truly exists and for what individuals and under what circumstances. Additionally, the cultural context for the terms (and phrases) that Hispanic/Latino families use within familial conversations about weight has not been assessed.

According to the CDC from 1999–2000 through 2015–2016, a significantly increasing trend in obesity was observed in both U.S. adults and youth (CDC, 2022b & 2022c). Specifically, Hispanic adults and youth had a higher prevalence of obesity compared with other race and/or ethnicity groups (CDC, 2022c). Given the racial and ethnic disparities in the prevalence of obesity and the psychosocial consequences of obesity, this area of research is noteworthy in strengthening strategies for healthy weight-related behavior in children. The following sections outline a listing of topics to be explored as important contributors to the variables of interest. A current literature review on this subject includes a detailed discussion on: (a) childhood obesity; (b) its impact on health; (c) psychosocial well-being and eating behavior; and (d) the role of familism in the modeling of children's eating habits.

2.1. Childhood Obesity

2.1.1. Defining Obesity

With an estimated one in five U.S. children and adolescents having obesity and many others being overweight, the Healthy People 2030 campaign is targeting to reduce the proportion of children and adolescents with obesity from 17.8% to 15.5% (Healthy People 2030, 2022). There are different assessment methods currently used to determine if an individual is overweight and/or obese. Ideally, healthcare professionals will choose anthropometric measures that are: (a) easily performed and reproducible; (b) able to assess body fatness independent of height; (c) comparable to available reference standards; (d) able to provide some measure of fat distribution in central verses peripheral adipose tissue depots (Ronald et al., 2019) and (e) ultimately feasible, reliable, and valid.

Overweight and obesity are defined by the World Health Organization (WHO) as abnormal or excessive fat accumulations (WHO, 2022). The medical definition used to define obesity is an excess accumulation of adipose tissue containing stored fat in the form of triglycerides (Ronald et al., 2019). The definition of excess is not easily determined and thus not easily explained. For adults, overweight and obesity ranges are determined by using weight and height to calculate a number called the *Body Mass Index*. BMI is defined as weight in kilograms divided by height in meters squared. The formula is illustrated below.

$$\text{BMI} = \frac{\text{kilograms}}{(\text{meters})^2}$$

An adult who has a BMI between 25 and 29.9 kg/m^2 is considered overweight. An adult who has a BMI of 30 or higher is considered obese. BMI does not directly measure body fat and may over and underestimate body fat due to bone and muscle mass. Thus, BMI may classify some individuals, such as athletes, as overweight or obese even though they do not have excess body fat. As a result, other methods of estimating body fat and body fat distribution should be considered. However, BMI is extremely convenient, only requiring the collection of two anthropometric measurements, weight, and height (or length), which can be easily attainable in any setting. It is cost-efficient, requiring no subjective assessments or trained individuals, and the same formula can be used for both males and females (Coulston et al., 2001). For these reasons BMI is often used to determine overweight and obesity status in both adults and youths. In fact, the Expert Committee on Clinical Guidelines for Overweight in Adolescent Preventive Services Report (1994) recommended BMI as the standard measure of obesity in children and adolescents (Barlow & Committee, 2007). In addition, national surveys such as the National Health and

Nutrition Examination Survey (NHANES), Hispanic Health and Nutrition Examination Survey (HHANES), National Health Interview Survey (NHIS), Behavioral Risk Factor Surveillance System (BRFSS), and Youth Risk Behavior Surveillance System (YRBSS), among others and campaigns such as Healthy People 2030 and The Weight of the Nation use BMI in their data methodology and evaluation designs.

BMI is age and sex-specific and, in children, is often referred to as BMI-for-age. Thus, BMI ranges for children and adolescents consider normal differences in body fat between boys and girls and differences in body fat at various ages. After BMI is calculated, the BMI number is plotted on the BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. These percentiles are the most commonly used indicator(s) to assess the size and growth patterns of individual children in the United States. The percentile indicates the relative position of the child's BMI number among children of the same sex and age. The growth charts show the weight status categories (underweight, healthy weight, overweight, and obese). In the underweight category, the child plots less than the 5^{th} percentile on the growth charts. Healthy weight is defined as plotting at the 5^{th} percentile to less than the 85^{th} percentile. In the overweight category, the child plots at the 85^{th} percentile and less than the 95^{th} percentile (CDC, 2022c). Lastly, obesity is defined as plotting at/or greater than the 95^{th} percentile. As an additional method of assessing growth, *BMI z-scores* (also known as BMI standard deviation (SD) scores) are becoming more widely used due to their accuracy. A BMI *z*-score is calculated based on a child's age, gender, and BMI, along with an appropriate reference standard. Cole's LMS equation (T. Cole, 1990) is a method used to determine these reference standards, *z*-scores (SD above or below the mean). BMI z-scores are calculated using the CDC-LMS equation, and both the CDC and WHO provide assistance on using it. Table 1 illustrates the weight categories based on the *z*-scores.

Table 1

Weight Classification using BMI z-score

BMI *z*-score	BMI-for-Age
>3	Obese
>2	Overweight
>1	Risk of overweight
0	Normal
<1	Normal
<2	Wasted
<3	Severe wasted

Note. Adapted from the World Health Organization Interpreting Growth Indicators (2008) and the Center for Disease Control and Preventions (2015).

BMI does not measure body fat directly, therefore, research on its validity as a measure of adiposity has been extensively researched throughout the years. Past research has focused on comparing BMI to assessments that have performed well against the gold standards of body composition assessments, underwater weighing, and Dual Energy X-ray Absorptiometry (DEXA). To validate BMI as an index of adiposity in children, a study involving 387 healthy white children (aged 8 to 18 years) was conducted by Maynard et al. (2001). Total body fat and fat-free mass were determined from hydrodensitometry. BMI was strongly correlated with TBF and percent body fat ($r = 0.64$ and 0.85; $p < 0.001$), indicating that BMI is a suitable measure of adiposity. Due to the changing nature of the growth in both stature and mass during childhood, the authors examined if BMI precisely measures body composition as height increases. BMI was strongly correlated with stature at ages 10 to 14 years in boys and age 9 years in girls ($p < 0.001$). This suggests that children and adolescents who are tall for their ages may have larger BMI values because of stature rather than excess adiposity. Mean BMI values increased with age in both sexes, which is an expected result as fat mass increases with age.

Among more racially and ethnically diverse populations, BMI was examined using DEXA. In a sample consisting of 192 White and African American males and females (aged 7 to 17 years), BMI was found to be correlated with age among females and males respectively (r = 0.53 and 0.64; r = 0.47 and 0.45; $p < 0.001$) (Daniels et al., 1997). In addition, multiple regression analysis showed that BMI, gender, race, and sexual maturation were significant independent correlates of the percent body fat (r = 0.77; $p < 0.001$). Similar results were reported in a sample of 198 Italian children, aged 5 to 19 years (Pietrobelli et al., 1998). BMI was strongly associated with DEXA total body fat (R^2 = 0.85 and 0.89 for boys and girls, respectively) and percent body fat (R^2 = 0.63 and 0.69 for boys and girls, respectively). Lindsay et al. (2001) also found similar results among Pima Indians (n = 985). Data were analyzed in three age groups: 5 to 9 years, 10 to 14 years, and 15 to 19 years. BMI was strongly correlated in all age groups to both DEXA percent body fat (r = 0.83 to 0.94; for each group, $p < 0.0001$) and fat mass (r = 0.96 to 0.98; $p < 0.0001$). Additionally, similar results in younger U.S. children (aged 3 to 8 years) have been found by Eisenmann and colleagues (Eisenmann et al., 2004).

To this author's knowledge, the most recent multi-ethnic U.S. study validating the use of BMI in children was conducted in 1999 (Boeke et al., 2013). The authors examined 1,110 multi-ethnic children participating in Project Viva (a prospective pre-birth cohort study in eastern Massachusetts). The sample included: 63.5% White, 16.9% black, 4.2% Hispanic, 3.4% Asian, and 11.9% other race/ethnicity children. Correlations were adjusted for exact age due to the variation in exact age (aged 6.5 to 10.9 years) and gender differences. However, unadjusted correlations were used since the adjustment did not substantially change correlations. Mean (*SD*) BMI was 17.2 (3.1) and total fat mass by DEXA was 7.5 (3.9) kg. DEXA total fat mass was highly correlated with BMI (r = 0.83). BMI was also highly correlated to waist circumference (r = 0.86) and the sum of subscapular and triceps skinfolds (r = 0.79).

2.1.2. Other Anthropometric Measurements and Interpretations

Besides BMI, other methods that are readily used to assess body fatness in children (and adolescents) are skinfold thickness, abdominal (waist) circumferences, Bioelectrical Impedance Analysis (BIA), DEXA, air displacement plethysmography (also known as BodPod©), and ultrasound technology. Each method has advantages and disadvantages with respect to cost, technical difficulty, and precision in estimating body fat. See Table 2 for further detail on body composition measures for research use.

Table 2

Assessments of Body Compositions

Method	Description	Trained Staff	Cost	Validity / Reliability	Accuracy	Availability	Fat Distribution
BMI	A person's weight in kilograms divided by the square of height in meters $BMI = \frac{kilograms}{(meters)^2}$	No	Low	Yes [a]	Low	Feasible	No
Skinfold Thickness	Estimating the amount of subcutaneous fat by using calibrated calipers at defined body sites (upper arm or triceps, subscapular region, and upper abdomen)	No	Low	Yes	Low	Feasible	Yes
Waist Circumference	A value representing the measurements of a person's abdomen using a non-stretchable tape	Yes	Low	Yes	Low	Feasible	Yes
BIA	Use of a low-intensity electrical current to evaluate body composition	No	Moderate	Yes	High	Feasible	Yes
DEXA	Use of a whole-body scanner to estimate bone mineral, body fat, and fat-free mass soft tissue	Yes	High	Yes	High	Not Feasible	Yes
BodPod©	Use of the relationship between the volume and pressure of air to predict the density of one's body	Yes	High	Yes	High	Not Feasible	Yes
Ultrasound	Use of sound, imaging, and a prediction equation to estimate fat-free mass and body fat mass inside the body and convert them into body fat percentages	Yes	Moderate	Yes	High	Feasible	Yes
Underwater weighing (Gold Standard)	Use of whole-body densitometry to determine body composition.	Yes	High	Yes	High	Not Feasible	Yes

Note. Modified from Whitney, E. & Rolfe, S. Understanding Nutrition 8^{th} ed. West/Wadsworth, Belmont, CA. 1998. [a]Author notes disagreement on reliability and availability, but Eisenmann et al. (2004) validates BMI as a valid and reliable tool in the population planning to study.

2.2. Prevalence of Childhood Obesity

NHANES has provided vital information on the health and nutritional status of adults and children in the United States since the 1960s. Despite changing its focus to meet the health and nutrition needs of the public, NHANES continues to survey a nationally representative sample of U.S. children and adolescents aged 2 to 19 years. This information has provided great insight into the prevalence of major diseases and risk factors for diseases. Most recently, Fryar, Carroll, and Ogden (2020) used the 2015–2016 NHANES to examine obesity trends among children and adolescents (Fryar et al., 2020). The authors followed the BMI cutoff criteria based on the sex-specific BMI-for-age 2000 CDC Growth Charts (*n* = 3,340). Overweight was defined as BMI at the 85th to less than the 95th percentile. Obesity was defined as BMI values at or above the 95th percentile. Severe obesity was defined as BMI at or above 120% of the 95th percentile. The researchers found that an estimated 18.5% of U.S. children and adolescents aged 2 to 19 years were obese, including 5.6% with severe obesity, and another 16.6% are overweight. Additionally, a positive linear trend for all definitions of overweight, obesity, and severe obesity was noted (refer to Table 3 below). The authors additionally noted the discrepancy in the prevalence of obesity among children and adolescents aged 2–19 years, by sex and race, and Hispanic origin (discussed in the next section).

Table 3

Prevalence of Overweight, Obesity, and Severe Obesity Among Children and Adolescents

Survey Period	*N*	% Overweight	% Obese	% Severe Obese
1971–1974	7,041	10.2	5.20	1.0
1976–1980	7,351	9.20	5.50	1.3
1988–1994	10,777	13.0	10.0	2.6
1999–2000	4,039	14.2	13.9	3.6
2001–2002	4,261	14.6	15.4	5.2
2003–2004	3,961	16.5	17.1	5.1
2005–2006	4,207	14.6	15.4	4.7
2007–2008	3,249	14.8	16.8	4.9
2009–2010	3,408	14.9	16.9	5.6
2011–2012	3,355	14.9	16.9	5.6
2013–2014	3,523	16.2	17.2	6.0
2015–2016	3,340	16.6	18.5	5.6

Note. Reproduced with permission from Fryar, Carroll, and Ogden (2020).

2.2.1. Obesity in Hispanic Children

Excess body fat accumulation is detrimental to health (Whitney & Rolfes, 1999). Some have speculated that Mexican American children tend to be shorter and heavier than U.S. non-Hispanic white children (Kaplowitzl et al., 1989). Past research has investigated body fatness specifically in Mexican Americans to determine if this was factual. The HHANES (1982–1984) was a temporary shift after NHANES II (1976–1980) to collect population-specific survey data. Three Hispanic groups were examined, Mexican Americans (Southwest), Cuban Americans (Florida), and Puerto Rican Americans (New York). Ultimately, the research from this survey has been used to assess differences among Hispanic groups and compare these groups to other race/ethnic groups. To date, there has not been another HHANES or national survey on Mexican

American children. Thus, HHANES provides a great historical perspective on Hispanic groups, specifically Mexican American children.

One study compared 3,580 Mexican American children (aged 0.5 to 19 years) from the HHANES to White children from the NHANES II using the recorded growth chart measurements (Roche et al., 1990). Differences were noted between the HHANES and NHANES II data in weight-for-age; stature-for-age; and weight-for-stature. The authors noted that starting at 14 years for males and 11 years for females, the stature-for-age percentile levels for Mexican Americans were markedly lower than those for whites, especially in females. Mean differences for statue-for-age were statistically significant ($p < 0.05$) in the 50th and 90th percentiles for females. In females, weight-for-stature at the 50th and 90th percentiles for age were significantly higher for Mexican American females than non-Hispanic whites ($p < 0.05$). Weight-for-stature at the 5th, 50th, 75th, 90^{th,} and 95th percentile for age was significantly higher in Mexican American males than non-Hispanic white males ($p < 0.05$). Additionally, weight-for-stature at 10th, 25th, 50th, 75th, and 90th percentiles for age were significantly higher in Mexican American females ($p < 0.05$). It was noted that after the age of 12, the upper stature (height) percentiles for boys and all statures (height) in girls tended to be lower in Mexican American children compared to white children. Similar results were reported by Malina et al. (1987). Thus, Mexican American children are shorter than non-Hispanic whites.

It has been hypothesized that this increase in fat is disproportionately distributed in the body and that Mexican American children have a more centralized fat distribution. Kaplowitz et al. (1989) examined the level of fatness and fat distribution in a large ($n = 3,467$), representative sample of Mexican American children (aged 0 to 17 years) from the NHANES survey using skinfold thickness (triceps, subscapular, suprailiac, and medial calf sites). An index of fat distribution was derived by taking the ratio of the subscapular to the triceps skinfold thickness. Mexican American children were generally “fatter” than white children (measured in NHANES II). Main differences were particularly evident for trunk skinfold thickness, which increased with age. These findings coincided with Roche and colleagues (Roche et al., 1990) but in different magnitudes ($p < 0.05$). Baumgartner et al. (1990) reported similar results by investigating the prevalence of central obesity in 3,575 Mexican American children (aged 1 to 18 years) from HHANES (1982–1984). Obesity was defined as a sum of skinfolds > the 75th percentile for each age group. Central obesity increased from less than 1.0 to 10.8% from 1 to 18 years of age in boys, which indicated that the prevalence of excess adiposity with a central fat distribution increased with age. These studies identified indices of fat distribution that clearly showed a centralized, upper body adiposity pattern among Mexican American children. This is of concern since greater fat deposition on the trunk has been associated with an increased risk of heart disease, stroke, diabetes, hypertension, and some types of cancers (Whitney & Rolfes, 1999). However, the exact mechanism of how this causes disease development remains unknown.

A discrepancy in the prevalence of obesity among children and adolescents aged 2–19 years, by sex and race, and Hispanic origin has been thoroughly investigated (see Table 4).

Table 4

Prevalence of Obesity Among Children and Adolescents Aged 2–19 Years, By Sex and Race, and Hispanic Origin

	Boys					Girls				
Survey Period	White	Black	Asian	Hispanic	**Mexican American**	White	Black	Asian	Hispanic	**Mexican American**
1988–1994	9.7	10.6	---	---	**14.8**	8.6	14.5	---	---	**13.8**
1999–2000	10.9	16.4	---	---	**23.5**	11.1	21.4	---	---	**16.8**
2001–2002	15	15.5	---	---	**22**	12.7	19.5	---	---	**17**
2003–2004	17.8	16.4	---	---	**22**	14.9	23.8	---	---	**16.1**
2005–2006	13.4	18.3	---	---	**24.3**	12.2	24.4	---	---	**20.6**
2007–2008	15.6	17.3	---	24.5	**24.9**	14.9	22.8	---	17.3	**16.6**
2009–2010	16.1	24.3	---	23.4	**24**	11.7	24.3	---	18.9	**18.2**
2011–2012	12.6	19.9	11.5	24.1	**24.2**	15.6	20.5	*5.6	20.6	**21.1**
2013–2014	15.9	16.8	12.1	20.6	**19.5**	14.6	20.9	*5.0	22.1	**24.2**
2015–2016	14.6	19	11.7	28	**29.2**	13.5	25.1	10.1	23.6	**24.3**

Note. Reproduced with permission from Fryar, Carroll, and Ogden (2020).

Early research found an association between obesity and Hispanic origin ($p < 0.02$), in which more Hispanic children had BMIs at the 85th and 95th percentiles for age than any other ethnic group examined (Melnik et al., 1997). Most recently, Fryar et al. (2018) noted these differences by examining the NHANES studies, where obesity in Hispanic children was assessed. The authors defined obesity as BMI at or above the 95th percentile from the sex-specific BMI-for-age 2000 CDC Growth Charts. The percentage of Hispanic and Mexican American children defined as obese differed dramatically from other racial and ethnic groups. Through the years, Hispanic and Mexican American boys, followed by African American boys had greater rates of obesity than any other race and ethnic group. In contrast among girls, African American girls, followed by Hispanic and Mexican American girls had the greatest obesity percentages.

2.3. Development of Obesity

There are several factors contributing to the development of obesity. Proposed etiological factors of obesity have included gene association with basal metabolism, dietary thermogenesis, appetite, satiety, lipid metabolism, and fat storage. These are possible factors for the inheritability of obesity in families (Trahms & Pipes, 1997). However, the etiology has not been well established. Most research supports the basic theory of energy imbalance. This theory states that adult weight is stable when energy is balanced. Therefore, weight is stable when energy intake equals energy expended. Obesity can only result when the body's energy balance is positive (Dietz, 1983). This energy imbalance is due to multiple factors, most notably those that are environmental. This includes physical inactivity. School policies and child safety concerns, such as fear of predators or neighborhood-related violence, lack of sidewalks and well-lit walking routes, and increase the distance to and from school, have reduced the opportunities for physical activity (Sahoo et al., 2015). Most recently, the novel coronavirus disease of 2019 (COVID-19) has also increased environmental risk factors for childhood obesity as families are practicing self-isolation and quarantine protocols. A sedentary lifestyle, such as increased TV, social media, gaming, and the internet (online streaming) also contributes to physical inactivity. Socioeconomic Status (SES), which includes family income, education level, age of parents, and family size also influences physical activity participation and food choices. Most evident are the dietary behaviors associated with the Americanized lifestyle and working families, such as increased snacking, fast-food (and eating out), large portion sizes, food advertisement (and promotions), and family (and individual) eating behaviors.

Nonetheless, when there is a positive energy balance, excess energy is stored as fat. As excess energy is consumed, fat cells expand in size until they reach their maximum size (Whitney & Rolfes, 1999). If the adult individual continues to be in positive energy balance, the fat cells expand and divide. Therefore, fat cells increase in number, which then causes an individual to accumulate body fat. In summary, obesity is caused by the accumulation of fat cells, which then causes an increase in body fat. However, the energy balance theory is more complicated for children because they must have some positive energy balance to grow and develop. Energy intake must exceed energy output in children due to rapid growth periods in infancy through adolescents (Rosenbaum & Leibel, 1998). Also, during infancy and adolescence, adipose tissue is growing by the combination of two things: (a) an increase in fat cell size; and (b) the number of these cells. Hence, children will more readily produce a larger number of fat cells. This is problematic as they become adults because they will not be able to get rid of these fat cells, only shrink them. The storage and release of fat cells in adipose tissue are unique and important factors to consider in the regulation of the energy balance among children and adolescents (Arner, 2018; Arner et al., 2019). Hence, genetics, excessive energy intake and reduced energy expenditure, and impaired regulation of energy balance are some factors that may contribute to obesity.

Childhood obesity is multifactorial as many factors contribute to the development of this condition (Hazrati et al., 2019). Causes of childhood obesity include factors that promote energy intake in excess, decreased physical activity, and increased sedentary behavior (Dietz, 1983). It must be noted that as opposed to genetic (and epigenetic) and biological factors, behavioral risk factors have increased due to "radical changes in food availability and energy expenditure as the result of our technological advancement and consumerist society" (J. C. Han et al., 2010). In summary, families have greater access to low costs energy-dense foods and are subjected to lower energy expenditure in daily life. These behavioral risk factors are greatly impacted by demographics (race/ethnicity, parents' work-related characteristics, and education) and the social environment, creating great disparities among different populations.

2.4. Health Disparities in Childhood Obesity

2.4.1. Race and Ethnicity

Obesity is a serious problem, placing individuals at risk for poor health. Notably, obesity has been found to be more common among certain populations, particularly Hispanics/Latino populations. Hispanics have proven to be heavier and shorter, which will likely have profound impacts on health issues in the future. Moreno-Black and Stockard (2015) examined the prevalence of overweight and obesity during childhood and developmental trajectories between Hispanic (n = 1,164) students and non-Hispanic white (n = 5,169) elementary-aged students. BMI z-scores (also called BMI standard deviation scores) was used as an appropriate reference standard. During a four-year period (fall 2005 to fall 2008), obesity was examined using the total population of 1st, 3rd, and 5th grade students in 18 schools in Western Oregon. The authors noted that in all comparisons, the Hispanic students had a greater prevalence of overweight/obesity (had higher average BMI *z*-scores) than the total group. Within each grade (F = 144.03, p < 0.0001), year (F = 108.68, p < .0001), and sex (F =145.49, p < .0001), the ethnic differences in BMI *z*-scores was noticeable at 1st grade. This difference in the prevalence of overweight/obesity increased over time. Developmental trajectories (tracking weight changes) were assessed using two panels of data: changes from 1st to 3rd grade (panel 1); and changes from 3rd to 5th grade (panel 2). Authors defined changes in weight status as: (a) normal weight status at both time periods; (b) moving from the normal category to overweight or obese; (c) moving from the overweight or obese category to normal, or (d) overweight or obese status at both time periods. Compared to non-Hispanic white students, Hispanic students began both panels with higher BMI *z*-scores and were more likely to increase and less likely to decrease BMI *z*-scores (Panel 1: x^2 = 18.56, df = 3, p < 0.001; Panel 2: x^2 = 9.13, df = 3, p = 0.03). Additionally, the authors noted that "Hispanic students' BMI values were predicted to be from 0.21 to 0.35 of a standard deviation higher than those of non-Hispanic white students who had identical BMI *z*-scores at the start of the period, school-level poverty (SES), and sex" (Moreno-Black & Stockard, 2015 p. 337).

Isong and colleagues (2018) reported that racial/ethnic disparities in U.S. children's weight status are established early. Mean BMI *z*-scores for Hispanic boys (*M* (SD)= 0.55 (0.09)) were already significantly higher by 24 months than their white peers (*M* (SD) = 0.37 (0.07)) and remained higher through kindergarten entry (*M* (SD) = 0.86 (0.05) vs. *M* (SD) = 0.59 (0.02); $p \leq 0.05$). Additionally, Hazrati, Khan, Huddleston, De La Cruz, Deeken, et al. (2019) used longitudinal data from "The First 1000 Days of Life and Beyond" (through the Inova Health System) to examine factors associated with excess weight in the first year of life (year one) in

1,009 infants (Hazrati et al., 2019). Thirty percent (30%) of the sample was Hispanic. Compared to non-Hispanic White children (n = 707), Hispanic infants (n = 302) had a greater obesity rate and higher mean weights (13.6% vs. 30.1%; M (SD) = 21.3 (2.8) vs. 22.3 (2.9); $p < 0.0001$) at year one. Hispanic children were also reported to have higher weight gain in the first year of life (M (SD) = 6322 (1189) vs. 6763 (1398); $p = 0.006$). On the CDC website, the Health Disparities and Inequalities Report found race and ethnicity, along with the social demographic contexts, in which Hispanics live "can explain in part, why certain populations are healthier than others and why some are not as healthy as they could be" (Frieden et al., 2013).

2.4.2. Low Socioeconomic Status

Lack of income impacts the nutrition within the household in various ways. Overall, the selection of lower-quality foods is due to the lower costs per calorie that more energy-dense foods, such as fast foods, boxed meals, and high-fat frozen meals have (Brooks-Gunn & Duncan, 1997; Drewnowski & Specter, 2004). Families with lower SES will purposely choose energy-dense foods low in nutritional value because they believe these foods are more likely to keep their children satiated until their next meal (Grant-Guimaraes et al., 2016).

Lower SES families may also choose these types of foods out of convenience. It is often the case that both parents (and single parents) in the household work long hours to earn enough money to survive, which limits their ability to cook together (Vazquez & Cubbin, 2020). Last, it is speculated that lower SES families live in lower SES neighborhoods or attend lower SES schools, where access to fresh fruits and vegetables may be unavailable or at a greater cost (Miller et al., 2020).

The first landmarking review on SES and obesity in children and adolescents was conducted by Sobal and Stunkard (1989). This cross-sectional review of studies included information on developed and developing countries. There was a total of 17 U.S. studies reviewed. Among boys, five studies showed a direct relationship between SES and obesity. Another five studies (among boys) showed an inverse relationship between SES and obesity. Among girls, there was a total of four studies that showed direct relationships between SES and obesity. Another five studies (among girls) showed an inverse relationship between SES and obesity. There were only four studies that did not show a relationship (either direct or inverse) in either boys or girls. Within the same time, Ryan et al. (1990) examined SES (assessed by the Poverty Index Ratio (PIR)) specifically among the Mexican American population using the HHANES 1982–1984. In comparison with their peers who were above the poverty line, Mexican American children (aged 13 to 18 years) who were poorer (at or less than the poverty line) had higher levels of skinfold thickness ($p < 0.05$). Other great research followed, cementing the relationship between SES and obesity (Gordon-Larsen et al., 2003; Ogden et al., 2002, 2018a; Paeratakul et al., 2002; Y. Wang & Zhang, 2006).

However, from 2006 until very recently, few reviews offered in-depth discussions about the relationship between childhood obesity and SES. "The issue seems to be that most studies are not reporting SES analyses beyond descriptive statistics" (Vazquez & Cubbin, 2020, p. 563). The Early Childhood Longitudinal Study – Birth Cohort (ECLS-B) has produced great research regarding SES and behavioral risk factors for obesity. Sponsored by the U.S. Department of Education, the National Center for Education Statistics (NCES), ECLS-B data consisted of a nationally representative sample of 14,000 children born in the U.S. in 2001. Families from diverse socioeconomic and racial backgrounds were surveyed in five waves: at their child's birth, at 9 months (wave-1), 24 months (wave-2), 4 to 5 years of age (wave-3: pre-kindergarten entry), 5 years of age (wave 4: kindergarten entry) and 6-years of age (wave-5: kindergarten entry for those entering in 2007 verses 2006). Researchers measured child health, development, care, and education to investigate the prevalence and causes (factors and co-factors) of overweight/obesity within race/ethnic groups. Different SES factors were assessed: poverty index score, household SES, neighborhood SES, parent's educational attainment, and occupational status.

Jones-Smith et al. (2014) used the ECLS-B data for children who completed all five waves and were not missing any covariate data (n = 4,950). Weight status (overweight or obesity between birth and age 5–6 years) was collected using age-and sex-specific referent mean for BMI using the WHO Child Growth Standards (for age 0 to 5 years); WHO Child Growth Reference (age 0 to 5 years) and weight-for-age (at birth). Overall, at the first visit (9 months of age), American Indian, African American, and Hispanic populations were underrepresented in the highest wealth quintiles, while white and Asian populations were overrepresented in the highest wealth quintiles. For each race/ethnic group, the odds of being overweight/obese were significantly lower for the highest SES quintile compared to the lowest SES quintile. Among Hispanic children (at age 5), the second (OR = 0.66; 95% CI: 0.47, 0.93) through fourth-highest quintiles of SES (OR = 0.60; 95% CI: 0.36, 1.01) had a lower probability of overweight/obesity compared to the lowest quintile ($p < 0.10$).

Williams et al. (2018) also used the ECLS-B to examine SES as a modifying risk factor for other demographic and behavioral obesity risk factors associated with childhood obesity. The researchers only included the kindergarten entry data (children aged 4 to 5 years), consisting of 7,022 children. The CDC's sex-specific BMI-for-age growth charts were used to assess weight status. SES ($p < 0.0018$), race ($p < 0.0001$) and birth weight ($p < 0.0001$) were significantly associated with children being overweight or obese. Children in the lowest SES quintile were 70% more likely to be overweight or obese than children in the highest SES quintile (OR = 1.7;

95% CI: 1.3, 2.2). Black (OR = 1.57; 95% CI: 1.21, 2.05) or Hispanic (OR = 1.65; 95% CI: 1.31, 2.08) children had 60% increased odds of being overweight or obese when compared to white children. Native American children (OR = 1.98; 95% CI: 1.17, 3.34) had an almost doubled odds of being overweight or obese compared with white children. Isong, Richmond, et al. (2017) also used ECLS-B, waves 1 to 4 data ($n = 7{,}200$) to examine weight and height (BMI *z*-scores) trajectories among race/ethnicities over time and to assess the age at which disparities originate and expand. BMI *z*-scores at waves 1 to 4 were calculated using CDC's sex-specific BMI-for-age growth charts. The researchers note that throughout the study period, BMI *z*-scores for Hispanic, American Indian, and Pacific-Islander girls were higher than those for white, African American, and Asian girls. Hispanic (β (SE) = 0.26 (0.08); $p = 0.002$) and African American boys (β (SE) = 0.34 (0.10); $p = 0.001$) had significantly higher BMI *z*-scores than white boys as early as age 24 months, with these disparities remaining relatively unchanged throughout all ages. This was also noted only for American Indian girls (β (SE) = 0.41 (0.11); $p < 0.05$) at 24-months. At preschool (β (SE) = 0.14 (0.06); $p < 0.05$) and kindergarten entry (β (SE) = 0.12 (0.06); $p < 0.05$), Hispanic girls had significant higher BMI *z*-scores compared to White girls. When models were adjusted for SES, Hispanic boys (β (SE) = 0.20 (0.08); $p < 0.05$) and American Indian boys (β (SE) = 0.39 (0.09); p < 0.05) had significantly higher BMI *z*-scores than white children.

Additionally, Isong, Rao, et al. (2018) also examined racial and/or ethnic disparities using up to wave-4 of the ECLS-B ($n = 10{,}700$). BMI z-scores at wave-4 (kindergarten entry) were calculated using CDC's sex-specific BMI-for-age growth charts. Statistical analysis included Blinder-Oaxaca decomposition analyses to determine racial and/or ethnic differences and to quantify the degree to which risk factors explained these racial and/or ethnic differences. Obesity behavioral risk factors included maternal (i.e., mother's weight and smoking history during pregnancy), infancy (i.e., breastfeeding history, age at solid food introduction, and infant weight gain), and early childhood risk factors (i.e., television viewing, sugar-sweetened beverage consumption, fruit and vegetable consumption, physical activity, family meals, and childcare arrangement). Whereas SES risk factors included household SES, food insecurity, and neighborhood safety. As Jones-Smith et al. (2014) reported, there were significant gaps in the percentage of low SES children (income < $25,000) between white (19.8%) and other races/ethnics: African American (56.7%), Hispanic children (51.3%), and American Indian (50.1%) using the ECLS-B data. Hispanic, African American, and American Indian children had greater obesity risk factor profiles (obesity behavior) compared to higher SES groups, White and Asian children. At baseline (age 2 years), Native American (*M* (SE) = 0.73 (0.25); 0.62 (0.15); $p < 0.01$) and Hispanic (*M* (SE) = 0.66 (0.11); 0.43 (0.16); $p < 0.01$) boys and girls, respectively had greater BMI z-scores than White (*M* (SE) = 0.44(0.07); 0.30 (0.08)) boys and girls, respectively. Similar trends were also observed at preschool and kindergarten entry, with White and Asian children having lower BMI *z*-scores as compared to Native American, Hispanic, and African American children. Household SES percent explained a great portion of variance between race/ethnicity. Differences in household SES between white and Hispanic girls accounted for 104% (OR = 0.140 (0.08); 95% CI: -0.289, 0.009, $p < 0.10$), meaning Hispanic girls would be better off than white girls if their SES could be adjusted to levels found among white girls. Miller et al. (2020) found similar results using both neighborhood SES and household SES, in which having either low neighborhood or low household SES is associated with a similarly increased prevalence of overweight status (OR = 0.51; 95%CI: 0.36, 0.72; $p < 0.01$). Ultimately, social, and environmental factors including, but not limited to, economic stability, neighborhood, and physical environment, education, food access, community, and social contexts, and healthcare access (or limited healthcare), may affect an individual's health and ability to engage in healthy behaviors. Several researchers have noted significant differences in household income and parent education levels concerning obesity among Hispanic and their non-Hispanic white counterparts (Assari et al., 2020; James et al., 2017; Ogden et al., 2019; Rogers et al., 2015; Rossen, 2014). It has been noted that parental education level is often the most predictive measure for childhood overweight/obesity with parental income being second (Vazquez & Cubbin, 2020).

2.4.3. Education Level

As one of the most commonly used measures of SES, parental education has been found to influence a number of factors, including household income and knowledge and beliefs regarding healthy lifestyles (Gebremariam et al., 2017; Mech et al., 2016; Vazquez & Cubbin, 2020; Wu et al., 2015). Past research has found maternal education to significantly influence BMI (Freedman et al., 2007; Lamerz et al., 2005; Ogden et al., 2005). It may be that educated mothers are more likely to visit the doctor frequently and maintain a good level of health care due to increased resources (and less financial stress). It is also speculated that educated mothers may have "healthier children because they have better knowledge about health care and nutrition, have healthier behavior, and provide more sanitary and safer environments for their children" (Chen & Guzman, 2021). Still, studies continue to show that raising a mother's educational level has a positive impact on her children's health, including their weight status.

Ogden et al. (2018) examined the NHANES 2011–2014 data to determine the prevalence of overweight/obese youth (aged 2 to 19 years) among various categories of income and head of household education level. Head of household education level was categorized as "*high school* *graduate or less*", "*some college*", and "*college graduate"*. Obesity was defined as a BMI ≥ 95th percentile for age- and sex-specific 2000 CDC growth charts. Obesity prevalence among youths increased from 1999–2002 to 2011–2014. The prevalence of obesity among U.S. youths (both boys and girls) was 17.0% and was significantly lower in households whose heads were college graduates (9.6%) compared to the other groups, some college (18.3%) and high school/GED (21.6%) (OR = 0.096; 95% CI: 7.3, 12.5, $p < 0.05$). Similar results were reported using "The First 1000 Days of Life and Beyond Study". Hazrati et al. (2019) found low maternal education as an obesogenic risk factor associated with excess weight in the first year of life (year one) in Hispanic and non-Hispanic White children (n = 1,009). Maternal education was collected and categorized as either having "*less than an associate's degree*" or "*having an associate's degree*" (or higher). Hispanic infants (n = 302) had a greater obesity rate and higher mean weights than the non-Hispanic White group at year one (13.6% vs. 30.1%; M (SD) = 21.3 (2.8) vs. 22.3 (2.9); $p < 0.001$). Obesity was categorized as being ≥ 95th percentile weight-for-length. Compared to the non-Hispanic White, fewer mothers in the Hispanic group had obtained an associate's degree (66.2% vs. 3.8%; $p < 0.001$), in addition to having lower maternal ages (M (SD) = 30.2 years (5.3) vs. 32.8 years (3.9); $p < 0.001$), higher maternal BMI's (M (SD) = 26.7 (5.5) vs. 24.7 (5.5); $p < 0.001$), higher household counts (M (SD) = 5 (2) vs. 4 (1) individuals; $p < 0.0001$), and higher parity rates (35.4% vs. 15.5%; $p < 0.0001$). Ultimately, excess weight for Hispanic children was associated to lower maternal education (OR = 2.37; 95% CI: 1.1, 4.5; $p < 0.001$).

Lê-Scherban et al. (2021) used data from the 2007–2016 Children's Hospital of Philadelphia Health System to obtain a large ethnically diverse sample of children aged 2 to 19 years (n = 170,735). The authors' primary objective was to compare the incidents of obesity among children whose mothers either had "more" or "less" education. Obesity was defined as ≥

95th percentile of age- and sex-specific BMI based on the 2000 CDC growth charts. Maternal education was categorized as "*less than high school"*, "*high school degree/GED*", "*some college*", or "*Bachelor's degree or higher*". The sample consisted of 56% White, 34% Black, 6% Latinx, 3% Asian, and 1% of other race/ethnicity. Results displayed "consistent, monotonic disparities" regarding obesity rates independent of gender, race/ethnicity, and age in children whose mothers had attained less education (less than high school) compared to more education (Bachelor's degree or higher). Obesity incidence was evident at age four (OR = 6.3%; 95% CI: 6.0, 6.5%), was found greater in females (OR = 7.6%; 95% CI: 7.3, 7.9%) as compared to males, and was more visible as children aged in both boys (OR = 23%; 95% CI: 22, 25%) and girls (OR = 27%; 95% CI: 25, 28%).

To understand the role of maternal education on childhood overweight/obesity, Ayine et al. (2020) examined parental feeding practices with BMI *z*-scores and maternal education in 169 elementary school children (aged 6 to 10 years) in Alabama. Maternal education level was obtained and categorized as "*high school or less*", "*associate's degree*", "*Bachelor's degree*", or "*graduate degree*". A path analysis was conducted to identify the association between various parental feeding factors (perceived child weight, parental concern, and pressure to eat) and BMI *z*-score while taking into consideration maternal education as a confounding factor. In the path model, the largest effect was observed between pressure to eat and maternal education (B = -2.15, $p < 0.001$). Children of mothers with a high school education or less were pressurized to eat more than children of mothers with higher education levels. The authors noted that to test direct and indirect effects, perceived child weight, parental concern, and pressure to eat were tested using maternal education as a mediating variable. Pressure to eat solely indirectly predicted BMI *z*-score through maternal education (B = 0.49, $p < 0.002$) and maternal education directly predicted BMI *z*-score (B = -0.23, $p < 0.01$). This study validates the importance of maternal education in parental feeding practices and its impacts on the BMI of children and adolescents.

Daundasekara, Schuler, and Hernandez (2020) used longitudinal data from the Fragile Families and Child Wellbeing Study ($n = 1,814$) to examine early childhood economic hardship trajectories in predicting overweight/obesity (at year 15) and differences among demographics. The Fragile Families and Child Wellbeing Study consisted of a birth cohort of 4,898 children from 20 large U.S. cities between 1998 and 2000. Maternal education was included as a covariate in the model of family hardships and a child's weight status. Maternal education was categorized as "*less than high school*", "*having a high school diploma*" or "*having greater education*". Overweight and obesity were defined as either 85^{th} to less than the 95^{th} percentile or $\geq 95^{th}$ percentile of age-and-sex specific BMI based on the 2000 CDC growth charts, respectively. The children with high-increasing economic hardship had increased odds of developing overweight/obesity in adolescence compared to those with low-stable hardship at year 15 (OR =2.61; $p = 0.006$). In addition, Hispanic ethnicity was associated with higher odds of overweight/obesity among adolescents (OR =1.36; $p = 0.020$). As differences in obesity become greater among race/ethnicity, SES, and education levels, it is important to understand the long-term impacts of this health condition. Overweight and obese children are more likely to stay obese into adulthood (WHO, 2022). In fact, Harvard's Chan School of Public Health (2017) found that only children currently at a healthy weight have less than a 50% chance of having obesity as adults (Ward et al., 2017). Supportive evidence on the mechanics of growth trajectories on childhood obesity into adulthood is discussed below.

2.5. Impact on Health

2.5.1. The Transition from Childhood Obesity to Adult Obesity

It has been hypothesized that the development of overweight or obesity in childhood is related to subsequent overweight or obesity in adulthood and an increased risk of adult mobility and mortality. Based on CDC BMI-age (2 to 20 years of age) growth charts, BMI drops between 2 and 5 or 6 and then rebounds in all children until it reaches adult levels (CDC, 2022c). *Adiposity rebound*, defined as the second rise of BMI occurring between 3 and 7 years, has been identified as a critical period of growth (T. J. Cole, 2004). In children of normal weight, the percentage of body fat begins to increase in both boys and girls until about age four. Between the ages of four and eleven, the amount of body fat is stable in children who are close to their ideal body weight. It is suspected that excess fatness during the adiposity rebound curve is a good predictor of adult obesity. “Children whose rebound curve occurs before age 5½ years have a greater BMIs and subscapular skinfolds when they are older, compared with children with rebounds closer to age 7 (Dietz, 1994). Table 5 illustrates the relationship between early and later obesity.

Table 5

Relationship Between Early and Later Obesity

Variable	Relationship
Obesity at 0–1 yr. of age and adult obesity	Weak
Obesity at 3–5 yr. of age and adult obesity	Stronger
Obesity in adolescence and adult obesity	Strongest

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In an early study, Guo, and colleagues (Guo et al., 1994) analyzed the data from Fels Longitudinal Study to evaluate the predictive value of childhood and adolescent BMI on adult overweight. It was concluded that the assigned BMI values in childhood and adolescence were related to subsequent adult overweight status ($p < 0.001$). A decade later, Guo and associates (Guo et al., 2000) updated their previous report by using the new CDC BMI charts and definitions of childhood overweight and obesity to predict adult overweight and obesity status in 166 males and 181 females (aged 2 to 30) using the same sample. Overweight or obese adults at 35 years of age had significantly higher BMI values in childhood and adolescence than did non-overweight or non-obese adults ($p < 0.05$). In a recent study, it was found that "around 55% of obese children go on to be obese in adolescence, around 80% of obese adolescents will still be obese in adulthood and around 70% will be obese over age 30." (Simmonds et al., 2016)

Specifically, two studies have focused on the influence of rapid weight gain from age 5 to 15 years leading to adulthood obesity (i.e., BMI trajectory throughout childhood). Balantekin et al. (2018) used the Early Dieting in Girls study, which gathered BMI on non-Hispanic white girls ($n = 182$) at ages 5, 7, 9, 11, 13, and 15 years and a follow-up at 24 years (Balantekin et al., 2018). Four groups were created based on their BMI trajectory from age 5 to 15: (a) Upward Percentile Crossing (UPC) group, a consistent pattern of upward BMI percentile crossing throughout childhood; (b) Delayed Downward Percentile Crossing (DDPC) group, upward BMI percentile crossing between ages 5 and 9 years, followed by a downward BMI percentile crossing trajectory at ages 11–15 years; (c) 60^{th} Percentile Tracking (60PT) group, weight tracked along 60^{th} percentile; and (d) 50^{th} Percentile Tracking (50PT) group, weight tracked along 50^{th} percentile. BMI at age 24 was highest for the UPC group compared to the other three groups ($p < 0.001$). Greater BMI change and weight change from 15 to 24 years, were found in the UPC group than the 50PT group ($p < 0.05$). Overall, 60% of the UPC group had obesity at age 24, compared to <10% in either of the other three groups. Similar results were reported by

Ventura and colleagues (2009) using the same sample but comparing girls aged 5 and 15. Yet, adult obesity is not the only health outcome related to overweight and obesity in childhood. "Children who experience obesity are at increased risk for chronic health conditions including diabetes, cardiovascular diseases, and depression, along with being at risk of experiencing obesity in adulthood" (Pulgarón et al., 2013).

2.5.2. Diabetes in Children

Obesity has been the primary suspect in the development of DM2. Intrabdominal fat in obese adults predicts diabetes, heart failure, hypertension, and hyperlipidemia (Dietz, 1994). It has been proposed that the mechanism by which obesity causes DM2 in children may be similar to that observed in adults. Visceral fat appears to be directly related to basal insulin secretion, stimulated insulin secretion, and insulin resistance (Dietz, 1997). Increased free fatty acids from the intrabdominal fat may act on the liver to produce insulin resistance and reduce insulin-mediated suppression of hepatic glucose production and release (Dietz, 1983, 1994). These effects contribute to glucose intolerance and DM2.

The relationship between dietary intake and blood glucose levels has been thoroughly examined in the adult population in the past decades. This topic was the "topic of interest" in the 90s and early 2000s. Past research reported that a diet high in fat is related to DM2 or insulin sensitivity in the adult population (Feskens et al., 1995; Hu et al., 2001; Kitagawa et al., 1998; Mann et al., 2004; Marshall et al., 1994, 1997; Meyer et al., 2001; Trichopoulou et al., 2003; Vessby et al., 2001). Current research continues to assess this relationship (Ajala et al., 2013; Snorgaard et al., 2017; Tay et al., 2018). However, DM2 in children is complex and not fully understood. Most notably, Santoro (2013) identifies three important differences in DM2 in youth vs. adults. First, glucose dysregulation is faster in youth than in adults. "Adults' transition toward

DM2 (pre-diabetes to overt diabetes) takes about 10 years with about 7% reduction per year in beta-cell function, vs. an obese youths' DM2 transition period of about 2.5 years with 15% reduction per year in beta cell function" (Santoro, 2013). Second, DM2 in youth seems to be resistant to treatments using either pharmacological agents, lifestyle interventions, and/or both (Wilfley et al., 2011). Third, family access to pre-lifestyle interventions (increased physical activity, less sedentary life, and better-quality foods) may pose its challenges (CDC, 2021b).

Few studies have found a relationship between adiposity and insulin resistance (insulin sensitivity and impaired glucose metabolism) in youths (Clausen et al., 1996; Nguyen et al., 2010; Reinehr et al., 2004). Fewer studies have found that practical and convenient clinical tools such as BMI, BMI *z*-scores, and waist circumference can predict insulin resistance in youth (Aristizabal et al., 2015; Arslanian & Suprasongsin, 1996; Maffeis & Morandi, 2018; Morandi et al., 2014; Qi et al., 2017). More research is still needed in this area. Using longitudinal data from the Early Dieting in Girls Study, Ventura et al. (2009) examined patterns of weight change within girls with increased risk of obesity (data on familial characteristics) for the early identification of risk for obesity and metabolic syndrome. Distinct trajectories of BMI change among non-Hispanic girls (n = 180) and their parents were assessed at daughters ages 5, 7, 9, 11, 13, and 15 years. BMI and fasting blood glucose were assessed among other things. As noted, before, two groups were of focus: 1. UPC group, a consistent pattern of upward BMI percentile crossing across childhood; 2. DDPC group, upward BMI percentile crossing between ages 5 and 9 years, followed by a downward BMI percentile crossing trajectory at ages 11 to 15 years. Girls in the UPC group (upper BMI trajectory group) had significantly higher values for waist circumference, total cholesterol, low-density lipoprotein cholesterol, fasting insulin, homeostasis model assessment of insulin resistance, triglycerides, and blood pressure at age 15 years compared to girls with lower BMI trajectories. At age fifteen, trends were seen for an effect of BMI trajectory group, independent of weight status on metabolic health outcomes for Low-Density Lipoprotein (LDL) cholesterol ($F (1, 148) = 3.66$, $p = 0.06$) and insulin ($F (1, 133) = 3.30$, $p = 0.07$). Hence, BMI trajectory monitoring can provide insight into the early identification of girls at elevated risk for obesity and metabolic syndrome.

2.6. Impact of Psychosocial Well-Being

2.6.1. Weight Stigmas and Obesity Stereotypes

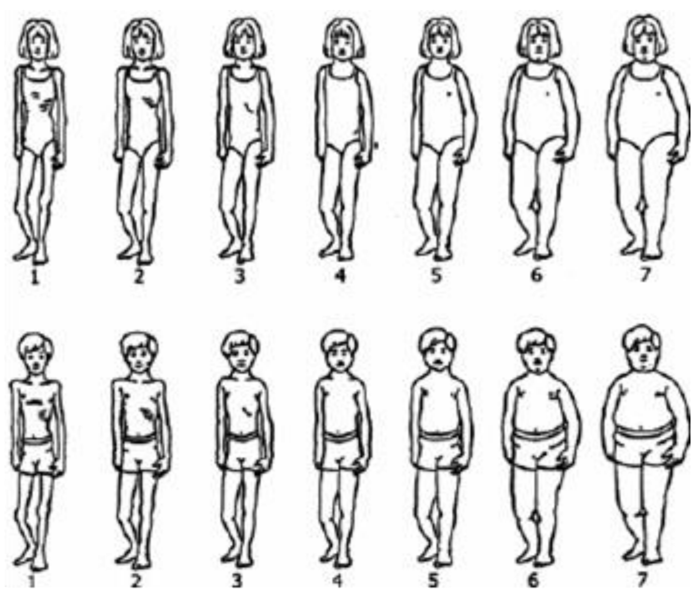
Weight stigmas, also referred to as sizeism, weight/size oppression, weightism, weight/size bias, and weight-based discrimination, are defined as the discrimination or stereotyping based on a person's weight, body, and size (The Academy for Eating Disorders, 2021). As it can affect people in all weight categories, body shapes, and sizes, most have focused on those who are overweight and/or obese. Weight stigmas are a "representation of internalized beliefs and attitudes one has about another person's body type" that occurs throughout our social connections (The Academy for Eating Disorders, 2021). Weight, on the other hand, is a physical and non-social characteristic. The "social worlds of overweight and obese children and adolescents tend to be hostile, rejecting, and negative" (Salvy & Bowker, 2014). Research has shown that those who are overweight and obese are perceived more negatively (Holub, 2008; LaFontana & Cillessen, 2002; Wardle et al., 1995), and less accepted by peers (K. K. Davison & Birch, 2002a; A. E. Field et al., 2001; Hill & Silver, 1995) and ultimately victimized (van Geel et al., 2014). This impacts our feelings, thoughts, and behaviors towards one's weight, body, and shape. Our perception of what is healthy and what is not is heavily influenced by societal norms.

2.6.2. Body Image Dissatisfaction

Body image dissatisfaction also referred as body dissatisfaction, is defined as the difference between perceived ideal body size and perceived actual body size (A. Fisher et al., 2005). For this paper, body image dissatisfaction and body dissatisfaction will be used interchangeably. Questionnaires and figural images, such as the *Collins Figure Rating Scale* (CFRS) and the *Children's Body Image Scale* (CBIS) have been shown to be helpful tools to gather actual and ideal body sizes in children. These tools can be used for self-assessment (child's self-perception) or for others, such as parents, etc. to document their perception regarding the child's body size/weight. Both scales use a pictorial representation. The CFRS (see Figure 3) developed by Elizabeth Collins (Collins, 1991)consists of seven male and female figures to illustrate body weight ranging from very thin (figure 1) to obese (figure 7). This is a modified version of *Stunkard's Body Figure Rating Scale* (SBFRS) that is used on adults.

Figure 3

The Collins Figure Rating Scale



Note. Reproduced with permission from, M. Elizabeth Collins (1991).

The subjects would be asked to select from the seven figures (same-gender child figures) by answering the two following questions: (a) which picture looks the most like you? And (b) which picture shows the way you want to look? A *Figure Satisfaction Index* (FSI) is then obtained by subtracting the value that represents the child's ideal body shape from the value that represents the child's current body shape, with a possible score ranging from -6 to 6. Reliability coefficients were established as 0.71 for the perceived self-score and 0.58 for the ideal self. However, actual weight comparisons cannot be made using the CFRS. On the other hand, the CBIS (Truby & Paxton, 2002) arranges BMI from smallest to greatest using seven photographic images, separately for boys and girls. BMIs represented for boys are 14.0–14.6 (image #1), 14.7–15.5 (image #2), 15.6–16.5 (image #3), 16.6–18.5 (image #4), 18.6–24.9 (image #5), 25.0–28.4 (image #6) and 28.5–29.0 (image #7). BMIs represented for girls are 13.0–13.5 (image #1), 13.6–14.9 (image #2), 15.0–16.6 (image #3), 16.7–17.7 (image #4), 17.8–19.4 (image #5), 19.5–24.6 (image #6), and 24.7–28.5 (image #7). Like the Collins technique, each child is asked to answer the same questions regarding their perceived vs. ideal weight. The difference between the category number of their perceived and ideal figures is used as a measure of body size dissatisfaction.

The validity for a gender-appropriate pictorial scale to measure body image in young children based on a measurable index of adiposity was established for the CBIS-girls ($r = 0.60$, < .001, 10 to 12 years) and the CBIS-boys ($r = .35$, $p < .01$, 10 to 12 years) in 312 children (aged between 7 and 12 years). Test-retest reliability ($r = 0.67$–0.87; $p < 0.001$) of the CBIS and the use of international standards of BMI (U.S.) was established by Truby and Paxton (Truby & Paxton, 2008). The CBIS was designed in Australia to be used in conjunction with the 1979 National Center for Health Statistics (NCHS) BMI percentiles (BMI range: 3rd percentile to 97th

percentile). The reference charts were updated to the 2002 CDC growth charts (Center for Health Statistics, 2000). This resulted in the need to alter the BMI categories and category figures for both boys and girls (85^{th} percentile and 97^{th} percentile in images #6 and #7, respectively). The CBIS was developed for a primarily white population.

2.6.3. Prevalence of Body Image Dissatisfaction

Research shows that preference for thinner bodies starts as early as four years of age among all children regardless of weight status. In a study by Musher-Eizenman et al. (2003) in 42 preschool children (aged 4 to 6.2 years), a self-rating tool revealed that 31% of the children would like to be thinner (Musher-Eizenman et al., 2003). In addition, 26% of the children choose the thinnest figure as being the ideal figure for society. Holub (2008) found similar results in a slightly larger sample (n = 69) (Holub, 2008). Within the same age range (aged 4 to 6 years), there was a significant difference in attributes assigned to thin, average, and overweight figures ($F = 66.43$, $p < 0.05$). Thirty percent (30%) of the children represented their current body size as the thinnest body shape. The overweight figure (image #7 on the CFRS) was rated the most negative.

Using the CBIS, Truby and Paxton (2002) found body dissatisfaction across all age groups in 312 children (age 7 to 12 years). Girls and boys, 48% and 38%, respectively, wished to have smaller body figures than their own. Similar findings were found in 261 children (M = 9.5 years) using CFRS (Skemp-Arlt et al., 2006). Overall, 50.6% of the children were dissatisfied with their current body shape, which included 41.8% wanted to be thinner. Specifically, 55% of girls were dissatisfied with their current body shape, with 45.1% wishing to be thinner. On the other hand, boys showed similar results with 48.9% dissatisfied and 38.9% wishing to be thinner. Wood et al. (1996) found similar results in 204 children (aged 8 to 10 years). Using the CFRS and a revised body satisfaction scale of the Eating Disorder Inventory (EDI), 55% of girls in comparison to 35% of boys were found to be dissatisfied with their current figures. Specifically, 45 girls wished to be thinner. Nineteen out of 81 boys wished to be thinner. Gender differences were also noted in 817 fourth-grade children (*M* = 9.3 years) by Thompson et al. (1997). Using the CFRS, females (*M* = -0.49) were found to have experienced more body dissatisfaction (ideal body size minus current body size) than males (*M* = -0.11, $p < 0.00$). Additionally, 92% of the females wanted to be thinner than their current body weight, while only 2.9% of males scored in the high weight concern group. Similarly, 41.9% of girls compared to 35.5% of boys, respectively, wanted to be thinner (Schur et al., 2000). Body dissatisfaction was gathered from 62 children (ages 9 to 12 years) using semi-structured interviews and desired weight change questionnaire. Using a different approach to assessing ideal body preference, Gardner et al. (1999) reported similar results in 216 children (aged 6 to 13 years). Using TV-video methodology to assess ideal body preference, a significant relationship among body size, gender, and age (F = 9.32, $p < 0.00$) was found with females wanting a greater change in body size than males. Additionally, Gardner and colleagues (1998) examined methodological concerns regarding the use of silhouettes.

2.6.4. Weight Status Influence on Body Satisfaction

In a sample of 379 boys and girls (aged 9 years), Hill and Silver (1995) found that 80% of both overweight girls and boys indicated they desired to be thinner. Specifically, 41% of girls preferred a thinner body shape, while 18% preferred a broader body shape. The authors used the modified SBFRS to assess body satisfaction. Additionally, Phillips and Hill (1998) also found body shape satisfaction was significantly different between weight groups (F = 33.43, $p < 0.00$). Overweight and obese girls (*M* = 9 years) wanted to be significantly thinner, in comparison to normal and underweight girls (F = -0.77, $p < 0.00$). Similarly, Roncoclato et al. (1998) found similar results in 185 boys and girls ($M = 10.6$ years). Two subscales from the EDI were used to identify body satisfaction. BMI was used to assess weight status. As found in previous studies, girls had significantly higher body dissatisfaction scores than boys ($M = 7.09$ vs. 3.98, $p = 0.001$). Additionally, children with higher BMI were significantly more dissatisfied with their bodies ($p < 0.0001$).

Gordon-Larsen (2001) examined obesity-related attitudes in 32 obese and non-obese girls (aged 11 to 15 years) using a modified SBFRS to identify body image. There was a significant intergroup difference between current body size and body dysphoria, with greater dissatisfaction with body size for obese females ($p < 0.00$ and $p < 0.00$, respectively). In 2006, Allen and colleagues reported similar findings when they examined the associations between weight status and body dissatisfaction in 207 obese and healthy-weight children. These children were aged 7 to 13 years (Allen et al., 2006). The CBIS was used to assess body satisfaction. An ANOVA was used to examine the main effects of weight status. There was a significant main effect of weight status on weight and shape concern (F = 31.49, $p < 0.001$), with overweight children reporting higher levels of weight and shape concern than healthy-weight children. Also, overweight children reported significantly higher levels of body dissatisfaction (F = 39.26, $p < 0.001$) than healthy-weight children. Similar results were found in a larger sample size (J. K. Thompson et al., 2007). Thompson and colleagues (2007) evaluated body dissatisfaction in 325 girls (aged 14 to 17 years). The EDI Body Satisfaction Scale and BMI were used. Overweight and at-risk overweight girls scored higher than average weight girls on body dissatisfaction.

Body dissatisfaction is also present among different U.S. racial and ethnic groups. Robinson et al. (2001) examined the prevalence of overweight concerns and body dissatisfaction among 760 third-grade children (M = 8.5 years) while controlling for ethnicity. Body dissatisfaction was determined using the Kids' Eating Disorders Survey (KEDS) Gender-Specific Child Figures (Robinson et al., 2001). Overweight concerns and body dissatisfaction increased with increasing BMI in all ethnic groups ($p = 0.04$). Girls reported greater overweight concerns ($p = 0.001$), greater body dissatisfaction ($p = 0.02$) and thinner desired body shapes ($p < 0.0001$) than boys. Specifically, African American girls followed by Latina girls reported more overweight concerns than any other ethnicity. Mirza et al. (2005) reported similar findings in a predominately Hispanic sample ($N = 113$). In this study, body dissatisfaction scores were higher among overweight and at risk of being overweight children (*M* (SD) = 1.48 (0.32) vs. 0.18 (0.18), $p < 0.0001$, respectively). Also, BMI *z*-scores were significantly associated with body size dissatisfaction ($p < 0.0001$) in children aged 10 to 18 years. The CFRS, a parent questionnaire, and BMI were used in the study. Additionally, girls desired a smaller body size compared to boys (3.09 vs. 3.83, $p < 0.0006$).

2.6.5. Weight Status Influence on Body Satisfaction and the Desire to Lose Weight

Self-perception of weight plays a key role in body dissatisfaction and/or attempts to lose weight. Unfortunately, one's perception of his/her weight differs from their actual weight. From 2005 to 2012 it was noted that approximately 30% (approximately 9.1 million) of youths aged 8–15 years misperceived their weight status (Sarafrazi et al., 2014). Surprisingly, approximately 2 million normal-weight youths considered themselves to be too thin or too fat (Sarafrazi et al., 2014). Concerning gender and race/ethnicity, the prevalence of weight status misperception was higher among boys (32.3%) than girls (28.0%) and was lowest among non-Hispanic whites (27.7%) compared with non-Hispanic black (34.4%) and Mexican American (34.0%) youth (Sarafrazi et al., 2014). This is greatly concerning due to the harm that it may cause one who thinks he/she is overweight and/or obese. In children aged 8 to 15 years, the self-perception of being overweight increased the odds of persistently attempting to lose weight (Ling et al., 2018). The researchers used the 2005 to 2014 NHANES data ($N = 4,914$).

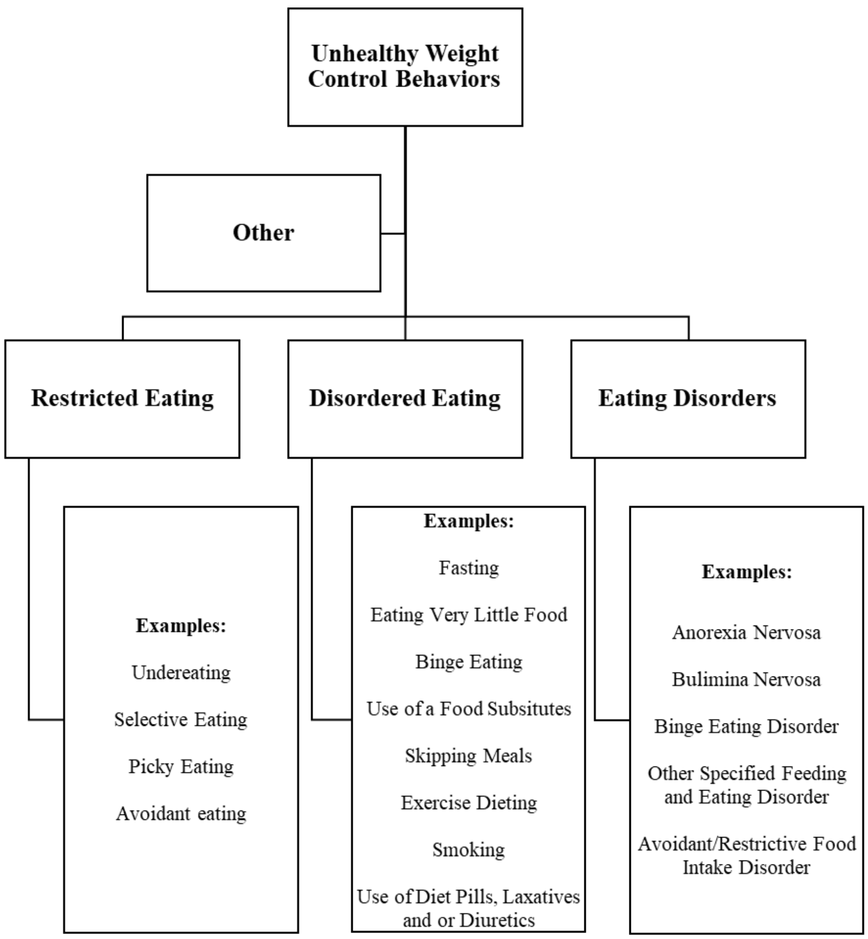
Body image concerns, also referred to as weight concerns are also topics highly correlated to eating and dieting behaviors. Body image concerns are a combination of the thoughts and feelings that one has about their body (National Eating Disorders Collaboration, 2022). One's behavior results from one's body image. According to the Academy for Eating Disorders, body image concerns can include "the over-evaluation of shape and weight, body avoidance (i.e., avoidance of mirrors, weighing, wearing tight clothing, and being photographed), and body checking (i.e. obsessive weighing and shape checking, including pinching or touching body parts of concern, looking at mirrors and reflective surfaces, measuring body parts, and assessing the tightness of clothes or accessories)" (The Academy for Eating Disorders, 2021). Ultimately, a person with a negative body image is dissatisfied with the way they look, which may cause them to engage in unhealthy behaviors to change their appearance. Much research has found body image concerns and weight loss to be related. For example, Davison et al. (2003) examined the development of girls' weight concerns and body dissatisfaction in a group of 182 girls when they were five, seven, and nine years old (K. K. Davison et al., 2003). Girls' weight concerns, body dissatisfaction, and weight status were measured using Dutch Eating Behavior Questionnaire (DEBQ), Children's Eating Attitude Test (chEAT), and BMI, respectively. It was found that across ages five to nine years, weight concerns and body dissatisfaction were present and increased with age ($p < 0.10$). In another study, high BMI was also strongly correlated with both desiring weight loss ($r = -0.44$) and desiring a thinner body shape ($r = -0.56$, $p < 0.025$) (Schur et al., 2000). This was found in 62 children, aged 9 to 12 years. On average, children had the desired weight loss of 3.2 pounds (*M* (SD) = -3.2 (11.4)). In fact, Kant (2002) reported that over 90% of those who considered themselves overweight wanted to weigh less. These results were gathered from 2,765 adolescents (aged 12 to 18 years) using questionnaires.

Through questionnaires, research ($n = 304$) has found that fourth-grade American Indian girls and boys ($M = 9$ years) are dissatisfied with their body size (Stevens et al., 1999). Forty-eight percent (48%) of girls vs. 34% of boys desired slimmer body sizes, and 22% of girls vs. 15% of boys desired a larger body size ($p < 0.001$). Overall, children who reported trying to lose weight were more likely to desire a thinner body shape and were unhappier about their weight than children who did not report trying to lose weight ($p < 0.001$). Similar results were reported in a larger sample ($n = 1,441$) of American Indian children (Story et al., 2001). Using the modified SBFRS, children who were overweight or obese were more likely than non-overweight children ($M = 8.6$ years) to choose thinner figures as depicting their perceived healthiest weight. Additionally, descriptive statistics found children with heavier weight status were more likely to have tried to lose weight. This is discussed in the upcoming dieting section (see Section 2.8.1).

It must be noted that body dissatisfaction can occur in individuals of all weight categories (underweight, normal, overweight, and obese), shapes, and sizes. Research has found non-overweight, in addition to overweight youths, reporting dissatisfaction, overvaluation, and/or a preoccupation with their weight (shape and/or size). Regardless of weight status, this is a common issue. However, research has consistently shown that overweight and/or obese children are at greater risk for poorer self-esteem, depressive symptoms, and body dissatisfaction (Lim et al, 2016). In fact, children who are overweight and/or obese are more likely to experience more body dissatisfaction compared to normal-weight children, as research has shown that increased BMI leads to greater dissatisfaction (K. K. Davison et al., 2003; Roncolato et al., 1998; Schur et al., 2000). Additionally, body dissatisfaction is a growing concern as it can lead to problematic dieting behaviors, disordered eating and ultimately eating disorders. Under the umbrella of unhealthy weight control behaviors, there are restrictive eating, disordered eating, and eating disorders (see Figure 4).

Figure 4

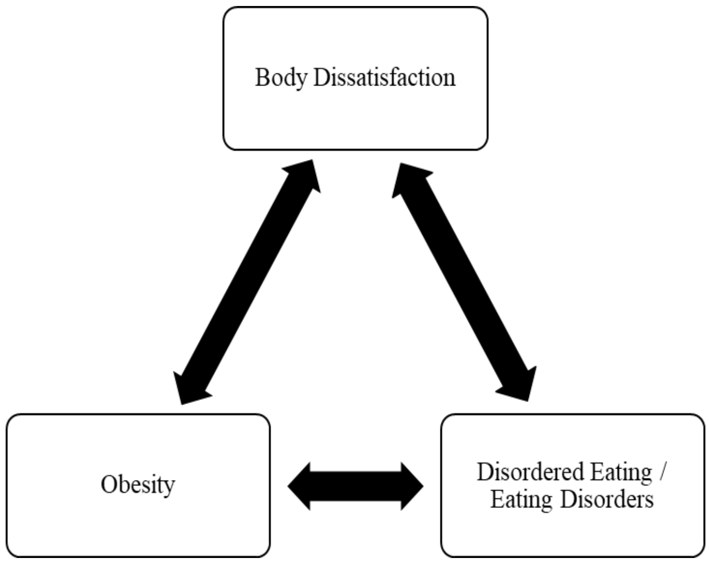
Defining Unhealthy Weight Control Behaviors



Imposing great influence on one's food behavior and overall health, eating disorders and obesity are on opposite sides of the continuum. Obesity can lead to eating disorders and eating disorders can lead to obesity (see Figure 5). However, risk factors may be the same. Specifically, body image dissatisfaction has been found to be related to obesity, disordered eating, and eating disorders. In fact, according to the National Eating Disorders website, “body (image) dissatisfaction is a leading risk factor in the development of eating disorders” (National Eating Disorders Collaboration, 2022).

Figure 5

Relationship Among Obesity, Body Dissatisfaction, and Disordered Eating/Eating Disorders



2.6.6. Interconnectedness of Body Image Dissatisfaction, Obesity, and Disordered Eating/Eating Disorders

Within the adult population, the relationship among body image dissatisfaction, obesity, disordered eating (Brechan & Kvalem, 2015), and eating disorders, including anorexia (Cash & Deagle, 1997; Sepúveda et al., 2002) and bulimia (Garfinkel et al., 1992; Keel et al., 2001; J. Lydecker et al., 2017; J. A. Lydecker et al., 2022) has been extensively examined. However, in children, research has focused on the causes of poor diet behaviors. The impact of body dissatisfaction on weight control behaviors has been addressed, suggesting that body dissatisfaction leads the path to unhealthy weight control behaviors. These behaviors can then become more extreme dieting measures, which then leads to disordered eating and eating disorders.

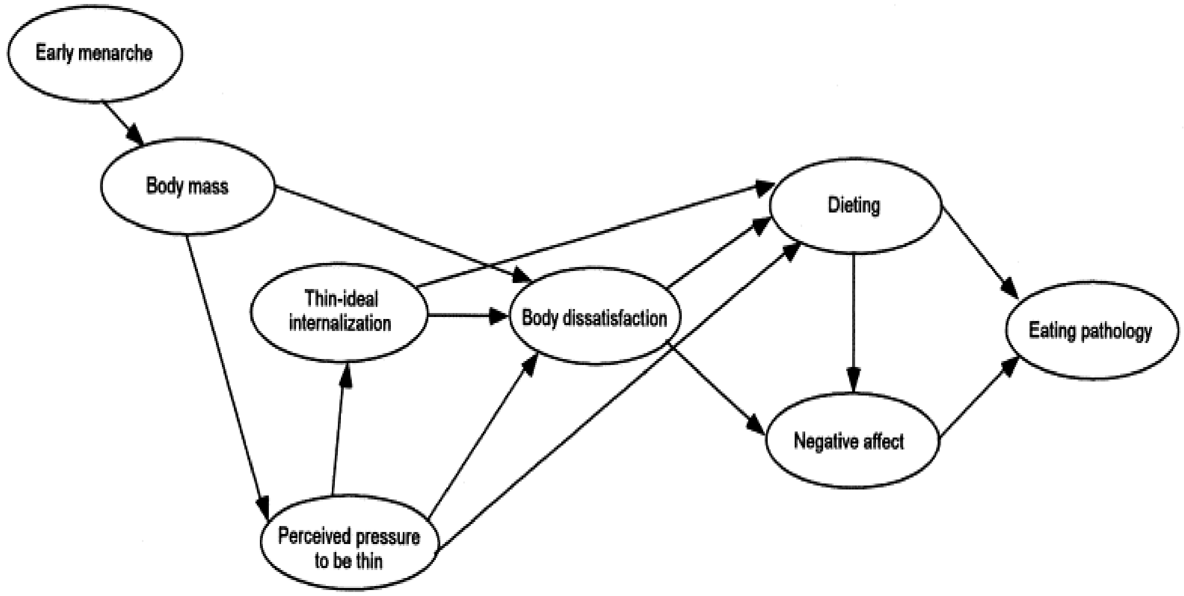
Using Project EAT-II, the associations between body satisfaction and health behaviors in an ethnically and socioeconomically diverse sample of 2,516 adolescents from 1999 (Time 1) to 2004 (Time 2) were examined (Neumark-Sztainer et al., 2006). Project EAT-II followed students from 31 Minnesota schools from middle and high school (total 5-years). The Body Shape Satisfaction Scale (BSSS), dieting, and weight-control behavioral questions were used. Among girls, lower body satisfaction (*M* (SD) = 31.76 (9.55)) predicted higher levels of dieting ($p < 0.001$), unhealthy weight control behaviors ($p < 0.001$), very unhealthy weight control behaviors ($p < 0.001$), and binge eating ($p < 0.012$). Among boys (*M* (SD) = 36.93 (8.73)), predicted higher levels of dieting ($p < 0.001$), unhealthy ($p < 0.001$), and very unhealthy weight control behaviors ($p < 0.001$), binge eating ($p < 0.001$), and smoking ($p < 0.11$). Similar results were reported 10 years later in a large multi-ethnic sample (Bucchianeri et al., 2016). The researchers examined body dissatisfaction in a large multi-ethnic sample ($n = 2{,}793$) of adolescents ($M = 14.4$ years) participating in the Eating and Activity in Teens Study (2010). Tools included the BSSS, BMI, and specific questions about dieting, disordered eating, and eating disorders. Among boys (*M* (SD) = 25.3 (10.0)) and girls (*M* (SD) = 26.8 (10.2)), body dissatisfaction was significantly ($p < 0.05$) related to prevalence of dieting, unhealthy weight control behaviors, extreme weight control behaviors, and binge eating.

Johnson & Wardle (2005) investigated dietary restraint (binge eating, emotional eating, abnormal attitudes to eating and weight), body dissatisfaction, and psychological distress in a large sample of 1,177 girls (13 to 15 years). The DEBQ, Body Satisfaction Questionnaire, BMI, chEAT (anorexia) and Eating Disorders Inventory (bulimia subscale) were used. At baseline ($r = 0.68$, $p < 0.001$) and at follow-up ($r = 0.70$, $p < 0.001$), there was a significant correlation between dietary restraint and body dissatisfaction. Additionally, body dissatisfaction was a significant predictor of adverse changes in emotional eating ($\beta = 0.5$; $p < 0.001$), abnormal eating attitudes ($\beta = 0.76$; $p < 0.001$), bulimic symptoms ($\beta = 0.46$; $p < 0.001$), stress ($\beta = 0.42$; $p < 0.001$), low self-esteem ($\beta = 0.7$; $p < 0.001$), and depression (p < 0.44; $p < 0.001$). A more recent study (Micali et al., 2015), childhood body dissatisfaction strongly predicted eating disorder cognitions (weight and shape concerns) in British girls (aged 14 years). In British boys, childhood body dissatisfaction predicted eating disorder cognitions, but only in the presence of having a high BMI. Questionnaires was collected from 6,140 British adolescents.

Ultimately, this research suggests that body dissatisfaction can be viewed as the "*gateway behavior*" to eating disorders. While research shows no single cause of eating disorders, Stice & Shaw (2002) indicates that body dissatisfaction is the best-known contributor to the development of eating disorders, specifically anorexia nervosa, and bulimia nervosa (see Figure 6). The authors (Stice & Shaw, 2002) claims this is a direct result of dieting. This theory was examined by Evans et al. (2013). It was noted that in a sample of girls aged 7 to 11 years ($n = 127$), the following paths were found to be significant: body dissatisfaction ($r = -0.26$, $p < 0.01$) predicted dieting and depression ($r = -0.26$, $p < 0.01$); and dieting ($r = 0.30$, $p < 0.001$), depression ($r = 0.38$, $p < 0.001$) and thin-ideal internalization ($r = 0.37$, $p < 0.001$) predicted disordered eating attitudes. Body dissatisfaction was assessed using a computer-based figure-choice scale. Disordered eating attitudes were assessed using the ChEAT. Dietary restraint was assessed using the 7-item DEBQ Restraint subscale, the DEBQ C-R. Depression was assessed using the Child Depression Inventory Short Form, the CDI-S.

Figure 6

Precursors and Consequences of Body Dissatisfaction



Note. Reproduced with permission from Stice & Shaw (2002).

2.7. Impact on Behavior

2.7.1. Dietary Assessments

Several different dietary assessment methods are used to assess caloric intake. The five traditional dietary assessment methods are dietary records and/or food records, 24-hour recalls, food frequency questionnaires, diet histories, and direct observation. Table 6 illustrates the strengths and weaknesses of different dietary assessment methods (Coulston et al., 2001).

Table 6

Overview of Dietary Assessment Methods

Dietary Method	Description	Strengths	Weakness	Availability of Valid Reliable Tools
Food Records	A self-reported account of all food and beverages consumed by a respondent over a given time period	Quantifiable intake	High costs High respondent burden Multiple days needed Underreporting Sample bias	Yes
24-Hour Recalls	A structured interview intended to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours	Quantifiable intake Population appropriate Low respondent burden Does not affect behavior Ability to assess overall intake	Multiple days needed Underreporting Need for a trained interviewer Found not suitable for children	Yes
Food Frequency Questionnaires	A survey that consists of a finite list of foods and beverages with response categories to indicate the usual frequency of consumption over a given time period	Usual intake is asked Ability to assess overall intake Low costs	Not quantifiable data Underreporting/misreporting	Yes
Health (Food) Survey	A self-report of one's knowledge, attitudes, and practices related to health and diet issues	General intake is asked Ability to assess overall intake Low costs	Not quantifiable data Underreporting/misreporting	Yes
Direct Observation (gold standard)	Observers typically watch subjects throughout a defined period and document subjects' eating behaviors regarding items and amounts consumed, traded, and/or spilled	Quantifiable intake Population appropriate Low respondent burden Ability to assess overall intake	High costs Need for a trained interviewer Many days are needed May affect food behavior	Yes

Note. Adapted from Coulston, A.M., Rock, C.L., Monsen, E.R. Nutrition in the Prevention and Treatment of Disease, Academic Press 2001, San Diego, CA.; and Gibson, RS. Principals of nutritional assessment. University Press, 1990. New York, NY.

2.7.2. Nutrition Recommendations

Obesity has been associated with increased dietary energy intake in children and adolescents, in addition to physical activity behaviors, biological factors, and environmental influences (Walker et al., 2018). However, the dietary causes of obesity are complex and are not yet fully understood. Nonetheless, energy intake is a part of maintaining energy balance. In children and adolescents, estimated caloric needs consider energy needs for growth, in addition to age, gender, and physical activity level. Table 7 (see next page) illustrate the estimated calorie requirements (in kilocalories) for each gender and age group at three levels of physical activity. While a nutrition clinician and/or registered dietitians would have to know the caloric needs of a child to assess whether their intake is excessive, it is not recommended to share calorie level recommendations with the family. It is the position of both the Nutrition/Obesity Committee and the Eating Disorder Committee of the Society of Adolescent Health and Medicine to provide "flexible, balanced, and satisfying nutrition approaches that will lead to long-term physical and emotional wellness" (Society for Adolescent Health and Medicine, 2020, p. 875). The committees warn that the recommendation of weight changes carries the risk of harm by stigmatizing body image and encouraging disordered eating and/or low self-esteem. Hence, weight management goals should be based on empirically supported guidelines to improve the quality and appropriate quantity of food, healthy exercise patterns, and optimization of physical, socioemotional, and cognitive functioning.

Table 7

Estimated Calorie Needs per Day, by Age, Sex, and Physical Activity Level

		Activity Level		
Gender	Age (years)	Sedentary	Moderately Active	Active
Child	2 to 3	1,000	1,000	1,000
Female	4 to 6	1,200	1,400	1,400 - 1,600
Female	6 to 8	1,200 – 1,400	1,400 – 1,600	1,600 – 1,800
Female	8 to 10	1,400	1,600 – 1,800	1,800 – 2,000
Female	10 to 12	1,600	1,800 – 2,000	2,000 – 2,200
Female	12 to 14	1,600 – 1,800	2,000	2,200 – 2,400
Female	14 to 18	1,800	2,000	2,400
Male	4 to 6	1,200 – 1,400	1,400 - 1,600	1,600 - 2,000
Male	6 to 8	1,400	1,600	1,800 – 2,000
Male	8 to 10	1,400 – 1,600	1,600 – 1,800	2,000 – 2,200
Male	10 to 12	1,600 – 1,800	1,800 - 2,200	2,000 - 2,400
Male	12 to 14	1,800 – 2,000	2,200 – 2,400	2,400 – 2,800
Male	14 to 18	2,000 – 2,400	2,400 - 2,800	2,800 - 3,200

Note. Adapted from the Dietary Guidelines for America 2015 –2020.

In addition, the purpose of the Dietary Guidelines for Americans developed by the U.S. Department of Agriculture (USDA) and Department of Health and Human Services (DHHS) is to meet nutrient needs, promote health, and prevent disease. The Dietary Guidelines for Americans (2020–2025) recommends that all individuals aged 2 years and older follow a healthy eating pattern that encompasses variety, moderation, and balance. Specifically, a variety of fruits, vegetables, proteins, and oils should be eaten. Other healthy food options include 100% whole grains items, fat-free (and low-fat) dairy products, and leaner and more nutritious proteins.

In addition, the Dietary Guidelines of Americans (2020–2025) recommend that individuals limit calories from solid fats (specifically, saturated, and trans-fatty acids), added sugars, sodium intake, and stay within their referred calorie needs. However, most children's actual dietary intake does not coincide with these recommendations. Past research has shown children diets are low or deficient in calcium, iron, zinc, vitamin B6, and vitamin A, in addition to being energy-dense foods (Basch et al., 2011; Brady et al., 2000; Crooks, 2003; Devaney et al., 1995; Erinosho et al., 2011; E. Han & Powell, 2013; Krebs-Smith et al., 2010; Lino et al., 1999; Lutter & Rivera, 2003; Lytle et al., 2002; Murphy et al., 1990; National Institutes of Health, 1994; Neumark-Sztainer, 2006; Neumark-Sztainer et al., 2004, 2011; Reedy & Krebs-Smith, 2010; Sheppard & Cheatham, 2018; Story et al., 1998). The CDC website identifies the current eating behaviors of young people as:

> "Between 2001 and 2010, the consumption of sugar-sweetened beverages among children and adolescents decreased, but still accounts for 10% of total caloric intake. Between 2003 and 2010, total fruit intake and whole fruit intake among children and adolescents increased. However, most youth still do not meet fruit and vegetable recommendations. Empty calories from added sugars and solid fats contribute to 40% of daily calories for children and adolescents aged 2 to 18 years, affecting the overall quality of their diets. Approximately half of these empty calories come from six sources: soda, fruit drinks, dairy desserts, grain desserts, pizza, and whole milk. Most youths do not consume the recommended amount of total water" (CDC, 2021a).

Despite the USDA's 2005 MyPlate platform for communicating dietary information and recommendations to the public to promote healthy eating, current research from the National Youth Risk Behavior Survey (2017) found the following: no change in overall vegetable consumption (1999–2019, $p < 0.05$) nor having vegetables three or more times per day (1999–2019, $p < 0.05$); a decrease in milk consumption (decreased 1999–2019, $p < 0.05$); and a decrease in eating breakfast every day (1999–2019, $p < 0.05$) in young adults (grades 9 to 12) (CDC, 2018). In a sample that included younger children (2 to 19 years), fruit and vegetable consumption using the NHANES 2015–2018 data was examined (Wambogo et al., 2015). Compared to all age groups, children aged 2 to 5 years had the highest reported intakes of fruits, ranging from 45% to 90%, and vegetables, ranging from 13% to 90%. With increasing age, fruit and vegetable consumption declined. Table 8 has detailed information regarding these results.

Table 8

Percentage of U.S. Youths aged 2-19 Who Consume Fruits or Vegetables on a Given Day by Age, 2015-2018.

	All Ages	2 to 5 Years	6 to 11 Years	12 to 19 Years
Any Fruits	75%	90.1%	80.6%	64.3%
Fruit: Citrus, Melons, or Berries	32%	45.2%	37.5%	21.9%
Other Fruit: Whole	49.7%	67.7%	54.3%	37.7%
Fruit Juice	46.9%	62.1%	51.4%	36.4%
Any Vegetables	91.0%	91.1%	90.2%	91.5%
Vegetables: Dark Green	16.7%	13.9%	16.1%	18.5%
Vegetables: Red or Orange	75.0%	73.6%	72.7%	77.5%
Vegetables: Starchy	47.5%	50.9%	47.8%	45.6%
Other Vegetables	55.7%	54.3%	55.1%	56.8%

Note. Adapted from the results of Wambogo et al., 2020.

In contrast, it has been reported that only 31% of children ≤ 4 years of age consumed the recommended five servings of fruits and vegetables (Briefel et al., 2015). The researchers assessed adherence to dietary recommendations (American Academy of Pediatrics) using parental 24-hr recalls. In a study conducted a year later, it was confirmed that children's usual dietary intake does not conform to dietary recommendations (Fox et al., 2016). Additionally, Eliason et al. (2020) examined children's (aged 3 to 18 years) fruit, vegetable, and added sugar consumption relative to the Dietary Guidelines for Americans (via food frequency surveys) in a large diverse sample that included 2,229 households located in five New Jersey cities. The sample consisted of 47% non-Hispanic black, 40% Hispanic, and 13% White (and/or other). Young children (ages 2 to 3 years) consumed 19% and 94% of the recommended amounts for vegetables and fruits, respectively. However, except for one age group (boys aged 9 to 13 years), all fruit and vegetable consumption decreased with increasing age.

2.7.3. Dieting and Unhealthy Weight Control Behaviors

In childhood and adolescence, eating healthy is important for proper growth and development, to prevent nutritional deficiencies and various health conditions. Yet, as found in the research above, most youths are not meeting dietary recommendations. Nutritional deficiencies (i.e., inadequate calories, protein, fats, and vitamins/minerals) impair overall health. Stunted growth, delayed puberty, and osteoporosis is just a few examples of negative health outcomes. Nutrient deficiencies may occur for multiple reasons, dieting included. In the general public as well as healthcare professionals, diet is a poorly defined behavior. In most cases, it implies a temporary, but intentional, change in behavior in eating to lose weight (Findlay, 2018; C. H. Markey & Gillen, 2022; C. N. Markey & Gillen, 2016). For the most part, dieting can be seen as behavioral changes that involve alterations in eating habits and/or exercise frequency. Whether a diet is healthy or unhealthy depends on the practices used. The exclusion of certain types of food, purging behavior (i.e., self-induced emesis, laxative use, diet pill use), fasting and skipping meals, use of substances to suppress appetite (i.e., smoking, medications/drugs, etc.), and obsessive exercise habits are considered unhealthy weight control behaviors in this review.

Dieting and unhealthy weight control behaviors are common in youth. Research has found overweight and/or obese youths are more than twice as likely to endorse extreme weight control behaviors (Haynos et al., 2018). Earlier studies such as Childress et al. (1993) examined disordered eating tendencies in a large student consisting of 3,175 adolescents (M = 13.8 years) using the KEDS. About 40% of the adolescents reported "*felt looked fat to others*" and "*wants to lose weight now*"; 23% reported "*afraid to eat because of weight gain*"; 31.4% had "*dieted*"; and

16.2% participated in "*binge eating*". BMI comparisons were found significant for "*wants to lose weight*" ($t = 13.6$, $p < 0.05$); "*felt looked fat to others*" ($t = 10.8$, $p < 0.05$); "*afraid to eat because of weight gain*" ($t = 6.1$, $p < 0.05$); "*dieted*" ($t = 12.2$, $p < 0.05$); "*fasted*" ($t = 4.3$, $p < 0.05$); "*used diuretics*" ($t = 4.9$, $p < 0.05$); and "*used diet pills*" ($t = 4.9$, $p < 0.05$). Later research (Balantekin et al., 2014; Bauer et al., 2013; Berge et al., 2018; Cain et al., 2008; Frazier et al., 2015; Lampard et al., 2016; McCormack et al., 2011; Sawka et al., 2015) confirm increased weight status as a factor for dieting.

However, dieting and weight control measures are not limited to only the overweight/obese population, but also among normal-weight children and adolescents. Several studies point out the thin-ideal internalization that drives the pursuit of weight loss. In a sample of 2,793 adolescents ($M = 14.4$ years) 45.8% of girls and 31.1% of boys engaged in dieting during the past year (Neumark-Sztainer, Wall, Larson, et al., 2012). Additionally, 50.2% of girls and 38.1% of boys engaged in unhealthy weight control behaviors, and 30.6% of girls and 26.9% of boys engaged in frequent self-weighing during the same time frame. Story et al. (2001) and Kant (2002) reported that 72% and 65% of their large samples of children and adolescents had tried to lose weight in the past year in addition to trying to lose weight inconsistently. In the literature, dietary restraint was another method of altering eating habits to meet a certain health goal within this age group. Dietary restraint was defined as the tendency to consciously restrict or control food intake. This method has been seen in young girls. Davison et al. (2003) examined dietary restraint using the DEBQ in 182 young children (aged 5 to 9). Among girls aged five to seven, those with high weight concerns and higher BMI were more likely to show higher dietary restraint at age nine ($R^2 = 0.16$, $p < 0.0001$).

Research on the impacts of dieting in young children (less than eight years) is limited. This is due to its inappropriateness at this age. In children, most health professionals do not approve of dieting unless necessary due to its potential for physical and emotional consequences. Therefore, while it is likely that young children are exposed to dieting in one form or another, there is very little research examining the impact of dieting on these children.

2.8. Impact on Nutrition

Brown et al. (2019) examined differences in demographic characteristics, self-perception of weight, and food group and nutrient intakes of children (8 to 11 years) and adolescents (12 to 15 years) using the NHANES 2011-2012 data (Brown et al., 2019). A total of 1,303 children (n = 729) and adolescents (n = 574) completed BMI and identified their self-perception of weight (one question), weight loss efforts (one question), methods (three questions), and dietary intake (24-hr dietary recall). Most youth (53.9%, n = 702) reported trying to lose weight. For those who reported trying to lose weight (n = 702), methods to lose weight included exercising dieting (n = 328, 46.7%), skipping meals (n = 318, 45.3%), and starving for a day or more (n = 162, 23.1%). Total energy ($p < 0.035$) and total fat ($p < 0.156$) intakes were significantly lower for participants who reported trying to lose weight compared to those who reported never trying to lose weight.

In a longitudinal study (Larson et al., 2009), patterns of weight control behaviors over 5 years to examine nutritional outcomes in 2,249 adolescents and young adults (M = 17.2 years) using Project EAT (Eating Among Teens) data. Females who either started and persisted in unhealthful weight-control behaviors had less frequent meals (breakfast, lunch, and dinner), consumed less energy, and had less nutritious dietary intakes (energy, calcium, iron, folate, and fiber). Specifically, persistent use of unhealthful weight-control behavior (n = 537) was associated with measures of poorer dietary intake, such as lower fiber, vegetables, whole grains, and snack foods ($p < 0.05$). Similar results have been reported by others (Neumark-Sztainer et al., 2004, 2006; Story et al., 1998).

Hohman et al. (2018) examined dieting behavior in 139 Non-Hispanic White preadolescence and adolescent girls (9 and 15 years) in a longitudinal cohort study. Three 24-hr recalls were used to assess nutrient intake (Hohman et al., 2018). Self-reported diet behaviors, dietary restraint (and disinhibition), and disordered eating were measured using the question, "Have you ever dieted?", the DEBQ, and chEAT tools. Girls who reported dieting had significantly lower average kcal, magnesium, and iron intakes than girls who never dieted ($p < 0.05$). Additionally, girls who reported dieting had significantly lower average intakes of calcium, potassium, zinc, fiber, and dairy compared to non-dieters ($p < 0.10$). Additionally, Deierlein et al., (2019) examined associations of 4,904 adolescents' (aged 10 to 15) weight control intentions with dietary intakes using NHANES 2005–2014. Results found that boys who reported "trying to lose weight a lot" in the previous year consumed fewer calories (OR = 188.34; 95% CI: 357.67, 19.01) and percent calories from fat (OR = 1.41%; 95% CI: 2.80, 0.02) and greater percent calories from protein (OR = 1.48%; 95% CI: 0.41, 2.55) compared to boys who never tried to lose weight.

2.8.1. Impact on BMI

Research has shown mixed results on the impact of dieting on BMI among youth. However, when examining dieting's impact on weight change and/or BMI over time, most of the research has found adolescent dieting to be ineffective in weight loss. Using the National Longitudinal Study of Adolescent Health (NLSAH) data, Fields et al. (2007) examined the relationship between dieting and weight gain (assessed via BMI) in 4,302 females aged 11 to 20 (M = 14.8 years). Dieting (using "*Yes*" and "*No*" questions) and unhealthy weight control behaviors (i.e., vomiting, using laxatives, or using diet pills) were assessed. At follow-up, female dieters had gained significantly more weight (β = 0.39; 95% CI: 0.08, 0.71, $p < 0.05$) than their nondieting peers. Similar results were reported by others (A. Field et al., 2003; Haines et al., 2010; Stice, Agras, et al., 1999; Tanofsky-Kraff et al., 2006).

Neumark-Sztainer, Wall, Story, et al. (2012) examined 10-year longitudinal associations between dieting, unhealthy weight control behaviors, and BMI from adolescence to young adulthood using Project EAT I (1998–1999), II (2003–2004), and III (2008–2009) longitudinal data ($n = 1,902$). The samples were predominately non-Hispanic White with a mean age at baseline (1998–1999) of 12.8 ± 7 years. The mean age at point III (2008–2009) was 25.2 ± 1.6 years. Change in BMI was calculated as the difference between Time 3 and Time 1. These were termed BMI units. Dieting and weight control behaviors were assessed using two different questions. Dieting was assessed using the following question, "How often have you gone on a diet during the last year?" (Neumark-Sztainer, Wall, Story, et al., 2012). While weight control behaviors were assessed by the following question, "Have you done any of the following things to lose weight or keep from gaining weight during the past year?" (Neumark-Sztainer, Wall, Story, et al., 2012). In overweight and non-overweight females, dieting (*M* (SE) BMI units = 4.33 (.26); $p < 0.001$) and unhealthy weight control behaviors (*M* (SE) BMI units = 4.63 (.25); $p < 0.001$) in 1998–1999 and 2003–2004 predicted greater BMI unit increases in 2008–2009, as compared with no use of these behaviors. In overweight and non-overweight males, dieting (*M* (SE) BMI units = 6.96 (.41); $p < 0.001$) and unhealthy weight control behaviors (*M* (SE) BMI units = 5.42 (.33); $p < 0.001$) in 1998–1999 and 2003–2004 predicted greater BMI unit increases in 2008–2009, as compared with no use of these behaviors. Specifically, skipping meals and reporting eating very little (females and males), use of food substitutes (males), and use of diet pills (females) predicted significantly larger BMI unit increases (p = 0.011 to 0.001) in the 10-year follow-up (2008–2009).

Additionally, Goldschmidt et al. (2018) assessed weight-change and BMI trajectories using 15-year longitudinal data from Project EAT I (1998–1999), II (2003-2004) and III (2008-2009), and IV (2013-2014). The sample (n = 1,902) was predominately non-Hispanic White (non-overweight/obese at baseline) with a mean age at IV (2013–2014) of 31.0 ± 1.7 years (Goldschmidt et al., 2018). The same assessments as Neumark-Sztainer et al. (2012) were used to assess diet and unhealthy weight control behaviors. All four time points and all weight-trajectory groups reported higher rates of dieting (males: F = 2.54, p = 0.0069, females: F = 3.02, p = 0.0014) and unhealthy weight control behaviors (males: F = 3.30, p = 0.0005, females: F = 3.02, p = 0.0014), with the never-overweight group reporting the lowest rates.

2.8.2. Impact on Diabetes

Obesity is the most well-known predictor of DM2. To date, much research has shown favorable effects on improved insulin sensitivity associated with significant weight loss in the adult population. Among obese children and adolescents (M = 10 years), Reinehr et al. (2004) found that weight loss leads to significant improvement in insulin sensitivity, but only if BMI decreased by ≥ 0.5 kg/m². Similarity in a later study, Reinehr et al. (2008) reported comparable findings. Hence, one of the most prominent recommendations for insulin resistance and obesity therapy has included weight loss through calorie-reduced diets. Because of this, the impact of dieting on DM2 management is another area being examined. Due to the critical importance of weight loss for DM2 management, research has shown that most youths with DM2 diet. U.S. children and adolescents living with DM2 (aged 7 to 18 years) have been subjected to a large amount of research on dietary interventions (Kirk et al., 2012; Krebs et al., 2010; Mirza et al., 2013). All researchers have included a weight-loss dietary intervention, which ultimately leads to a reduction in body fat measures post-intervention ($p < 0.05$). However, only Kirk et al. (2012) showed significant changes in the identified metabolic risk factor, fasting insulin ($p = 0.05$). Specifically, Kirk et al. (2012) added a mixture of dietary interventions that included a 500-kcal deficit compared to the other interventions.

Most recently, Gow et al. (2017) investigated whether a Very-Low-Energy Diet (VLED) was a feasible and acceptable treatment option for DM2 in a small sample ($n = 8$) of non-US children and adolescents and whether adherence can lead to rapid weight loss and DM2 reversal. The sample consisted of eight youths (aged 7 to 16 years) with DM2 and obesity. There were three intervention phases without any exercise component: (a) introduction of a VLED (800 kcal/day, less than 40% carbohydrate; 40–55% protein; less than 20% fat) for 8 weeks; (b) transition to a reduced-energy diet for week 9-12; and (c) continued use of reduced-energy diet for week 13-34. The authors defined adherence as having ≥ 5% body weight loss during the 8-week VLED diet. Results found that both diet adherers ($n = 5$) and non-adherers ($n = 3$) had a median weight loss of 7.5% and 0.5%, respectively, at 8 weeks. For both groups (i.e., adherers and non-adherers), HbA1c (*M* (SD) = 8.1% (0.7%) – 6.6% (0.5%); $p = 0.004$) and fasting blood glucose (*M* (SD) = 15.6 (1.6) – 11.3 (1.0) mmol/dL; $p = 0.009$) were significantly reduced at 8 weeks compared with baseline (Gow et al., 2017). Additionally, adherers had a significant reduction in fasting insulin (*M* (SD) = 71 (46 to 210); $p = 0.043$) and an increase in insulin sensitivity (*M* (SD) = 9.3 (3.7 to 14.9); $p = 0.04$).

2.8.3. Disordered Eating and Eating Disorders

The American Psychiatric Association (2022) defines on their website eating disorders as "illnesses in which people experience severe disturbances in their eating behaviors and related thoughts and emotions" (American Psychiatric Association, 2022). The three common eating disorders include anorexia nervosa, bulimia nervosa, and binge eating disorder. In contrast to eating disorders, the Academy for Nutrition and Dietetics (2022) defines disordered eating as a range of irregular eating behaviors that may or may not warrant a diagnosis of a specific eating disorder. The Academy for Nutrition and Dietetics website identifies states:

> "The most significant difference between an eating disorder and disordered eating is whether or not a person's symptoms and experiences align with the criteria defined by the American Psychiatric Association. Signs and symptoms of disordered eating include: (a) frequent dieting, anxiety associated with specific foods or meal skipping; (b) chronic weight fluctuations; (c) strict rituals and routines surrounding food and exercise; (d) feelings of guilt and shame associated with eating; (e) preoccupation with food, weight and body image that negatively impacts the quality of life; (f) feeling of loss of control around food, including compulsive eating habits; and (g) using exercise, food restriction, fasting or purging to "make up for bad foods" consumed" (Academy of Nutrition and Dietetics, 2022).

Long-term research posits that individuals with continued weight concerns "will pursue riskier weight loss behavior, such as engaging in disordered eating to maintain or achieve their ideal body shape or weight" (Neumark-Sztainer, 2012, p. 80). For this reason, dieting has been implicated as a "potent proximal risk factor in the development of disordered eating and eating disorders" (Rosen, 2010, p. 1241). In the Patton et al. (1999) landmark study, results showed that Austrian females (aged 14 to 17 years) who were highly engaged in dieting behavior were 18 times more likely to develop an eating disorder than those who did not diet (OR = 18; 95% CI: 4.9, 67; $p < 0.05$). Those who dieted at a moderate level were five times more likely to develop an eating disorder than those who did not diet (OR = 4.9; 95% CI: 1.7, 15; $p < 0.05$). Eating disorders were assessed according to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition. Similar results were found in U.S. studies (Stice et al., 2008, 2011; Wertheim et al., 2001).

Medical complications that result from eating disorders are concerning. Most evident is the impact of caloric restriction and weight loss on overall health, with increasing concern for those conditions that are not irreversible. Additionally, research now shows that disordered eating and eating behaviors are associated with greater weight gain due to food restriction that results from short-term cycles of weight loss, followed by relapse (Golden et al., 2016). Ironically, disordered eating can eventually lead to greater weight gain and higher BMI.

2.8.4. Impact on Diabetes

The prevalence of eating disorders in adolescents with Type 1 Diabetes Mellitus (DM1) and DM2 has been researched. However, there is more research available on DM1 than DM2 due to the onset of DM1 vs. DM2. Nonetheless, one of the first studies that include a large sample (The TODAY Study Group) was conducted by Wilfley and colleagues (Wilfley et al., 2011). The researchers examined the prevalence of binge eating with adiposity and psychosocial functioning in 678 adolescents (M = 14.0 years; 64.9% girls; 41.7% Hispanic) with DM2. Using the Youth Eating Disorder Examination Questionnaire (YEDEQ), 20% of the sample was identified as subclinical binge eaters, and 6% as clinical binge eaters. More recently, 50.3% of 149 young adults with DM2 (age 21.8 years ± 3.5; 64.4% female) have a disordered eating behavior (Nip et al., 2019). Disordered eating was assessed via Diabetes Eating Problem Survey-Revised (DEPS-R). To date, few studies have only examined the prevalence of DM2 and eating disorders in obese children and adolescents. The etiology work on how these areas intercept is yet to be researched.

However, being that both DM2 and eating disorders have been identified as being multifactorial, it is theorized that there are shared risk factors between them. “Empirically supported risk factors that include internalization of a culture’s idealization of thinness as beautiful, body dissatisfaction, higher body mass, a history of dieting, and a history of depression” are strongly associated with both DM2 and eating disorders (Pinhas-Hamiel & Levy-Shraga, 2013, p.1). Hence, children and adolescents with DM2 may be at increased risk to develop eating disorders. Research in this area is highly needed.

Alarmingly, dieting, disordered eating, and eating disorders are prevalent among children and adolescents. Additionally, these behaviors can both contribute to the development of and result from obesity and DM2. The onset of these attitudes and behaviors must be explored. Studies have speculated that factors within the home environment, particularly parental and familial behaviors, are “putative risk factors for the development of weight-related concerns and behaviors in youth” (Haines et al., 2008, p.2). The role of the family in how they perceive their weight and their child’s weight as healthy sets the stage for food and weight behaviors. It is theorized that within the home, children begin to develop their perception of their weight (and health) as parents talk about food, weight, and health and as parents model their food and weight behavior to their children. Ultimately, parental modeling of healthy or unhealthy food behaviors, directly and indirectly, will be explored.

2.9. Role of the Family

2.9.1. Hispanic Health Paradox

Hispanic Health Paradox, also known as the *Latino Epidemiologic Paradox,* has been a topic of interest in the last decade or so. As mentioned previously, the *Hispanic Health Paradox* is a proposed theory that states Latinos and/or Hispanics sustain a health advantage over non-Hispanic whites. In 2015, the National Center for Health Statistics reported that on various sociodemographic descriptors, Hispanics compared to non-Hispanic Whites had lower levels of education (35.3% had less than a high school diploma); income (24.8% lived below the poverty line); English literacy (32.3% did not speak English); health insurance (41.5% lacked health insurance), medical access and treatment (15.5% reported delay or nonreceipt of needed medical care because of cost concerns) (National Center for Health Statistics, 2015). In addition, Hispanic/Latinos endure greater discrimination than non-Hispanic Whites. Despite the barriers Hispanics face, it has been noted that Hispanics have better health outcomes including, mortality, cardiovascular diseases, preterm birth, and mental health than non-Hispanic Whites. In addition, the life expectancy among Hispanics is two years longer than non-Hispanic whites (Arias et al., 2015). In comparison to gender, Hispanic males have been found to have lower death rates from cancer, heart disease, unintentional injuries, chronic lower respiratory diseases, suicide, homicide, perinatal conditions, stroke, and diabetes than non-Hispanic whites and black populations (Dominguez et al., 2015). Hispanic females had lower death rates from cancer, heart disease, chronic lower respiratory diseases, stroke, unintentional injuries, suicide, perinatal conditions, diabetes, Alzheimer’s disease, and kidney disease non-Hispanic white and black populations (Dominguez et al., 2015). Many have been perplexed about why Hispanics have these advantages, especially since they are a very disadvantaged group. Several theories have been proposed. *The Health Hispanic Advantage* proposes that Hispanics exhibit better physical and mental health due to familism, and stronger orientations toward the family (Diaz & Niño, 2019). Researchers have also made the same assumption when studying Hispanic children (Avalos et al., 2020; Mendoza, 2009; Romero et al., 2004; Stein et al., 2013; Steiner et al., 2019).

2.9.2. Familism

Hispanic families live in an immediate physical and social setting that develops health and well-being, according to researchers. *Familism* are sociocultural practices, attitudes, and behaviors, that foster close family relationships, interconnectedness, social and material support among Hispanic families. Family-child interactions "affect children's behavior over and above the influence of socioeconomic and demographic factors, such as income, family structure, and parent education" (Steiner et al., 2019). This *family connectedness* builds a strong sense of community and belonging, playing an important protective factor for a variety of health risk behaviors. The CDC (2022) reports that "youth who feel connected at school and home were found to be as much as 66% less likely to experience health risk behaviors related to sexual health, substance use, violence, and mental health in adulthood" (CDC, 2022a). Family connectedness measures (i.e., a priority placed on family meals, and a positive mealtime environment) have been shown to be significantly correlated with psychological well-being and inversely correlated with depressive symptoms and unhealthy weight-control behaviors (Fulkerson et al., 2007).

Familism may provide a supportive environment in which individuals can feel comfortable communicating with their families about anything, including weight, shape, and size. It is assumed that within family conversations, children develop their first social constructs regarding food, weight, and health. The SCT provides the foundation for understanding the influence of family on food and dieting behaviors as it addresses the psychosocial dynamics of the person, environment, and food (and diet) behavior.

2.9.3. Social Cognitive Theory

Albert Bandura's (1986) SCT of human behavior proposes three interacting influences on outcome: person, environment, and behavior factors. Based on the premise that people learn from their own experiences and the actions of others as well as the results of those actions, it postulates that behavior can be changed through continuous and dynamic interactions between the influences (Glanz, 2001). There are several concepts within the SCT in relation to behavior change. However, for this paper, only reciprocal determinism and observational learning will be reviewed as it applies to a child's food and diet behavior.

The social environment, which includes family members, provides opportunities for support. Both the situation and the person's perception of the social environment provide opportunities to promote healthful norms. Hence, the environment and situation are both needed to understand behavior. The dynamic interaction of the environment, person, and behavior is *reciprocal determinism*. Using this concept, behavior is a function of a shared environment among family members and their behavior and personal characteristics. In the application of reciprocal determination, a child's food and dieting behavior will be in part due to the home environment and the communication among parents and their children (Baranowski & Perry, 1990).

Observational learning, also known as shaping and/or modeling, is defined as the process of learning by watching others' behaviors (Bandura, 1961). This learned behavior is "processed" and then "copied". Processed through attention, retention, reproduction, and motivation, Bandura (1977) explained that individuals learn behavior continuously whether the targeted behavior is directed or not. Behaviors are shaped by observing how others interact with their environment. These behaviors are then copied. Hence, if a child sees parental modeling of healthy food behavior, the child can successfully copy the observed behavior. Bandura also emphasis that learning behaviors are exhibited especially if that behavior is rewarded (Bandura et al.,1964). Both concepts heavily rely on the role of the family. Another theory that also applies to familism is the *Sociocultural Theory*. Lev Vygotsky's (1978) Sociocultural Theory includes how society, culture, and other elements of the external environment impact individual development. According to Vygotsky, children are born with biological constraints on their minds. Yet, one's culture provides "tools of intellectual adaptation" (Cherry, 2022). By way of definition, Vygotsky identifies intellectual adaption tools as methods of thinking, learning, and remembering, or strategies for solving problems that children internalize from social interactions. An example of this would be a culturally determined memory mnemonic. This theory, ultimately, analyzes how cultural dispositions influence behavior. Therefore, the Sociocultural Theory suggests that individual learning is influenced by both societal and cultural factors, explaining health disparities among races and ethnicities.

2.9.4. Familism on Health Perception

A 2009 study found that BMI was positively related to self-esteem and leadership trait scores in a large sample of predominately Hispanic children, aged 9 to 11 years (Gonzalez-Quiroz, 2009). At that time, most research stated the opposite, that the greater the BMI, the lower the self-esteem score (and leadership scores). The researcher speculated that these results could have been influenced by many sociocultural factors modeled within the home environment. A great deal of research shows that there is a strong connection between behavior and the family (CDC, 2018). Regarding health and nutrition, parents both influence their children's dietary behavior directly through communication strategies (e.g., weight-based teasing, encouragement to diet) and indirectly via modeling (e.g., parent dieting) (Balantekin, 2019). These types of influences have been labeled as "negative" and detrimental to a child's emotional and physical health. However, within Hispanic families, there is a great emphasis on support. Hispanic's direct communication regarding weight, shape, or size has been seemingly positive. Limited research has been established to determine if "*familial weight acceptance*" exists among Hispanic families. This direct and/or indirect sociocultural messaging considers the family's perception of what is considered healthy and unhealthy, appropriate, and inappropriate, and beautiful or ugly through direct or indirect communication and/or behaviors.

Romo and Mireles-Rios (2015) was first to identify "*positive familial communication*" on body image in Latina mother-daughter dyads (n = 46). Before this, direct messaging from sociocultural agents, such as family (and peers) had been found to advocate for the "*thin ideals*". In the thin ideal, a slender physique is favored, as well as a smaller waist and less body fat (Lowes et al., 2003). Through the use of observation videos that assessed conversations between daughters (aged 12 to 17 years) and mothers, conversations about "how daughters feel about their bodies" were captured. The researchers found that esteem-enhancing messages arise from these "emotionally charged conversations about body shape and size" (Romo and Mireles-Rios, 2015). These mothers consistently provided their daughters with positive reassuring messages that included positive teasing comments and/or compliments that boosted their body esteem, especially when they expressed body dissatisfaction. Ultimately, the mothers provided messages to convince their daughters to embrace their bodies when daughters expressed body dissatisfaction and desire to look thin. Based on this research, it can be assumed that differences in attitudes and beliefs regarding what is considered "*healthy*" may exist among the Hispanic community. The term healthy in this research refers to practices that promote physical, mental, and social well-being.

There has been evidence that Mexican American mothers prefer a larger body size that is larger than what is considered healthy in multiple studies (Alexander et al., 1991; Bojorquez-Chapela et al., 2014; Martinez et al., 2017; Mendoza, 2009; Reifsnider et al., 2006; Sosa et al., 2015; Worobey & Lopez, 2005). Within a culture that promotes a sense of unity and cohesiveness, individuals may perceive themselves as “healthy” since there is social support that allows them to maintain a positive self-evaluation and a sense of efficacy to cope (Stein et al., 2013). Hence, those who are either overweight (or obese) may not accurately perceive their weight status. Additionally, parents may also not accurately perceive their children’s weight. This has been found to be true for Hispanic parents with obese children (Bayles, 2010; de La O et al., 2009; Duncan et al., 2015; Sosa, 2012). In addition, Hispanic obese children have also been found to inaccurate perceive their actual body size, selecting the healthier body size instead (A. Fisher et al., 2005; Intagliata et al., 2008; Montoya et al., 2016; Snethen & Broome, 2007).

2.9.5. Influence of Weight Conversations & Comments

According to the sociocultural model of dieting, children who grow up in an environment that promotes values related to thinness are more likely to adopt those values (Balantekin, 2019). As sociocultural agents, families convey direct and indirect messages about adopting thin body ideals as a reference point (Romo & Mireles-Rios, 2016). Direct communication strategies (e.g., weight-based teasing, encouragement to diet) and indirectly via modeling (e.g., parent dieting attitudes and dieting) are equally influential. Communication within the home and among family members has been researched. In fact, a variety of methods have elucidated the nature of these types of conversations among families. Most of this research was found in older samples of youths. It has been reported that 53% of 30 families of preschoolers reported family as the primary influence on body image (Liechty et al., 2016). Additionally, 40% of the families believed their preschool children would approach them directly and tell them verbally if they were struggling with body image.

Parents unknowingly used weight talk and weight teasing interchangeably throughout their home and family conversations (Berge et al., 2015). It was found that within a sample (*n* = 120) that consisted of diverse (65% African American) low-income families, 65% (*n* = 77) of the participating families participated in some form of weight talk and/or teasing. However, the authors failed to mention whether the conversations were perceived (by the children) as positive or negative. This is important to explore due to the effect it may have on one's weight perception and influence on diet. Regarding this, the occurrence of negative weight-based talk across low-income and minority family members (*n* = 120 children, aged 9 to 12 years) was examined (Berge et al., 2016). Direct observations (data on family meals) and detailed interviews were used. Sixty percent (60%) of the children reported experiencing negative weight-based talk from a family member (mother, father, older/younger brother, older/younger sister). Among family members, children reported a higher prevalence of negative weight-based talk from mothers (42%) and older siblings (33%). Additionally, mothers' negative weight-based talk focused on concerns about child health, whereas fathers' negative weight-based talk focused on child appearance, which included teasing. The extent of the impact of these negative weight-based talks was not noted. This was important to note as research has found that negative weight conversations cause individuals to feel ashamed and embarrassed, leading to weight concerns and body dissatisfaction.

Hitti et al. (2020) studied 198 Hispanic college students (aged 18 to 25 years). The Parental Comments Scale and the Eating Disorder Examination Questionnaire assessed participants' perceptions of the messages they received from their parents and body image dissatisfaction, respectively. Both positive paternal and maternal comments were significant ($F (5, 183) = 9.42$, $p < 0.001$ and $F (5, 185) = 9.89$, $p < 0.001$), and accounted for 20.47% and 21.09% of the variance in depressive symptoms (Hitti et al., 2020). Specifically, negative maternal and paternal comments were positively associated with body image dissatisfaction ($r = 0.40$, $p < 0.001$ and $r = 0.46$, $p < .001$, respectively). Additionally, negative maternal and paternal comments were also positively correlated with depressive symptoms ($r = 0.16$, $p < 0.05$ and $r = 0.25$, $p < 0.001$).

2.9.6. Influence on Child Dieting & Restrictive Eating

In theory, the role of parental restrictive feeding practices and encouragement to diet influences later eating and dieting behavior. This was found to be true by researchers. Parental influences on children's weight-related attitudes and behaviors in 73 parent-child pairs were examined (Haines et al., 2008). Self-reporting surveys indicated that parent report of parental encouragement to diet were significantly associated with higher levels of body dissatisfaction (β (SD) = 0.48 (0.21), $p < 0.05$), weight concerns (β (SD) = 1.06 (0.47), $p < 0.05$), and dieting (OR = 1.81; 95% CI = 1.03, 3.21, $p < 0.05$). Similarly, Balantekin et al. (2014) examined this same relationship (both maternal and paternal diet encouragement) in different time periods, before age 11(early dieting) and between 11 to 15 years (adolescents dieting) in 197 non-Hispanic, White families living in Central Pennsylvania. The Parent Encouragement of Child Weight Loss Scale and a dieting question were used. The question read: "Have you gone on a diet in the past month? By diet, we mean to change the way you eat so you can lose weight." Daughters who were encouraged to diet early by their mother were approximately twice as likely to report early dieting than daughters who were not encouraged to diet. Additionally, if encouragement came from both mother and father, daughters were eight times more likely to diet. Similar results were reported by other researchers (Damiano et al., 2015; Hanna & Bond, 2006; Huon et al., 2000; Keery et al., 2005; Masheb & Grilo, 2000).

In a large longitudinal study of 1,902 young adults, personal and socioenvironmental predictive factors associated with the persistence of dieting or disordered eating were examined from adolescence to young adulthood (Loth et al., 2014). In addition, factors associated with the initiation of dieting or disordered eating were also investigated. Factors were assessed among 4,746 students aged 11 to 18 years (baseline) at Minnesota public schools and then 10 years later at age 21 to 28 years (follow-up). Personal factors included self-esteem, body dissatisfaction, weight concerns, depression, weight importance, and health concerns. Socioenvironmental factors included parental weight concerns, peer dieting, weight teasing, and family communication. Specifically, family communication was assessed with four questions (mothers/fathers separately): "How much do you feel you can talk to your mother (father) about your problems? How much do you feel your mother (father) cares about you?" Disordered eating behaviors were assessed by asking participants to report if they had used unhealthy (e.g., fasted, ate very little food, used a food substitute, skipped meals, or smoked more cigarettes) or extreme (e.g., took diet pills, made myself vomit, used laxatives, or used diuretics) weight control behaviors during the past year. In females, high weight concern (OR = 28.6; 95% CI: 7.2 to 50.0), high weight importance (OR = 14.2; 95% CI: 5.7, 22.8), high family communication (OR = 11.7; 95% CI: 21.3, 2.1), and low body satisfaction (OR = 13.4; 95% CI: 28.2, 1.5), at baseline was significantly positively associated with persistent dieting from baseline to follow-up. Only high weight importance (OR = 15.8; 95% CI: 6.6, 24.9) at baseline was significantly positively associated with persistent disordered eating from baseline to follow-up. This indicates that personal factors, weight concern, weight importance, and low body satisfaction present during adolescence are predictive of an individual's engagement in dieting (and disordered eating for weight importance only) behaviors 10 years later.

Unfortunately, dieting or being encouraged to diet does not always lead to the desired effect of weight loss. Balantekin et al. (2014) found that girls who dieted and had parental encouragement to do so had increases in BMI percentiles from age 9 to 15 years. Those girls who dieted early (before 11 years) were predicted to have an increase of 6.2 BMI percentiles per unit due to maternal encouragement to diet. In contrast, those girls who dieted during adolescence were predicted to increase 4.2 and 4.4 BMI percentiles per unit increase in maternal and paternal encouragement to diet, respectively. Similar results were reported by Fulkerson et al., 2002 (Project EAT) in a sample of 810 adolescents (*N* = 381; 429, boys and girls, respectively).

2.9.7. Modeling of Unhealthy Eating Behaviors

Studies have examined the influence of parental use of specific weight control behaviors on child use of those behaviors. Within the category of indirect influences, these behaviors include but are not limited to the mothers' dieting and weight management strategies, mothers' dissatisfaction with their weight, and mothers' appearance-related comments. Arroyo et al. (2017) examined both maternal commentary and maternal modeling using path analysis in 242 multi-ethnic grandmother–mother–daughter triads (3% were Hispanic). The assessment included: a self-questionnaire, Eating Attitudes Test-26, and the Parental Influence Questionnaire, where each person was asked to report on perceptions of her mother's behaviors.

Dieting, oral control, and bulimia were observed through maternal commentary and maternal modeling using path analysis. The structural path model ($x^2 = 59.61$, df = 49, $p = 0.14$, x^2 df ratio = 1.22, CFI = 0.98, RMSEA = 0.03) was as follows: grandmothers' reports of maternal modeling to daughters' eating attitudes through four intervening variables over the generations was significant ($\beta = .002$, $p < 0.05$); grandmothers' disordered eating to mothers' disordered eating through mothers' reports of maternal commentary ($\beta = .036$, $p < 0.001$); and mothers' disordered eating to daughters' disordered eating through daughters' reports of maternal commentary ($\beta = .038$, $p < 0.05$). These paths illustrate the intergenerational transmission of eating behaviors within families. These results illustrate the intergenerational modeling of unhealthy eating behaviors within the family unit. Similar results have been found in mother-daughter dyads (Abraczinskas et al., 2012; Cooley et al., 2008; J. Evans & le Grange, 1995; Garcìa De Amusquibar et al., 2003; Linville et al., 2011).

2.9.8. Modeling of Healthy Eating Behaviors

Aside from dieting and encouraging restrictive eating, there are other methods to promote healthy eating in children. Parents are viewed as the social influence on children's healthy eating and have had long-term effects (Pedersen et al., 2015). Encouraging and role modeling healthy eating and physical activity behavior are such methods. A plethora of research exists on these various methods which include, family mealtime, including fruits and vegetables in meals/snacks, preparing meals together, practicing portion control, limiting low nutrition foods, participating in physical activity, and limiting screen time. Unfortunately, not all studies examine the same outcomes. This is the general limitation of all studies that examine the impact of healthy eating behaviors. Consistency of measurement of defined factors of healthy eating practices is needed. For this section, healthy eating methods will only include increasing fruit and vegetable intake in children and adolescents. The impact of parental modeling on this type of healthy eating behavior will be discussed.

Early studies examined reducing fat intake and increasing fruit and vegetable consumption (Tibbs et al., 2001; Weber Cullen et al., 2001; Young et al., 2004). Low-fat eating patterns were defined as choosing low-fat snacks, substituting low-fat for high-fat food items, modifying meat options, avoiding fried foods, replacing high-fat foods for more fruits and vegetables, and avoiding fat as a spread. In a sample of 456 African American parents, Tibbs et al. (2001) found parental modeling of healthful dietary behavior to be associated with increased low-fat eating patterns ($r = 0.48$; $p < 0.001$), lower dietary fat intake ($r = -0.30$; $p < 0.001$), and higher consumption of fruits and vegetables ($r = 0.18$; $p < 0.001$). The Parental Dietary Modeling Scale (PDMS), Eating Patterns Questionnaire, and Eating Frequency Questionnaire were used. Cullen et al. (2001) found similar results in a diverse sample of 221 children and adolescents (25% African American, 29% Euro-American, 37% Mexican American, 9% Asian/Other). Parent fruit, juice, and vegetable (FJV) modeling was positively correlated with consumption of fruit ($r = 0.18$; $p < 0.01$), juice ($r = 0.14$; $p < 0.05$), total FJV ($r = 0.20$; $p < 0.01$), fruit/1000 kcal ($r = 0.18$; $p < 0.01$) and total FJV/1000 kcal ($r = 0.23$; $p < 0.01$). FJV modeling by parents was measured on a 34-items scale (not described). In predominately non-Hispanic children ($N = 366$), Young et al. (2004) found that perceived parent modeling ($\beta = 0.312$, $p = 0.002$) had a positive effect on fruit and vegetable consumption for students reporting high perceived fruit and vegetable availability. Additionally, perceived parent modeling along with perceived parent support significantly predicted fruit and vegetable consumption ($F = 7.327$, $p < 0.001$, adjusted $R^2 = 0.218$). The Child Modeling Scale and questions from the BRFSS were used. Additionally, a literature review of 98 papers on determinants of fruit and/or vegetable intake among children and adolescents (aged 6 to 18 years) found parental modeling (parental intake) as a strong positive predictor among boys and girls (Rasmussen et al., 2006).

A meta-regression analysis of twenty-four studies examining the associations between parent and child nutrient and caloric intake. Of those twenty-four, fifteen studies found parents' influence on a child's intake to be weak to moderate (Y. Wang et al., 2011). However, within the studies reviewed, those that used a stronger diet methodology found stronger correlations in fat and energy intake. This was assessed by their assigned sub-scores (ranging from 1-3, three being the best) on different components (sample size, age range of children, dietary assessment, nutrients, and foods reported, types of parent-child dyads, adjustment for potential confounders, and representativeness of sample). Most studies with a small sample size had weak correlations. More evidence to support the theory that parents play a strong role in children's eating behaviors is needed.

Parents' influences on children's eating habits were examined to gain a deeper understanding of how children develop their eating habits (Prichard et al., 2012). The researchers examined daughters' and mothers' intake of Energy-Dense Food (EDF) and vegetables in 112 females (aged 17 to 25 years). To assess the long-lasting effects of parental influences, this study focused on university-aged daughters, who may or may not live at home, and may or may not share meals with their parents rather than young children whose dietary choices are constrained by foods made available by their parents. Food consumption and eating behavior were assessed using Campbell's Food Frequency Questionnaire and the Dutch Eating Behavior Questionnaire, respectively. The EDF intake of daughters was strongly related to perceptions of mothers' intake of EDF (r (112) = 0.78, $p < 0.01$). Additionally, vegetable intake of daughters was also significantly correlated with perceptions of mothers' vegetable intake (r (112) = 0.67, $p < 0.01$).

Earlier studies on young children also found similar results (K. K. Davison & Birch, 2002b; Ellison et al., 1992; J. O. Fisher et al., 2002; Young et al., 2004).

To better examine mother-child eating behavior the Parental Modeling of Eating Behaviors Scale (PARM) was developed (Palfreyman et al., 2014). A total of 484 mothers with a child aged between 18 months and 8 years participated. Ultimately, this instrument captured three scales: verbal modeling (modeling through verbal communication); unintentional modeling (children adopting eating behaviors that parents had not actively modeled); and behavioral consequences (children's eating behaviors directly associated with parental modeling). In 2015, the PARM scale researched on 18 families with children aged 2 to 6 years (Palfreyman et al., 2015). Observed maternal behavioral modelling was found to be significantly negatively correlated with children's emotional overeating ($r = -0.529$, $p < 0.05$) and significantly positively related to food enjoyment ($r = 0.526$, $p < 0.05$).

Ma et al. (2018) examined perceived parental modeling, in 1,657 adolescents (aged 12 to 17) consumption of fruits and vegetables using the Family Life, Activity, Sun, Health, and Eating Survey. Sugary drinks and less healthful food were also reviewed. Perceived parental modeling was correlated (positive relationship) to adolescents' fruit and vegetable consumption ($b = 0.13$, $p < 0.001$) and a negative relationship to their consumption of sugary drinks and less healthful food ($b = -0.06$, $p < 0.001$). In a Denmark study, similar results were reported in 757 parent dyads (Pedersen et al., 2015).

2.10. Summary

Childhood obesity among the Hispanic population is a growing challenge. Yet, obesity rates in all children are increasing in all age groups including the very young. Obesity is a multifaceted disease and is affected by factors ranging from genetics to intake and activity, to role modeling and social interaction. Interestingly, the thinness ideal exists and plays a vital role in what is considered acceptable and not acceptable body shape. There is little research on the impact of culture on dieting practices in young children and the impact on obesity and BMI. While the vast majority of studies have focused on the factors contributing to childhood obesity, limited research has targeted healthy modeling as a protective role. Specifically, the role of familism as a protective factor on obesity and BMI has not been assessed in young Hispanic children. Also, while young children should not be exposed to calorie-restricted diets, it is most likely occurring given the prevalence of obesity and the fact that those who are obese also have body dissatisfaction and practice restrictive eating behaviors. Therefore, a closer examination of restrictive eating practices on young children based on parents' perception of the child's health and their dieting behaviors needs to be assessed. Ultimately, the impact of those practices (parents' perception of a child's healthy body size and their dieting behavior) on BMI seems warranted.

3. METHODOLOGY

3.1. Background Characteristics

This research is a secondary analysis using baseline data obtained from the South Texas Early Prevention Study Pre-K (STEPS Pre-K) Project. STEPS Pre-K was a three-year grant (from September 2017 to August 2020) supported by Award No. 1 CPIMP171151-01-00 from the Office of the Assistant Secretary of Health. The project focused on bettering the outcomes of obesity and obesity-related health behaviors among Hispanic children and their families in the Rio Grande Valley area (a region in the southernmost tip of South Texas). A line drawn between Brownsville and Corpus Christi and then Laredo defines the southernmost tip. The STEPS Pre-K Project followed the *Bienestar* (English translation is "well-being") Coordinated School Health Program model, which was created by the Social and Health Research Center in San Antonio, Texas. However, this project had a grander focus on obesity prevention vs. diabetes prevention. As a culturally relevant school-based obesity prevention program, the STEPS Pre-K Project goals included: obesity prevention (control of body weight) through decreased dietary fat intake, increased healthy eating practices (specifically fruits, vegetables, and whole grains), and physical activity.

3.1.1. Program Design and Participants

STEPS Pre-K was a cluster-randomized trial designed to assess the effect of the Bienestar coordinated school health program on children's health outcomes. The targeted sample was pre-Kinder (Pre-K) Hispanic children and their families. Only families from schools with embedded pre-kindergarten programs were asked to participate due to the target age group, 4-year-old children. These children were recruited from the Pharr-San Juan-Alamo and La Joya Independent School Districts, both located in the Rio Grande area, which is along the Texas-

Mexico border. The Texas-Mexico border is known for its high levels of Hispanics, unemployment, poverty, and risk factors for obesity and chronic diseases (U.S. Department of Health & Human Services, 2020). School demographics at the time (2015–2016 academic year) were: 99.0% Hispanic, 88.3% economically disadvantaged, 31.2% bilingual, 14.5% English as a Second Language, and 5.27% migrant (Treviño-Peña et al., 2021). The Hispanic ethnicity category included any individual of Mexican, Puerto Rican, Cuban, Central or South American, or any other Spanish origin. These standards were consistent with the racial and ethnic categories set for federal statistics and administrative reporting used in the U.S. Census (United States Census Bureau, 2020). However, the sample consisted mostly of Mexican Americans.

Originally the sample consisted of 1,277 parent-child dyads. However, to keep consistency within the dataset, only dyads with complete information on all variables of interest (BMI, diagnosis of diabetes, parent's perception of a healthy child, parent dieting behaviors, child's dieting behaviors, and child's food behaviors) were kept ($n = 676$). Additionally, those dyads with incomplete physical activity data were removed from the sample ($n = 571$). Physical activity data were used to confirm the accuracy of dieting responses (in parents and children). Additionally, because there was only a small sample size of male parents, only data that was completed by female parents was kept ($n = 534$). The use of a complete dataset for all parameters listed above contributed to a more stringent methodology. By doing so, a reliable path analysis with a lower error rate could be examined. There was no compensation for participation.

3.1.2. Ethics for Using Human Children

The approval of the STEPS Pre-K Project was obtained by the University of Texas Rio Grande (UTRGV) Valley Institutional Review Board (IRB) on March 28, 2018 (Appendix A). The Social and Health Research Center and North Dakota State University (NDSU) signed a data user agreement on August 30, 2021. Secondary analysis of STEPS Pre-K data for this study was approved by the NDSU IRB (Protocol #IRB0003689) on September 03, 2021 (FWA00002439, Appendix B).

To maintain the privacy and confidentiality of parent-child dyads, all children were assigned a child ID number (STEPS ID) and only de-identified data was shared with NDSU. The STEPS IDs were generated using sequential order (after sorting in alphabetical order by the school district and school name). Data was shared and transferred electronically through a secured email and encrypted external storage data management system. All STEPS Pre-K Project data downloaded was stored in a padded lock external drive.

3.2. Data Collection Procedures

3.2.1. Recruitment Procedure

Recruitment strategies (selected schools only) for the STEPS Pre-K Project included flyers/letters, school posters, public presentations, and word of mouth. A standardized procedure was used to explain the project (i.e., the study was explained, and families were informed in writing that they were not required to participate, and required consent). Families were asked to complete program surveys online or in paper-pencil format. For those choosing the online format, a valid email address was requested. Completion of all survey forms was done individually unless assistance was requested. If assistance was requested, using a set protocol, program staff provided assistance via phone. Once completed, online survey forms were collected via email. For paper-pencil formats, school staff (i.e., homeroom teachers, school nurses, or parent liaisons) assisted in the collection process. Families were contacted via telephone in an attempt to gather incomplete data, including missing consent forms.

3.2.2. Consent Forms

Written consent forms, (in both English and Spanish) were collected from August 1st to October 1, 2018 (Appendix C). A signed (parental or legal guardian) consent form was required for participation in the STEPS Pre-K Project anthropometric data collection. Those with incomplete consent forms were not subjected to anthropometric measures. However, children were able to participate in the STEPS Pre-K Project intervention activities, which included nutrition and health educational lessons (and activities).

3.2.3. Data Collection

This research used baseline data collected by the STEPS Pre-K Project in the fall of 2018 (secondary data analysis). Trained STEPS Pre-K Project researchers conducted all anthropometric data on school grounds, either in school gyms or cafeterias. Pre-programmed laptop computers were used to collect data onsite. Laptop computers contained STEPS IDs for each assigned school. These were created to ensure anonymity and to allow project researchers to match all forms of data. To assist with data validation, laptop computers were pre-programmed with value ranges to alarm researchers of any outliers or questionable entries before the child left the collection site. All data were reviewed by project researchers prior to coding. Follow-up visits (at school sites) were conducted if there was any missing or ambiguous anthropometric data. Incomplete survey data was also reviewed prior to coding. As mentioned earlier, missing survey data was attempted to be collected via phone. To eliminate errors, a double data entry was performed.

3.3. Instruments of Measure

The variables of interest were as follows: (a) child's BMI *z*-score, ultimate endogenous variable (i.e., dependent variable); (b) child's diagnosis of diabetes (i.e., endogenous variable);

(c) parent's perception of a child's healthy body size, exogenous variable (i.e., independent variable); (d) parent's dieting behaviors (i.e., endogenous and exogenous variables); (e) child's dieting behaviors (i.e., endogenous and exogenous variables); and (f) child's food behaviors (i.e., endogenous and exogenous variables). The following instruments (see Table 9) were used to assess these variables of interest.

3.3.1. Body Mass Index *z*-score

Child's height and weight were collected in their school. The protocol for anthropometric measures was standardized across all schools. Children were asked to remove their shoes and any heavy clothing (i.e., sweaters and jackets). Each child was asked to step onto a weight scale (Tanita Corp. of America, Inc., Arlington Heights, IL 60005). Feet placement was examined (feet must be next to one another over the center of the scales) by project researchers. Stable weight was recorded to the nearest 0.1 kg.

For height, the child stepped onto the stadiometer (Detecto Corp., Webb City, MO 64870). Child's standing meant erect with the mid-axillary line perpendicular to the floor, weight distributed evenly on both feet, arms hanging freely by the sides, the knees and ankles placed together, and the scapula, buttocks, and heels were in contact with the vertical board. The headboard was placed firmly on top of the child's head with sufficient pressure to compress the hair to the scalp. Height was recorded to the nearest 0.1 centimeters. Height and weight were converted to calculate BMI (kg/m^2). To calculate BMI *z*-scores, the 2016 CDC growth charts for age (to the nearest year) and sex, and Cole's LMS method were used (T. Cole, 1990). Weight classification was according to the WHO Child Growth Standards was used and is as follows: underweight (BMI *z*-score < -2), normal weight (BMI *z*-score -1 to +1) overweight (BMI *z*-score > +2) and obese (BMI *z*-score > +3).

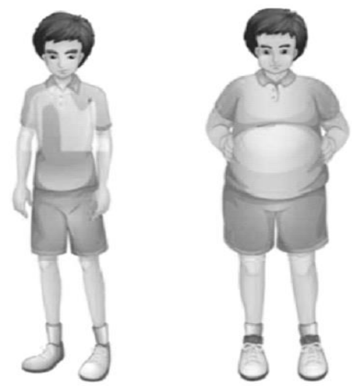
3.3.2. Family Demographics Survey (Demografía Familiar)

The Family Demographics Survey was available both via pencil-and-paper and online formats. This was a self-administered survey (available in English and Spanish) consisting of seventeen (17) multiple-choice and fill-in-the-blank questions (Appendix D). Parents and/or guardians were asked to complete this survey to the best of their knowledge. Within this survey, a child's diagnosis of DM2 was assessed using the question, "Has this child been diagnosed with diabetes (meaning you were told by a doctor or a medical worker that this child has diabetes)?". For each question in the survey, a Spanish translation was provided. The Spanish translation for this item was as follows: "Su niño(a), ¿ha sido diagnosticado/a con diabetes? (Por un médico)". Responses of "*No*" or "*Yes*" were coded as either 0 or 1 (0 = No; 1 = Yes), respectively.

Within this survey (Family Demographics Survey), *parent's perception of a child's healthy body size* was assessed using an image (see Figure 7) and the question, "Which child looks healthier?". The Spanish translation for this item is as follows: "¿Cuál niño ve usted más sano?". The image depicted two childlike figures that were both males. The two images showed children of different body sizes, with Child B having a larger frame. Responses of "Child A" or "Child B" were coded as either 0 or 1 (0 = Child A; 1 = Child B), respectively.

Figure 7

Perception of a Child's Healthy Body Size



Note. The image is taken from STEPS Pre-K Project data collection survey with permission from STEPS Pre-K Project.

3.3.3. Household Health Characteristics Survey (Encuesta de la Salud Familiar)

The *Household Health Characteristics Survey* was a self-administered (available in both English and Spanish) survey consisting of thirty-two (32) multiple-choice questions. Available in both pencil-and-paper and online formats, this survey immediately followed the Family Demographics Survey (Appendix D). Specifically, four questions from the 1996 CDC's BRFSS Questionnaire (Section 7: Weight Control, Questions #36 to #40) were used to assess weight control practices. The original BRFSS questionnaire consisted of ten sections that included a total of 78-items. Specifically, Section 7 included five questions (n = 5) on weight control practices in adults. However, the STEPS Pre-K Project did not use this survey in its entirety, using only four questions (n = 4). A question (Question #40) regarding healthcare recommendations for weight loss was omitted. It may have been intended to keep the questionnaire as short as possible. In addition, the survey items used (in this particular population) weren't piloted prior to assessment. A listing of the 1996 BRFSS questions, used and not used by the STEPS Pre-K Project, can be found in Appendix E.

For this research, parents' dieting behaviors were assessed using three questions (i.e., questions #23, #25, and #26). Only questions #23, #25, and #26 were considered, as these questions addressed dieting behaviors. The other questions pertained to weight maintenance, and therefore were not used. Question #23 read, "Are YOU now trying to lose weight?". The Spanish translation for this item is as follows: "¿Está usted intentando bajar de peso?". Responses of "*No*" or "*Yes*" were coded as either 0 or 1 (0 = No; 1 = Yes). Question #25 read, "Are YOU eating either fewer calories or less fat to lose weight or keep from gaining weight?". The Spanish translation for this item is as follows: "¿Está usted comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso?". Responses included: "*No*"; "*Yes, fewer calories*"; "*Yes, less fat*"; or "*Yes, fewer calories and less fat*". Responses of "*No*" were coded as 0 (0 = No). Responses of any options that included "*Yes*" (i.e., "*Yes, fewer calories*"; "*Yes, less fat*"; "*Yes, fewer calories and less fat*"; or "*No*") were coded as 1(1 = Yes). Question #26 read "Are YOU using physical activity or exercise to lose weight or keep from gaining weight?". The Spanish translation for this item is as follows: "¿Está usted haciendo alguna actividad física para bajar de peso o no subir de peso?". Responses of "*No*" or "*Yes*" were coded as either 0 or 1 (0 = No; 1 = Yes), respectively. In the end, these three questions were transposed into a new scale variable that displayed an overall score for parents' dieting behavior. Scores ranged from 0 to 3. The higher the value indicated greater the dieting practices. Internal reliability was identified as good ($\alpha = .69$).

Additionally, within the Household Health Characteristics Survey, the child's dieting behaviors were assessed (by the child's parents) using three questions. The STEPS Pre-K Project modified questions #23, #24, #25, and #26 (i.e., adult dieting survey items within the CDC BRFSS) to do so. The language of the survey items was modified to address the child's dieting behavior (i.e., "Is YOUR Child ….?) vs. parent's dieting behavior (i.e., Are YOU…….?). As indicated in the previous paragraph, the STEPS Pre-K Project did not use the CDC BRFSS Questionnaire (Section 7: Weight Control) in its entirety. Instead, only four (n = 4) were used. A shorter questionnaire may have been the goal here. Furthermore, the modified survey items were not piloted on this specific population prior to assessment.

In the present study, only questions #27, #29, and #30 were considered since they addressed the child's dieting behavior rather than weight maintenance. Question #27 read, "Is YOUR CHILD now trying to lose weight?". The Spanish translation for this item is as follows: "¿Está intentando que su niño/a, baje de peso?". Responses of "*No*" or "*Yes*" were coded as either 0 or 1 (0 = No; 1 = Yes), respectively. Question #29 read "Is YOUR CHILD eating either fewer calories or less fat to lose weight or keep from gaining weight?". The Spanish translation for this item is as follows: "¿Está su niño/a comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso?". Responses included: "*No*"; *Yes, fewer calories*"; "*Yes, less fat*"; or "*Yes, fewer calories and less fat*". Responses of "*No*" were coded as 0 (0 = No). Responses to any of the "*Yes*" options ("*Yes, fewer calories*"; "*Yes, less fat*"; "*Yes, fewer calories and less fat*"; or "*No*") were coded as 1 (1 = Yes). Question #30 read, "Is YOUR CHILD using physical activity or exercise to lose weight or keep from gaining weight?". The Spanish translation for this item is as follows: "¿Está su niño/a haciendo alguna actividad física para bajar de peso o no subir de peso?". Responses of "*No*" or "*Yes*" were coded as either 0 or 1 (0 = No; 1 = Yes), respectively. Ultimately, all three questions were transposed into a new scale variable that displayed an overall score for the child's dieting behavior. Scores ranged from 0 to 3. The higher the value indicated the greater the dieting practices. Internal reliability was found to be low (α = .595).

Within the same survey (Household Health Characteristics Survey), a specific set of questions were used to assess a child's food behaviors. STEPS Pre-K used the 2012 Behavioral Checklist from both the USDA (all questions) and the Expanded Food and Nutrition Education Program (EFNEP) assessment to assess home dietary practices. The USDA Behavioral Checklist was used in its entirety. For the EFNEP Behavioral Checklist, specific questions were taken from specific sections (i.e., Whole Grains, Fat, and Fruits & Vegetables). This demographic health survey (also referred to as a diet diversity questionnaire) collected data on both general food consumption and food intake. The original assessment had a total of 41-items. The STEPS Pre-K Project did not use this survey in its entirety. This was probably done to limit the length of the overall survey. Only 14-questions were used (see Appendix E). Piloting of the selected survey questions (within this specific STEPS Pre-K population) was not done prior to assessment. A listing of the survey items in the 2012 Behavioral Checklist, used and not used by the STEPS Pre-K Project, can be found in Appendix E.

In this study, only four questions (Questions #9, #12, #13, and #14) were considered (n = 4) because they were culturally relevant and addressed "intake" rather than general healthy eating practices. Parents responded (using a Likert Scale) to each of these questions in either English or Spanish. Question #9 read, "You use the "Nutrition Facts" on the food label to make food choices?". The Spanish translation for this item is as follows: "¿Usa la etiqueta de datos nutricionales para elegir alimentos?". Question #12 read, "You serve more than one kind of fruit to your family each day?". The Spanish translation for this item is as follows: "A su familia, ¿Sirve más de un tipo de fruta al día?". Question #13 read, "You serve two or more kinds of vegetables during your family's main meal?". The Spanish translation for this item is as follows: "A su familia, ¿sirve dos o más tipos de verduras en el platillo principal del día?". Question #14 read, “You use reduced fat (2%), low fat (1%), or non-fat (skim) milk?”. The Spanish translation for this item is as follows: “¿Consume leche baja en grasa (2%), o (1%), o descremada?”. Each question used the same 5-point scale: 0 = *Never*, 1 = *Seldom*, 2 = *Sometimes*, 3 = *Most of the time*, 4 = *Almost always.* The Spanish translation for this as follows: 0 = *Nunca*, 1 = *Rara vez,* 2 = *Algunas veces,* 3 = *La mayoría de las veces*, 4 = *Casi siempre*. Ultimately, these four questions were transposed into a new scale variable to obtain an overall score for a child’s food behavior. Total possible scores range from 0 to 16, with higher scores reflecting greater healthy food behavior. Internal reliability was identified as being low (α = .535). An overview of the assessment measures used in this research is displayed in Table 9.

Table 9

Detailed Information Regarding All Questions Used in This Research (English & Spanish)

Variable of Interest	Questions (*n*)	Assessment	Question Details (English)	Question Details (Spanish Translation)
Child's Diabetes Diagnosis	1	Family Demographics Survey (Demografía Familiar)	Question #16: If this child was diagnosed with diabetes, which type was it? Response Option: "Yes" or "No"	Quistión #15: ¿Si el niño(a) fue diagnosticado con diabetes, que tipo?" Opción: "Si" o "No"
Parent's Perception of a Healthy Child's Body Size	1	Family Demographics Survey (Demografía Familiar)	Question #17: Which child looks healthier? Response Option: "Child A" or "Child B"	Quistión #17: ¿Cuál niño ve usted más sano? Opción: "Nino A" o "Nino B"
Parent's Dieting Behavior	3	Household Health Characteristics Survey (Encuesta de la Salud Familiar)	Question #23: Are YOU now trying to lose weight? Response Option: "*Yes"* or *"No"* Question #25: Are YOU eating either fewer calories or less fat to lose weight or keep from gaining weight?" Response Option: "*Yes, fewer calories*"; "*Yes, less fat*"; "*Yes, fewer calories and less fat*"; or "*No*" Question #26: Are YOU using physical activity or exercise to lose weight or keep from gaining weight? Response Option: "*Yes"* or *"No"*	Quistión #23: ¿Está usted intentando bajar de peso? Opción: "Si" o "No" Quistión #25: ¿Está usted comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso? Opción: "Si, menos calorías", "Si, menos grasa", o "Si, menos calorías y menos grasa" Quistión #26: ¿Está usted haciendo alguna actividad física para bajar de peso o no subir de peso? Opción: "Si" o "No"
Child's Dieting Behavior	3	Household Health Characteristics Survey (Encuesta de la Salud Familiar)	Question #27: "Is YOUR CHILD now trying to lose weight?" Response Option: "*Yes* "or *"No"* Question #29: Is YOUR CHILD eating either fewer calories or less fat to lose weight or keep from gaining weight? Response Option: "*Yes, fewer calories*"; "*Yes, less fat*"; "*Yes, fewer calories and less fat*"; or "*No*" Question #30: Is YOUR CHILD using physical activity or exercise to lose weight or keep from gaining weight? Response Option: "*Yes"* or *"No"*	Quistión #27: ¿Está intentando que su niño/a, baje de peso?" Opción: "Si" o "No" Quistión #29: ¿Está su niño/a comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso? Opción: "Si, menos calorías", "Si, menos grasa", o "Si, menos calorías y menos grasa" Quistión #30: ¿Está su niño/a haciendo alguna actividad física para bajar de peso o no subir de peso?" Opción: "Si" o "No"

Table 9. *Detailed Information Regarding All Questions Used in This Research (English & Spanish)* (continued)

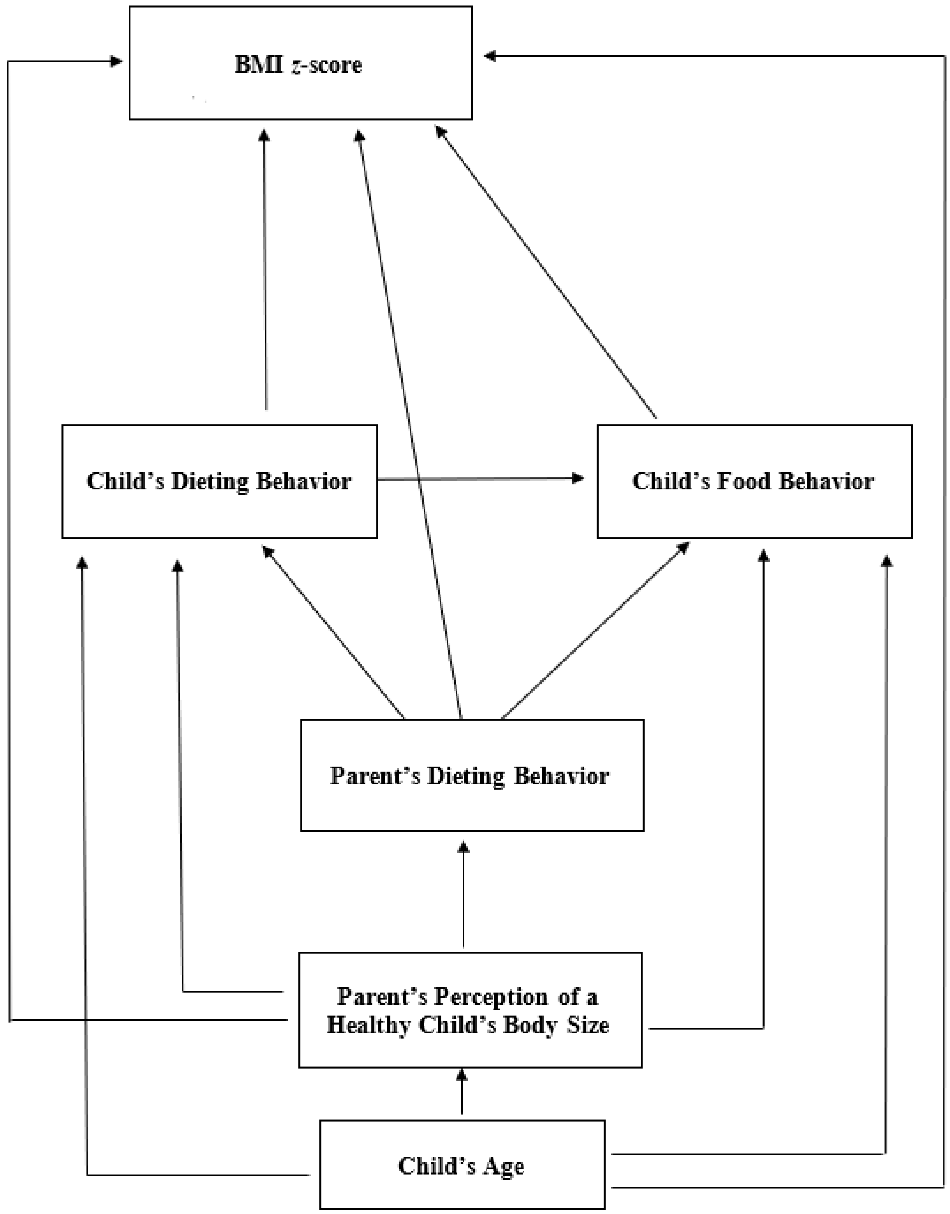
Variable of Interest	Questions (*n*)	Assessment	Question Details (English)	Question Details (Spanish Translation)
Child's Food Behavior	4	Household Health Characteristics Survey (Encuesta de la Salud Familiar)	Question #9: You use the "Nutrition Facts" on the food label to make food choices? Response Option: "*Never*", "*Seldom*", "*Sometimes*", "*Most of the time*", "*Almost always*"	Quistión #9: ¿Usa la etiqueta de datos nutricionales para elegir alimentos?". Opción: "*Nunca*", "*Rara vez*", "*Algunas veces*", "*La mayoría de las veces*", o "*Casi siempre*"
			Question #12: You serve more than one kind of fruit to your family each day? Response Option: "*Never*", "*Seldom*", "*Sometimes*", "*Most of the time*", "*Almost always*"	Quistión #12: A su familia, ¿Sirve más de un tipo de fruta al día?" Opción: "*Nunca*", "*Rara vez*", "*Algunas veces*", "*La mayoría de las veces*", o "*Casi siempre*"
			Question #13: You serve two or more kinds of vegetables during your family's main meal? Response Option: "*Never*", "*Seldom*", "*Sometimes*", "*Most of the time*", "*Almost always*"	Quistión #13: A su familia, ¿sirve dos o más tipos de verduras en el platillo principal del día? Opción: "*Nunca*", "*Rara vez*", "*Algunas veces*", "*La mayoría de las veces*", o "*Casi siempre*"
			Question #14: You use reduced fat (2%), low fat (1%), or non-fat (skim) milk? Response Option: "*Never*", "*Seldom*", "*Sometimes*", "*Most of the time*", "*Almost always*"	Quistión #14: ¿Consume leche baja en grasa (2%), o (1%), o descremada? Opción: "*Nunca*", "*Rara vez*", "*Algunas veces*", "*La mayoría de las veces*", o "*Casi siempre*"

3.4. Statistical Analysis

Data analyses were performed on the complete case data set using SPSS (Statistical Package for Social Sciences) for Windows version 27. Significance was identified as $p < 0.05$. To gather a complete case data set, list-wise deletion of missing values was performed. For multiple-item variables (i.e., parent dieting behaviors, child dieting, and food behaviors), variables were transposed into a scale variable. Next descriptive analyses, including mean and standard deviations, were calculated for all variables of interest. These analyses found that only two children ($n = 2$) were diagnosed with DM2. Because of this, the diabetes variable was removed from the path model. Figure 8 displays the revised model. Then, to estimate the relationships between variables, bivariate correlations (Pearson Product Correlations) were computed. This provided a basis to consider each of the variables in the model. Finally, path analysis was conducted to identify the influence of independent (and mediating) variables on the ultimate dependent variable, the child's BMI. Multiple independent variables served as the mediating variables in the model. Ultimately, two path models were developed: the Perception Model (discussed in detail in Chapter 4) and the Full Parent Model (discussed in detail in Chapter 5). For each model, multivariate simultaneous multiple regression analysis was conducted for each hypothesized path. If a relationship exists ($p < .05$), the path will remain in the model.

Figure 8

Revised Conceptual Path Model



Note. Arrow directions indicate hypothesized direction of the relationship between the exogenous variables (independent variables) with endogenous (dependent variables). The model is recursive because all arrows point in the same direction and the error variances are uncorrelated.

4. A PATH ANALYSIS EXPLORING THE ROLE OF FAMILISM ON HISPANIC CHILDREN'S BMI

4.1. Introduction

Obesity continues to be a serious public health condition that disproportionately impacts Hispanic children. There are currently 14.4 million obese children and adolescents (aged 2 to 19 years) in the U.S., and 25.6% of those children are Hispanic (CDC, 2022c). In Texas, the rate of obesity among older children (aged 10 to 17 years) is 20.3% (State of Childhood Obesity, 2022). Although the number of children aged 4 to 5 years who are obese is unknown, it can be assumed that obesity in young children is leading to obesity in older children. A study conducted in 2020 found that the rate of childhood obesity along the Texas-Mexico border is 18.2% (Treviño-Peña et al., 2021). Possible reasons for this rate of obesity for children on the Texas-Mexican border may include higher unemployment, limited healthcare, and lower education and health literacy. Research has pointed out the impact of these social and economic factors on obesity, as well as other common health problems (Gibbs & Forste, 2014; Isong, Rao, et al., 2018; Miller et al., 2020; Ogden et al., 2018; Williams et al., 2018). Obesity's influence on a variety of physical and psychosocial health conditions and diseases, as well as its persistence into adulthood, are areas for concern. In addition, obesity's unwarranted association with overall reduced quality of life is equally concerning and should prompt us to examine factors contributing to childhood obesity as well as protective factors for its prevention.

Social weight stigmas can create psychological distress for those who are obese, which can have a worsening effect on obesity. Notably, society has made it clear that being obese and/or overweight is physically undesirable. Many magazines, especially fashion magazines, show thin models. Almost all actors (both male and female) need to maintain a specific body figure in television and movies. Furthermore, media advertisements and marketing around fashion, beauty, and health reinforce the thin ideal. It is reported that ¼ of American fashion models had a BMI < 17.5, which is considered underweight according to weight classifications (Park, 2017). The American Psychiatric Association defines a BMI < 17.5 as anorexia. Additionally, children get increased exposure to the thin ideal because of social media. These days, shares and positive self-promotion are motivating factors in social media. This is accomplished by taking numerous "selfies", and selecting one from the lot, then editing it, and applying a filter. All of this is done to achieve a look that is not natural to the individual. Alarmingly, the desire for thinness has been found to emerge in children as young as five years of age (Ayine et al., 2020; Lowes & Tiggemann, 2003). This is a major problem as body dissatisfaction can lead to problematic dieting behaviors, disordered eating and ultimately eating disorders. The role of the family comes into question as research has shown that body image attitudes, as well as its associated dietary behaviors, are learned at home (Balantekin, 2019; Damiano, Paxton, et al., 2015; Hart et al., 2016; Yee et al., 2017). It is the parents' perception and modeling of that perception that shapes the dietary behaviors of their children. Interestingly, perceptions regarding what is considered a healthy weight, shape, and body size may be perceived differently among racially and ethnically diverse populations. Possibly, these perceptions are a result of their social interactions in the family. Hispanic children who are either overweight or obese may not accurately perceive their weight status. For example, one study conducted with young Hispanic children found that 75% thought they had a healthy body weight despite 30% of them being overweight (A. Fisher et al., 2005). Other researchers have found similar results, within this population (Montoya et al., 2016; Romo et al., 2016).

Identified as a close-knit group, Hispanics may not equate thinness with being healthy. Instead, the image a of healthy body size may be that of a child who is not considered thin nor of normal body size. Instead, Hispanics may consider body types that are associated with those that have BMIs that are associated with overweight and obesity as healthy. This image of health may create social environments that support every body size. Research on ethnic groups in this area is limited to my knowledge. Anecdotally, *cariños*, terms of endearment, are commonly used among the Hispanic community to show affection toward their children (and other loved ones). Hispanic parents and family members use *cariños* such as *mi rey/reyna* (my king/queen), *mi dulce* (my sweet) and *mi corazón* (my heart) to express their love. Additionally, Hispanic parents will also affectionally use physical characteristics such as *mi gordito/gordita* (my fatty boy/fatty girl), *mi panzoncito/panzoncita* (my chubby boy/my chubby girl), *mi chaparrito/chaparrita* (my short boy/short girl) to express affection. While this may not be explored in the scientific literature, these are terms commonly used in various Hispanic cultures.

4.2. Theoretical Background

A child's family environment serves as his or her first source of health education. It is here where modeling of health behaviors and observational learning occurs. This research builds on the SCT (Bandura, 1986), and Sociocultural Theory (Vygotsky, 1978) framework, as well as the notion of familism seen in Hispanic groups. Within the context of SCT, there are continuous dynamics and interactions between the child and their immediate environment, the family. Children observe and learn behaviors exhibited, especially if that behavior is rewarded. Additionally, Sociocultural Theory considers the role of cultural beliefs and attitudes on learned behavior. Having both societal and cultural factors influence individual learning may account for health differences seen among race and ethnic groups. Familism, family-oriented behaviors, and attitudes, have been used to explain the *Hispanic Health Paradox* on why U.S. Hispanics have more favorable health outcomes than non-White Hispanics, as well as any other race/ethnic groups (Diaz & Nino, 2019). Familism among Hispanic adolescents has been shown to have protective effects on depressive symptoms and educational outcomes (Stein et al., 2013). It is speculated that familism holds these relationship-enhancing benefits, which include building a great sense of community. This in turn increases belonging and the environment for social support. This study coined the term *familial weight acceptance* to define the closeness and the connection between family members, in which weight, body shape, and size can be openly discussed and viewed positively. Consequently, Hispanics are supported to maintain a positive self-evaluation, including how they feel about their physical appearance. This psychosocial benefit (higher control over life, social acceptance, higher self-esteem) may be a protective factor for obesity prevention. "*Hispanics*" is used as an umbrella term when discussing issues or findings in the literature that are relevant to all subgroups of Latinos; any person who is Cuban, Mexican, Puerto Rican, South or Central American, or of Spanish culture or origin, regardless of race. Other researchers, however, may use terms such as Latino/a, Latinx, Latindad, Latin@, and Chicano/a, etc.

4.3. Parental Perception as a Protective Factor Against Obesity

Romo and Mireles-Rios (2015) identified positive familial communication on body image in Latina mother-daughter dyads (n = 46). Researchers in this study documented the first body positive messages arising from "emotionally charged conversations about body shape and size" (Romo & Mireles-Rios, 2015, p. 26). Prior to this, direct messaging from sociocultural agents, such as family and peers had been found to advocate for the "*thin ideals*." This is the extent to which an individual cognitively "buys into socially defined ideals of attractiveness and engages in behaviors designed to produce an approximation of these ideals" (Thompson et al., 1999, p. 181). Research had focused on parents' influential roles in establishing or reinforcing body image concerns in white adolescent girls. Instead, Romo and Mireles-Rios (2015) found that Latina mothers consistently provided their daughters with positive reassuring messages that included teasing comments and compliments that boosted their body esteem, especially when they expressed body dissatisfaction. This differing socialization pattern was quite unusual and possibly unheard of. Unfortunately, weight perceptions on what these Latina mothers considered an acceptable weight, which may have given insights into this behavior (weight perceptions) were not gathered. Nonetheless, the research by Romo and Mireles-Rios (2015) shed light on familial interactions that elicit weight acceptance. Whether this is a potentially protective factor against childhood obesity, body image distortions, eating disorders, and the psychological impacts of obesity still needs to be determined.

Identifying childhood obesity at an early age is important (Balantekin, 2019). Understanding the impact that parental perception plays in obesity in children could lead to more effective interventions. The role that positive weight perceptions have on a child's weight needs more exploration. Examining the existence of these perceptions can provide information when developing culturally appropriate family-based prevention programs. There is a gap in information that explores the relationship between mothers' perceptions of a healthy child's body size and children's BMI. This study examines how Hispanic mothers perceive a child's weight, as well as how their perception influences their children's weight.

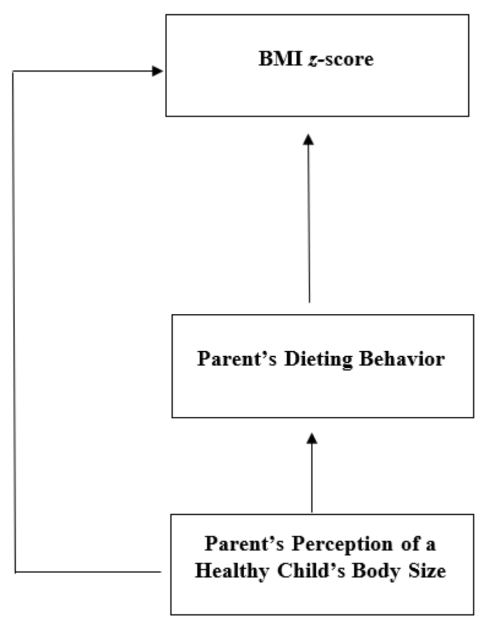
4.4. The Hypothesis of the Current Study

The present study hypothesizes the existence of associations also called paths between parent's perception of a healthy child's body size and a child's weight (see Figure 9).

Specifically, it was hypothesized that parents' perception of a healthy child's body size would influence a child's BMI *z*-score, directly and indirectly. Aligned with previous research on the potential roles of parental modeling on behavior, the effect of parent's perception of a healthy child's body size was assumed to be mediated. It was expected that parents' dieting would serve as a mediator (intervening variable) between perception and weight outcome expressed as a normative or indexed *z*-score for individual BMI.

Figure 9

Conceptual Path Model



Note. Arrow directions indicate hypothesized direction of the relationship between parent's perception of a healthy child's body size, and parent's dieting behaviors with child's body mass index *z*-score.

4.5. Methods

4.5.1. Participants

The initial sample size consisted of parent child-dyads (*n* = 1,277) that were part of the STEPS Pre-K Project, a grant-funded obesity prevention program that targeted Hispanic preschool children (and their families) attending two districts located along the Texas-Mexico border, served by San Juan-Alamo and La Joya Independent School Districts. Due to the target age group of 4-year-old children, only families from schools with an embedded pre-kinder preschool program were asked to participate in the study. To gather a complete case data set using the variables of interest and other parameters, list-wise deletion of missing values was performed (*n* = 571). This means all participants had values for all the data. Additionally, because there was only a small sample size of male parents, only data that was completed by female parents was kept (*n* = 534). Detailed information on sample omission procedures can be found in Chapter 3.

STEPS Pre-K, the original research study (from September 2017 to August 2020) was approved by the IRB at the UTRGV. This study conducted a secondary analysis of STEPS Pre-K baseline data collected during the fall of 2018. Ethical approval was obtained from the Social & Health Research Center and by the IRB at NDSU.

4.5.2. Procedure

Families were recruited during fall 2018 (August 2018 to October 2018) through flyers/letters, school posters, public presentations, and word of mouth. Following a standardized procedure (i.e., the study was explained, families were informed in writing that they were not required to participate, and written consent was obtained and reviewed), families were asked to complete two surveys at home (online or paper-pencil format). In general, surveys were completed individually unless assistance was requested. If assistance was needed, surveys were completed by telephone using a set protocol. For paper-pencil formats, homeroom teachers, school nurses, or parent liaisons assisted in the collection. Families were contacted via telephone in an attempt to gather incomplete survey data. Those with incomplete information were not subjected to anthropometric measures. Weight and height were collected on school grounds using laptop computers during a set timeframe. To ensure anonymity and allow the researchers to match all forms of data, STEPS ID numbers were created in sequential order (post alphabetic sorting by district and school name). Each participant was assigned was on these identification numbers to which research assistants had access. The STEPS ID number for each child was used to match anthropometric data with the appropriate survey information. There was no compensation for STEPS participation.

4.6. Measures

4.6.1. Demographics

Self-report information was gathered using the *Family Demographics Survey*. Parent (or guardian) and child's age, gender, and ethnicity were captured in this tool. Additional information on familial characteristics, such as parent's (or guardian's) education, income, family composition, and the family size was also gathered using a bilingual (in English, and Spanish) format. Spanish translations followed the English survey questions. The Family Demographics Survey was available in both pencil-and-paper and online format. This survey can be found in Appendix D.

4.6.2. Perception of Healthy Body Size

This was measured by comparing two child-like figures displayed on an 8.5 by 11-inch piece of paper. Within the *Family Demographics Survey* (see Appendix D), there were two cartoon-like male figures. Both figures displayed different body sizes, with "Child B" having a larger body size (see Figure 10). The survey respondent was asked to say either "Child A" or "Child B" to the following question, "Which child looks healthier?" Scores of 0 or 1 were entered for "Child A" or "Child B", respectively. Internal reliability could not be established due to this being a single-question item. The terms “parent’s perception of a healthy child’s body size” and “perception” were used interchangeably in the results section.

4.6.3. Dieting Behavior

In both English and Spanish, a self-reported tool assessed dieting behavior in both adults and children. The STEPS Pre-K Project used 4- survey items (out of 5- survey items) from the 1996 BRFSS Questionnaire (Section 7: Weight Control, Questions #36 to #40), which annually collects state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services to assess parent’s dieting behaviors. The questionnaire may have been intended to be as short as possible. The selected questions can be found in the *Household Health Characteristics Survey* (see Appendix D, after the Family Demographics Survey). Piloting of these survey questions (within this specific population) was not done prior to assessment. A listing of the 1996 BRFSS questions, used and not used by the STEPS Pre-K Project, can be found in Appendix E.

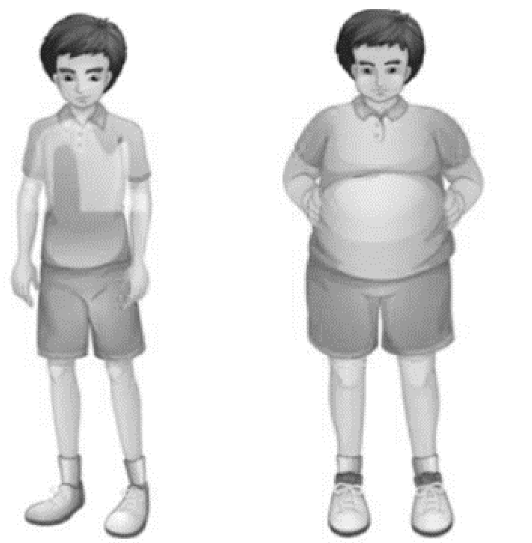
For this research, parent’s dieting behaviors used 3 out of the 4 questions available (n = 3). Intentions to lose weight vs. intentions to maintain weight were captured in this way. Refer to Chapter 3 for detailed information on the selection of survey items. Parent dieting survey items were: (1) “Are YOU now trying to lose weight?”; (2) “Are YOU eating either fewer calories or less fat to lose weight or keep from gaining weight?”; and (3) “Are YOU using physical activity or exercise to lose weight or keep from gaining weight?” to which the participants responded via a closed-ended scale (“*No*” or “*Yes*”). Responses of “*No*” or “*Yes*” were coded as either 0 or 1, respectively (0 = No; 1 = Yes). The 3-items were summed to obtain a score that represented overall dieting behavior. A higher score reflected greater dieting behavior. Internal reliability was identified as good (α = .69). The terms "parent's dieting behavior" and "dieting" were used interchangeably in the results section.

4.6.4. Weight Measurement - Body Mass Index

The protocol for the collection of anthropometric measures was standardized across schools. Trained STEPS Pre-K Project researchers conducted all anthropometric data on school grounds, either in school gyms or cafeterias. Weight was measured to the nearest 0.1 kg on a digital scale (Tanita Corp. of America, Inc., Arlington Heights, IL 60005). Standing height was recorded to the nearest 0.1 cm using a stadiometer (Detecto Corp., Webb City, MO 64870). Children were weighed and measured in school clothing without jackets and shoes. Laptop computers were pre-programmed with value ranges to sound an alarm if there were any outliers or questionable entries before the child left the collection site. Follow-up visits were conducted if there were missing or ambiguous data. These data were used to calculate BMI (kg/m^2). Internal reliability could not be established as it was a single observation. In order to provide an accurate assessment of weight status in children, BMI *z*-scores were used vs. BMI raw scores. BMI *z*-scores are based on weight, adjusted for height, sex, and age, and not simply on the weight and height of a child. Based on the 2016 CDC growth charts for age (to the nearest year) and sex, and Cole's LMS method (Cole, 1990), BMI *z*-scores were calculated. Weight classification was according to the WHO Child Growth Standards (WHO, 2008) and is as follows: underweight (BMI *z*-score < -2), normal weight (BMI *z*-score -1 to +1) overweight (BMI *z*-score > +2) and obese (BMI *z*-score > +3).

Figure 10

Perception of a Child's Healthy Body Size



Note. The image is taken from STEPS Pre-K Project data collection survey with permission from STEPS Pre-K Project.

4.6.5. Data Analysis

Data analyses were performed on the complete case data set. First, descriptive analyses, including mean and standard deviations, were calculated for all variables (see Table 10). Second, to estimate relationships among variables, bivariate correlations (Pearson Product Correlations) were computed (see Table 12). A path analysis was conducted to identify the paths between parental perception and a child's BMI. The ultimate dependent variable was the child's BMI *z*-score. The direct and indirect effects were evaluated using parents' dieting behavior as the mediating variable in the model. Hence, path analysis (mediated model), a form of multivariate simultaneous multiple regression analysis, was conducted to examine the influence of these variables on each other. Finally, a Chi-Square Independence Test was used to further examine results if significance was found in the model. Analysis was performed using statistical software

(SPSS version 21 for Windows; SPSS Inc., IBM, Chicago, IL, USA). Significance was specified as $p < 0.05$.

4.7. Results

4.7.1. Descriptive Analysis

Descriptive characteristics of the sample are presented in Table 10. Ninety-three percent of the mother child-dyads (*n* = 498) were Hispanic. Children's ages ranged from 4 to 5 years (*M* = 4.35, *SD*, .47). Dyads were more likely to be composed of boys (53.1%) than girls (46.9%). Ten percent (*n* = 56) of the children were underweight. Seventy-five percent (*n* = 401) of the children in dyads were of normal weight, 10% (*n* = 53) were overweight, and 5% (*n* = 24) were obese.

Table 10

Characteristics of the Sample (n = 534)

Characteristic	*n* (%)	*M* ± *SD*
Child's Age (y)		4.34 ± .47
Mother's age (y)		31.35 ± 5.96
Annual Household Income ($)		30,000[b]
Family Size		4.96 ± 1.49
Poverty Index Ratio		1.42 ± 1.40
Child BMI[a]		16.66 ± 2.48
BMI[a] *z*-score		.57 ± 1.32
Child's Gender		
Male	281 (52.6%)	
Female	253 (47.4%)	
Child's Ethnicity		
Hispanic	498 (93.3%)	
American Indian/Alaskan Native	6 (1.12%)	
White/Caucasian	2 (.37%)	
Two or more races	8 (1.50%)	
Unknown	20 (3.72%)	
Maternal Education[c]		
Less than High School Graduate/GED	132 (26.6%)	
High School Graduate/GED	127 (23.8%)	
Some College	125 (23.4%)	
College Graduate or higher	140 (26.2%)	

Note. [a]BMI = Body Mass Index. [b]Median Annual Income. [c]Sample size for Maternal Education, *n* = 524.

The vast majority of the mothers (*n* = 524; 98%) selected "Child A" (thinner body size) as the image that represented a healthier body size. While only 2% (*n* = 10) selected "Child B" (larger body size), see Table 11. With regards to percentages, a higher percentage of parents selecting "Child B" were trying to lose weight. However, there were relatively few parents who selected "Child B" as the healthier body size (see Table 11).

Table 11

Parent's Perception of a Healthy Child's Body Size vs. Responses to Dieting Behaviors

Survey Item	Selected Child A *n* (%)		Selected Child B *n* (%)	
	Yes	No	Yes	No
1. "Are YOU now trying to lose weight?"	296 (56%)	228 (44%)	9 (90%)	1 (10%)
2. "Are YOU eating either fewer calories or less fat to lose weight or keep from gaining weight?"	395 (75%)	129 (25%)	9 (90%)	1 (10%)
3. "Are YOU using physical activity or exercise to lose weight or keep from gaining weight?"	340 (65%)	184 (35%)	9 (90%)	1 (10%)

Note. A total of 437 mothers selected "Yes" to at least one dieting question.

4.7.2. BMI *z*-score

Table 12 presents the inter-correlations (Pearson Product correlation) for those noncategorical variables in the model. The table also displays two measurable statistics (*M* (SD)) for variables of interest. A statistically significant relationship was found between dieting and BMI *z*-score ($p < .05$). Within the path model, it is proposed that perception will directly and indirectly influence BMI *z*-score.

Table 12

Descriptives and Pearson Correlation Coefficients Among Variables

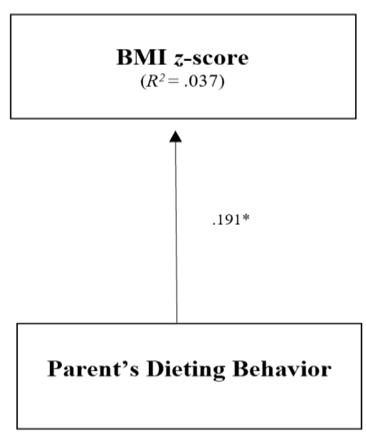
	Parent's Perception	Parent's Diet Behaviors	*M*	*SD*
Parent's Perception	-		.02	.13
Parent's Diet Behaviors	-	-	1.98	1.10
Body Mass Index *z*-score	-	.191*	.57	1.32
Body Mass Index (raw score)	-	.175*	16.66	2.48

Note. **p* < .05.

Perception was not found to have a statistically significant path, directly or indirectly, to BMI *z*-score (R^2 = .007, *p* = .054). The model was revised to exclude perception (see Figure 11). In the reduced model, dieting had a significant path to BMI *z*-score (R^2 = .037, *p* < .05). Indirect effect of greater dieting on BMI *z*-score (β = .191, *p* < .05), where for every 1-unit increase of dieting, BMI *z*-score increased by .191 units.

Figure 11

Path Analysis with Path Coefficients for Body Mass Index z-score



Note. **p* < .05. R^2 = variance explained.

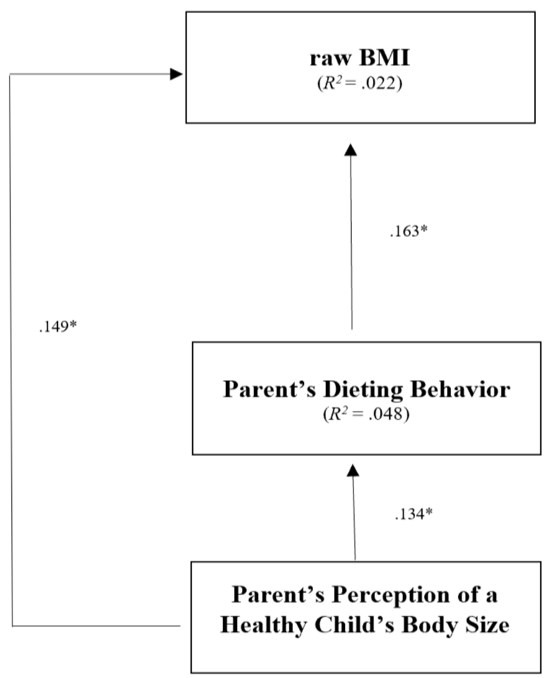
4.7.3. Raw BMI

Within the dataset, raw BMI was available. When this BMI (raw BMI) was substituted for the endogenous variable, BMI *z*-score, all hypothesized paths were statistically significant.

As seen in Table 12, raw BMI was found to be statistically significant with dieting (r = .175, $p <$ .000). As presented in Figure 12, perception had significant paths, directly and indirectly, to raw BMI that accounted for 2% of the variance ($R^2 = 0.22$, $p < .05$). Taking each path individually, there was a statistically significant effect of greater perception on raw BMI directly (β = .149, $p < .05$) and indirectly (β = .134, $p < .05$), where for every 1-unit increase of perception, raw BMI increased by .149 and .134 units, respectively. There was a statistically significant indirect effect of greater dieting on raw BMI (β = .163, $p < .05$), where for every 1-unit increase of dieting, raw BMI increased by .163 units.

Figure 12

Path Analysis with Path Coefficients for Raw Body Mass Index



Note. *$p < .05$. R^2 = variance explained.

Table 13

Parent Perception Related to BMI Through Parent Dieting Behaviors

Parameter	Model	Variables	β
Parent Perception of Healthy Body Size	Direct Effect	$PP^a \rightarrow BMI^b$	.149*
	Indirect Effects	$PP^a \rightarrow PD^c \rightarrow BMI^b$	.134** .163**
	Total Indirect Effect		.021
	Total Effect	Direct + Indirect	.170

Note. [a]PP = Parent Perception. [b]BMI = Body Mass Index. [c]PD = Parent Dieting Behaviors. β = standardized beta (path) coefficient. *p < .05. **p < .01.

In the revised full model (as seen in Figure 12) almost 5% of the variance (R^2 = .048) in raw BMI was explained by the indirect effect. While the variance is small, it is an important finding since the assessment used was not of high psychometric quality. The total indirect effect of perception on BMI was .0218 (.134 x .163). The total effect of perception on raw BMI through dieting was .170.

4.8. Discussion

In this study, parent perception of a healthy child's body size (perception) was found nonsignificant, directly, or indirectly, to child's BMI *z*-score. Though, in this particular group of children, child's raw BMI was influenced by perception, directly and indirectly. Both were significant, yet small (2% and 5%, respectively). Consequently, child's raw BMI may have been influenced by variables other than the ones examined in this model. About 95% (to 98%) of the variance in this model is still unexplained and would have to be attributed to other factors. For instance, this model did not consider perceptions from other sources such as siblings, teachers, peers, and social media. These may have added a greater influence on a child's weight than the variables in this research.

Within the model, the indirect effect of dieting was greater than that of only perception (~5% vs. 2% of the variance). This might have been the result of using a better tool to assess dieting verses the one used to assess perception. It must be noted that perception was limited to only two images that were male (additional weaknesses are reported in the limitations section). Whereas, dieting was gathered using 3-questions from the BRFSS Questionnaire, which annually collects state data. It is assumed that this instrument in its entirety has undergone several cycles of validity and reliability testing; however, no documentation was available. Yet, this research only used 3 out-of-the 5 total BRFSS Questionnaire items. Carry-over of psychometrics cannot be assumed. Nonetheless, these results show true to what has been found in the literature. Damiano et al. (2015) found both fathers' and mothers' body size attitudes, body dissatisfaction, and dietary restraint associated with the body size attitudes and body images of their 4-year-old children. Other researchers have found similar results, within this population (Holub, 2008; Holub et al., 2011; Lowes & Tiggemann, 2003; Spiel et al., 2012).

Paths within the model (including raw BMI) were found to be significant and positive. Overall, parents choose a "thinner child" (0 = Child A) as their perception of a healthy child's body size. Parents that picked "Child B" were more likely to have a child with a higher BMI. The same holds true for dieting. The more parents dieted, the higher their child's BMI. To assess differences in proportion between these two groups, mothers who selected, "Child A" versus those who selected, "Child B", a Chi-Square test of independence may be useful. However, with only 10-mothers choosing the obese child ("Child B"), the results can have no generalizability. Thus, no measure of association (i.e., Chi-Square test) was computed because the probability of finding significance would be vanishingly small. A revision of this assessment instrument is necessary.

Surprisingly, almost all mothers considered the image of a thin child to be healthier. In fact, only 2% (*n* = 10) of mothers perceived the image of an overweight child to be healthy. This was not expected within this sample of predominately Hispanic mothers. To our knowledge, there is no existing research to support or oppose this. Such information is only available anecdotally. Hence, there is a need for more research, especially since the U.S. Hispanic population is growing. However, education level may be a contributing factor to mothers who had a greater preference for the smaller body size. This sample consisted of highly educated mothers, with 50% identifying as either having some college (26%, *n* = 130) or a college degree (33%, *n* = 156). Research shows that educated mothers are more likely to know about health care and nutrition, engage in healthier behaviors, and provide a safer environment for their children (Prickett & Augustine, 2016). Mothers with higher education levels have higher health literacy and therefore are more likely to understand what obesity is and its negative impact. Hence, educated mothers may have had a greater understanding of what health professionals identify as a healthy child's body size, so their decision could have been based on prior knowledge. Additionally, the ideology of their preference for a smaller body size may be due to acculturation. According to results, people who spend more of their lifetime in the USA compared to their country of origin are more likely to suffer from body dissatisfaction, thin-ideal internalization, and eating disorders (Saunders et al., 2016). Generational differences in familial weight acceptance may exist among Hispanics. Diaz & Nino (2019) found familism to decline across generations (i.e., foreign-born Hispanic, first-generation Hispanics, and U.S.-born Hispanics) Unfortunately, this cannot be assessed in this study as this information was not collected.

Research has found families with higher SES have healthier food habits, while families with lower SES have dietary profiles that are less consistent with nutrition recommendations (Jyoti et al., 2005; Ogden et al., 2019; Treviño et al., 2008; Treviño-Peña et al., 2021; Y. Wang & Chen, 2011). This contributes to their poorer health status. In 2018, the poverty threshold for a family of five was $29,420. In this sample, there was a wide range in annual income ($6,000 to $144,000). However, the medium annual household income was $30,000 with most of the families (60%) having an annual household income < $40,000. Additionally, family size ranged from 2 to 14 individuals (*M* = 4.96; *SD*, 1.49). The majority (55%) of the sample had a PIR (family income divided by poverty threshold) of < 1 (*M* = 1.42; *SD* = 1.40). A ratio of < 1 means income was lower than that of the poverty level. As mentioned earlier, education level has also been identified as an important factor associated with healthy and adequate food choices. While the sample did achieve higher levels of education, it should be noted that their income for a family of five is still relatively low at 40,000 per year. Regardless of education level, income may still negatively impact eating habits. The fact that more than half of the sample had an income below the poverty line may present a problem.

4.8.1. Limitations

This study examined if data fits a proposed model. This is one possible model for these variables. These findings are from a particular group of children (in age, ethnicity, and geographical location). Specifically, these findings relate to young pre-school Hispanic children (aged 4 to 5 years) living along the Texas-Mexican border, where the population is predominantly Mexican American. What was found in this research may not be relevant for other 4-year-old Hispanic children living in other parts of Texas, or other states. These results may not apply to other age groups and ethnicities.

This study was limited to female parents. A total of 37 children were omitted from the final sample size due to a small sample size of fathers completing the survey. As a result, this study was limited in terms of gaining insight from the father's perspective. Research has found fathers as an influential role in their daughter's self-image development (Beckert et al., 2012; Hooper & Dallos, 2012; Klein et al., 2017; Siegel et al., 2021; Steinhilber et al., 2020). Research has also shown fathers' involvement in food parenting (K. Davison et al., 2020). Given the diversity of family structures today and the increasing involvement of fathers in caregiving, it is also important to pay attention to fathers' role within the food environment.

These results are based on very few mother-child dyads with obese children. The majority (75%) of the children in dyads were within the normal weight category. In fact, only 15% of children were either identified as overweight (10%) or obese (5%). This is lower than the percentage of 18.2% (obesity rate in Hispanic children) noted earlier. In spite of the fact that this number of children (n = 159) should cause concern, this sample did not allow for a comparable analysis. Assessing parents' perception of a child's healthy body size needs to be done using a more diverse sample that includes more children with different body sizes.

Another limitation of this study was the tools used to assess the variables of interest. This was a secondary analysis of the STEPS Pre-K Project's tools. Additionally, the results should be interpreted with the understanding that the survey responses were self-reported. Perception of a healthy child's body size was based solely on one question that referred to two male figures. Other tools used to determine parents' (and self) perception of weight status have included multiple gender-specific body-shape silhouettes. Most tools contain a wider range of body drawing to select from, most between 7 to 17 figures. Additionally, to our knowledge the current tool used has not been validated or used in this capacity. Also, the male images used potentially presented some bias by having unintended influence. First, the images were males. Mothers of female children were not looking at images that were females. Second, is the presentation of the figures. The facial and body features reflected a non-Hispanic ethnicity. Also, both figures were not arranged in the same stance or body posture. “Child B” had his body more positioned to the center. His feet were spread apart with hands-on his hips. This stance may have been viewed as threatening and/or aggressive to some mothers.

Also, parent dieting behavior was assessed using three questions (out of 5 questions) taken from a national survey. It is known that by not using a tool in its entirety, it may limit its validity. Piloting the selected questions with this population (to assess validity) would have assisted with this. It is unknown whether this was done at this time. Last, this study is a cross-sectional study, not a longitudinal study. The cross-sectional design of this study is insufficient for understanding disease trends.

4.9. Implications for Research and Practice

Our research shows an association between mothers’ perceptions and dieting behaviors and their child’s BMI. This is consistent with other research that suggests an influential role of mothers on their children’s weight. It was not possible to fully examine the concept of familial weight acceptance within this sample. To our knowledge, there is no specific research on familial weight acceptance, as a protective factor of childhood obesity. Perhaps, this is because some studies have identified the influence of culture as a barrier to healthy eating in Hispanics (Sosa, 2012). Common dishes within the Mexican diet (i.e., enchiladas, beef tacos, flautas, menudo, tamales, mole, etc.) are found to be high in fat and calories. Additionally, having multiple meals and taking “siestas” (short naps after a meal) are not viewed as healthy. However, the topic of familial weight acceptance focuses more on how health messaging can affect eating and dieting habits. Research has found that weight and food-related comments are occurring within the home. Further research needs to explore the context and impact of these comments and/or conversations among Hispanic families.

Particularly in this study, mother's perception and their dieting behaviors influenced the child's BMI. The cross-sectional exploratory design of this study provided some insight into the perception of Hispanic mothers. However, continued research is needed to fully understand the influence of sociocultural agents on body image, dieting behavior, and overall obesity. A greater understanding of these cultural experiences may better inform the need for culturally tailored health promotion programs. Furthermore, future research should focus on gathering qualitative research on Hispanic mothers' (and fathers') perceptions of health, as well as other issues, such as parents' perception of childhood obesity, and their role in its prevention.

5. ARE HISPANIC PARENT'S DIETING AND BODY SIZE PERCEPTIONS ASSOCIATED WITH THEIR CHILD'S FOOD INTAKE AND BMI

5.1. Introduction and Background

In the United States, Hispanic children are among the most obese. Hispanic children and adolescents (aged 2 to 19 years) have an obesity prevalence of 25.6%, non-Hispanic Black children have 24.2%, non-Hispanic White children have 16.1%, and non-Hispanic Asian children have 8.7% (CDC, 2022c). In Texas, the obesity rate of younger children (aged 10 to 17 years) is 15.9% (State of Childhood Obesity, 2022). While there is no data on how many children aged 4 to 5 years are obese at this time, it is likely that obesity in young children leads to obesity in older children. Hence, it is concerning that the Rio Grande area along the Texas-Mexico border has an obesity rate of 18.2% among Hispanic children aged 4 to 5 years (Treviño-Peña et al., 2021).

The short- and long-term adverse effects of childhood obesity are equally troubling. These includes an increased risk of developing DM2, CVD, and hypertension among other chronic diseases as an adult (Anderson et al., 2019; Ayine et al., 2020; Kelishadi & Azizi-Soleiman, 2014; Treviño et al., 2008; Treviño-Peña et al., 2021). Despite this, a great concern with childhood obesity is its psychosocial effect. Children who are obese often experience issues related to mood, self-esteem, quality of life, and body image. Even as young as age five, body dissatisfaction can be observed, along with the desire for thinness (Lowes & Tiggemann, 2003). This is problematic since body dissatisfaction has been linked to unhealthy eating behaviors including restrictive eating, disordered eating, and eating disorders (Bucchianeri et al., 2016; E. H. Evans et al., 2013; National Eating Disorders Collaboration, 2022; Neumark-Sztainer, 2006).

As childhood obesity remains a significant public health concern, other preventive measures should be considered. Within the Hispanic community, *familism* has been suggested to have protective effects. Among Hispanics, cultural values, practices, and norms foster close family relationships, interconnectedness, and social and material support. These sociocultural practices are familism. A promising concept is to examine this family connectedness as it relates to health perception and food behavior in Hispanic populations. "*Hispanics*" is used as an umbrella term when discussing issues or findings in the literature that are relevant to all subgroups of Latinos in the U.S. However, other researchers may use terms such as Latino/Latinas/Latinx, Chicanos/Chicanas, etc.

5.2. Familism and Hispanic's Perception of Health

This research builds on the SCT (Bandera 1986), the Sociocultural Theory (Vygotsky 1978), as well as the notion of familism (Diaz & Niño, 2019) seen in Hispanic groups. Some research suggests that this cohesion, functioning, and communication contribute to building a greater sense of community and belonging, leading to better health and the ability to overcome stressors (Avalos et al., 2020; Diaz & Niño, 2019; Stein et al., 2013). However, little is known about how it affects obesity. Considering that social constructs regarding weight, health, and food are formed in the family environment, it is important to examine this area. Interestingly, attitudes and beliefs regarding what is considered "healthy" may be perceived differently among the Hispanic community. It is assumed that familism contributes to one's health perception as a product of their social interactions with family members.

Research studies have provided evidence that Mexican American mothers prefer a larger body size that is larger than what is considered healthy (Alexander et al., 1991; Alexander & Blank, 1988; Cartagena et al., 2015; Contento et al., 2003; Reifsnider et al., 2006; Worobey &

Lopez, 2005). Hence, within a culture that promotes a sense of unity and cohesiveness, individuals may perceive themselves as "*healthy*" since there is social support that allows them to maintain a positive self-evaluation and a sense of efficacy to cope (Stein et al., 2013). Hence, those who are either overweight (or obese) may not accurately perceive their weight status. Additionally, parents may also not accurately perceive their children's weight. This has been found to be true for Hispanic parents with obese children (Bayles, 2010; de La O et al., 2009; Duncan et al., 2015; Sosa, 2012).

Research on Hispanic children's self-perceptions of weight is limited. However, the few studies that have examined body image perceptions in Hispanic children have found that overweight children do not accurately identify their own body size (A. Fisher et al., 2005; Intagliata et al., 2008; Montoya et al., 2016; Snethen & Broome, 2007). These researchers used figural scales where children aged 8 to 12 were asked to identify the figure that represented their current body size. The sample size ranged from 17 to 424 Hispanic children. Overweight children within this research identified themselves as having a healthy body weight. The authors do not discuss the reasoning for this. However, in a study that examined Mexican American mothers' perception of appropriate body size, 18% chose the "overweight child" and 36% chose the "at risk for overweight child" (Reifsnider et al., 2006). These results were from 25 mother-child dyads of 3-year-old children living on the Texas-Mexican border. It can be assumed that children's health perception was obtained from their social interactions with their mothers. Therefore, health perceptions modeled within the family unit play a significant role in influencing their children's perceived body image.

5.3. Influential Sociocultural Agents

Parents serve as influential agents of socialization that contribute to what a child perceives as beautiful or ugly; desirable or not desirable; healthy or not healthy through direct or indirect communication and/or behaviors. Liechty et al. (2016) reported that 53% of 30 families of preschoolers reported family as the primary influence on body image. Unknowingly, parents' attitudes and behaviors toward weight are observed by the child. This modeling of either healthy or unhealthy food behaviors impacts children's weight-related attitudes and behaviors. Modeling of healthy food behaviors, such as family mealtimes, including fruits and vegetables in meals and snacks, preparing meals together, practicing portion control, limiting low-nutrition foods, participating in physical activity, and limiting screen time has been researched. Unfortunately, not all studies examine the same outcomes. This is a general limitation to all studies that examine the impact of healthy eating behaviors in children. However, regardless of the methods used, the influence of parental modeling has been found to be positively correlated to a child's food intake (Cullen et al., 2001; Ma & Hample, 2018; Palfreyman et al., 2013, 2014, 2015; Pearson et al., 2009; Prichard et al., 2012; Tibbs et al., 2001; Y. Wang & Chen, 2011; Yee et al., 2017; Young et al., 2004).

Modeling of unhealthy behaviors has also been explored in research. Known as indirect maternal communication behaviors, these seem more potent than direct communication behaviors (i.e., verbal attempts to maintain and/or restrict the child's weight). These behaviors include but are not limited to the mothers' dieting and weight management strategies, mothers' dissatisfaction with their weight, and mothers' appearance-related comments. Arroyo et al. (2017) examined both maternal commentary and maternal modeling using path analysis in 242 multi-ethnic grandmother–mother–daughter triads (3% were Hispanic). Four indirect paths from maternal modeling to their daughters' report of disordered eating perceptions were significant over three generations (β = .002, $p < 0.05$); grandmothers' disordered eating to mothers' disordered eating through mothers' reports of maternal commentary (β = .036, $p < 0.001$); and mothers' disordered eating to daughters' disordered eating through daughters' reports of maternal commentary (β = .038, $p < 0.05$). These results illustrate the intergenerational transmission of unhealthy eating behaviors within the family unit. Similar results have been found in mother-daughter dyads (Abraczinskas et al., 2012; Cooley et al., 2008; J. Evans & le Grange, 1995; Garcìa De Amusquibar et al., 2003; Linville et al., 2011).

Little is known about the impact of culture on dieting practices in young children and the impact on obesity. Most of the attention has been given to the factors contributing to childhood obesity. Given the prevalence of obesity in the U.S. and the high rates among Hispanics, healthy modeling as a protective factor should be explored. This includes parent's perception and their dieting behaviors. Hispanic families may likely have a different perception of health. It is also likely that Hispanic parents practice dieting behaviors and might expose their children to restrictive eating behaviors. Young children should not be exposed to calorie-restricted diets. Thus, it is necessary to examine the eating practices of young children based on the parents' perceptions of the child's health and their dieting behavior. An investigation of those practices and their impact on BMI seems worthwhile.

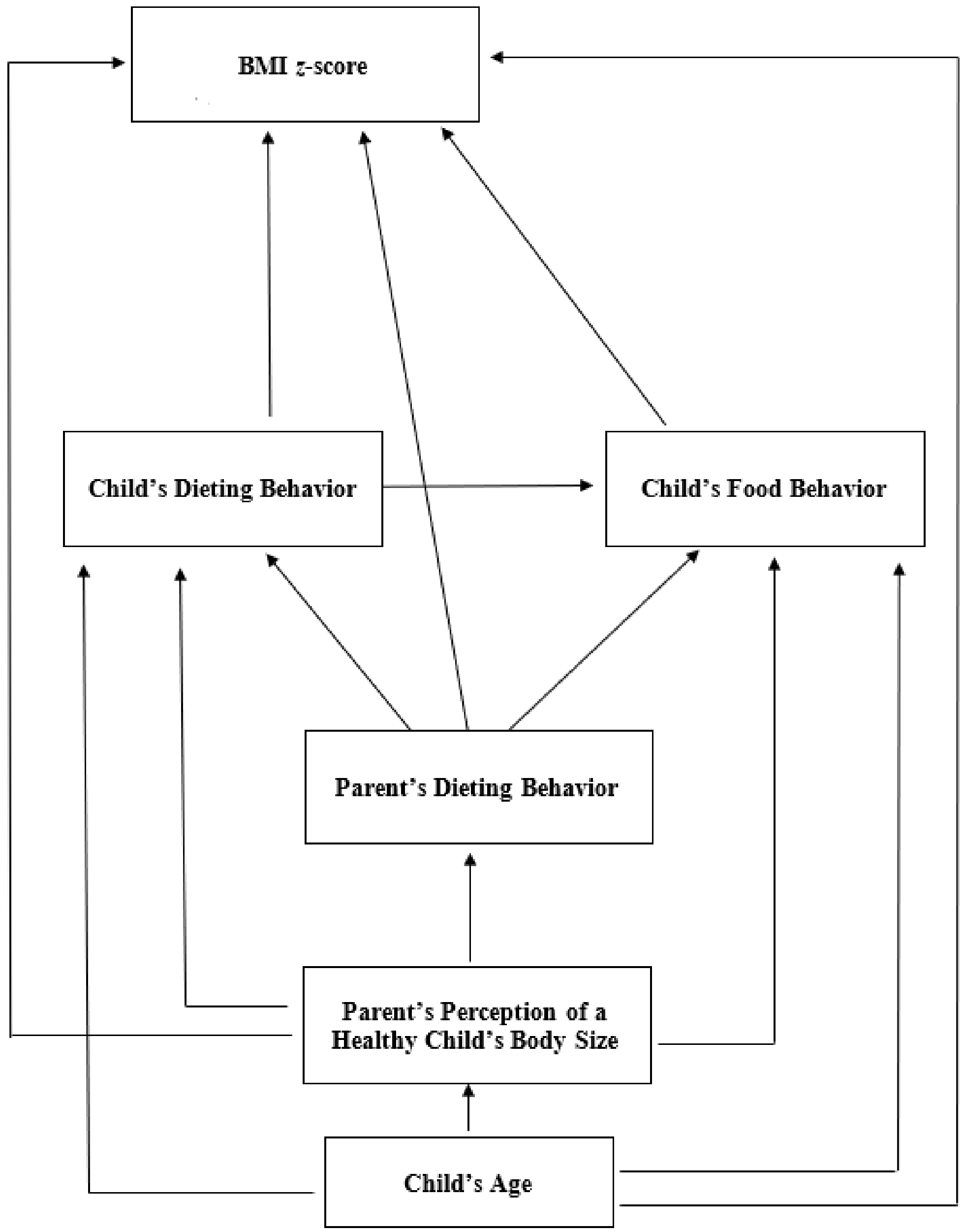
5.4. Purpose

The present study hypothesizes the existence of associations also called paths between multiple exogenous variables (independent variables) with endogenous (dependent variables) variables. Figure 13 displays a model that depicts 14-hypothesized direct and indirect relationships (paths) on the ultimate endogenous variable, child's weight status (BMI *z*-scores).

Within this complex model, four models were examined – the age model, the perception model, the parent model, and the child model. Ultimately four questions were asked: First, does child's age influence, directly and indirectly, parent's perception of a healthy child's body size and child's weight? Second, to what extent does parent's perception of a healthy child's body size influence, directly and indirectly, weight status in children? Third, to what extent does the parent's dieting influence, directly or indirectly, weight status in children? Fourth and last, to what extent does child's dieting and/or food behaviors influence, directly or indirectly, their weight status? Use of terms direct and indirect corresponds to the lack of or inclusion of a mediator variable, also known as an intervening variable. An indirect effect (also called mediation) occurs when an exogenous variable influences the endogenous variable through one or more mediator variables. In this model, multiple exogenous variables served as mediating variables. A detailed orientation to path analysis was described in Chapter 1.

Figure 13

Conceptual Path Model



Note. Arrow directions indicate hypothesized direction of the relationship between the exogenous variables (independent variables) with endogenous (dependent variables). The model is recursive because all arrows point in the same direction and the error variances are uncorrelated.

5.5. Methods

5.5.1. South Texas Early Prevention Study Project

The data for this secondary analysis was collected in fall 2018 as part of the STEPS Pre-K Project (September 2017 to August 2020), a grant-funded obesity prevention program aimed at Hispanic preschool children. The original study protocol was approved by the IRB at the UTRGV. Secondary analysis of STEPS Pre-K data was approved by the NDSU IRB. Explicit information regarding the program itself, its methods, and procedures were provided in Chapter 3.

5.5.2. Sample

An initial sample consisted of 1,277 parent-child dyads. Of this sample, those with complete information on all the variables of interest were kept. This was done using list-wise deletion of missing values (n = 571). Additionally, because there was only a small sample size of male parents and other family members, only data that was completed by female parents were kept. The final sample included 534 mother-child dyads (n = 534). Detailed information on sample omission procedures can be found in Chapter 3.

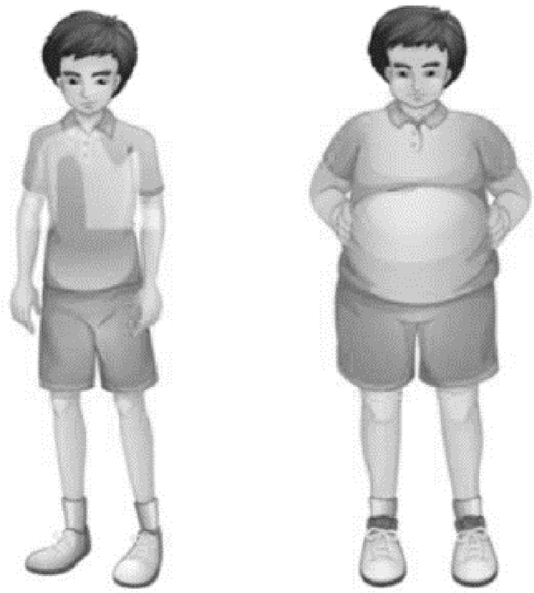
5.6. Measures

5.6.1. Family Demographics Survey

The *Family Demographics Survey* was used to gather sex, age, race/ethnicity, household income, family size, and the highest level of education demographics. Additionally, within this survey, a question pertaining to parents' perception of a healthy child's body size was used. Figure 14 displays the image used to assess this. Explicit information regarding this measure was provided in Chapter 3. The terms "*parent's perception of a child's healthy body size*" and "*perception*" were used interchangeably.

Figure 14

Perception of a Child's Healthy Body Size



Note. Image is taken from STEPS Pre-K Project data collection survey with permission from STEPS Pre-K Project.

5.6.2. Dieting Behaviors

The *Household Health Characteristics Survey* (see Appendix D, following the Family Demographics Survey) was used to assess the dieting behaviors of both adults and children. This was a self-reported questionnaire, in which parents responded to closed-ended questions in either English or Spanish. Dieting behavior questions were gathered using the 1996 BRFSS Questionnaire (Section 7: Weight Control, Questions #36 to #40). Within the original questionnaire (BRFSS Questionnaire), there were a total of five (n = 5) questions pertaining to weight control in adults. The STEPS Pre-K Project opted to omit one question regarding weight recommendations by a health professional (Question #40). It is possible that this was done to reduce the length of the survey. Thus, a total of four questions (n = 4) were used by the STEPS

Pre-K Project. Piloting (within this specific population) of the selected survey items (Questions #36 to #39) was not done prior to the assessment. Additionally, for this research, parent's dieting behaviors were limited to only three questions (Question #36, #38, and #39). In order to assess weight loss attempts versus weight maintenance, this was done. Refer to Chapter 3 for additional information on the parent's dieting behavior survey questions. The terms "parent's dieting behavior" and "parent's dieting" were used interchangeably in the results section.

Additionally, the STEPS Pre-K Project modified the selected questions described above (Questions #36, #38, and #39) to assess dieting behaviors in children (n = 3). These questions followed the adult dieting questions within the Household Health Characteristics Survey (Questions #27 to #30). Parents reported either a "*Yes*" or "*No*" to questions regarding weight control for their children. These responses were coded as either 0 or 1 (0 = No; 1 = Yes). Ultimately, these three questions were summed to create a new scale variable that displayed an overall score. Scores ranged from 0 to 3, in which the higher the value indicated greater dieting behavior. This was also the same process used for parent's dieting behavior (refer to Chapter 3). Internal reliability (for parent's dieting behavior) was found to be good ($\alpha = .69$). Internal reliability (for child's dieting behavior) was found to be low ($\alpha = .595$).

The child's dieting survey items (closed-end questions) were as follows: (1) "Is YOUR CHILD now trying to lose weight?"; (2) "Is YOUR CHILD eating either fewer calories or less fat to lose weight or keep from gaining weight?"; and (3) "Is YOUR CHILD using physical activity or exercise to lose weight or keep from gaining weight?". Explicit information regarding items used to assess parents' dieting and child's dieting behavior was provided in Chapter 3. The terms "child's dieting behavior" and "child's dieting" were used interchangeably in the results section.

5.6.3. Food Behaviors

To assess child's food behavior for this research, four questions (in both English and Spanish) were gathered from the STEPS Pre-K Project's *Household Health Characteristics Survey*. Parents responded (using a Likert scale) to these questions in either English or Spanish. Specific questions from the 2012 Behavioral Checklist from USDA and the EFNEP were used to assess home dietary practices. From 41-items, the STEPS Pre-K Project used only 14-questions (See Appendix D). This may have been done to reduce the survey's length. Additionally, for this research, only four questions (Questions: #9, #12, #13, and #14) were used, as these questions were culturally relevant and addressed true "intake" rather than general health practices. A listing of the 2012 Behavioral Checklist questions, used and not used by the STEPS Pre-K Project, can be found in Appendix E.

The child's food behavior survey questions were as follows: 1. "You use the "Nutrition Facts" on the food label to make food choices?"; 2. "You serve more than one kind of fruit to your family each day?"; 3. "You serve two or more kinds of vegetables during your family's main meal?"; and 4. "You use reduce fat (2%), low fat (1%), or non-fat (skim) milk?". Parents rated each question using a 5-point Likert scale (0 = never to 5 = almost always). The 4-items were transposed (summed to obtain an overall score) to represent the overall child's dieting behavior. Total possible scores range from 0 to 16, with higher scores reflecting higher healthy food behavior. Internal reliability was identified as low (α = .535). Explicit information regarding items used to assess child's food behavior was provided in Chapter 3. The terms "child's food behavior" and "food behavior" were used interchangeably in the results section.

5.6.4. Body Mass Index

A standardized protocol was used to collect height and weight. More explicit information regarding this was provided in Chapter 3. These data were used to calculate BMI (kg/m^2). Internal reliability could not be established due to a single observation. Based on the 2016 CDC growth charts for age (to the nearest year) and sex, BMI *z*-scores were calculated using Cole's LMS method (T. Cole, 1990), see Figure 15. Explicit information on the CDC LMS method was reviewed in Chapter 2. Values for L, M, and S are found on the CDC website (titled: *Z*-score Data Files).

Figure 15

Cole's LMS for Calculating BMI z-scores

$$BMIz = \left[\left(\frac{\text{BMI}}{M}\right)^{\text{L}} - 1\right] \div (\text{L} \times \text{S})$$

Weight classification was according to the WHO Child Growth Standards (WHO, 2008). BMI *z*-scores are interpreted as: underweight (BMI *z*-score < -2), normal weight (BMI *z*-score -1 to +1) overweight (BMI *z*-score > +2) and obese (BMI *z*-score > +3).

5.7. Analysis

Data analyses were performed on the complete case data set using statistical software (SPSS version 21 for Windows; SPSS Inc., IBM, Chicago, IL, USA). Significance was identified as $p < 0.05$. First, descriptive analyses, including mean and standard deviations, were calculated for all variables. Second, to estimate the relationships among variables, bivariate correlations (Pearson correlations) were computed. Finally, path analysis was conducted in all models to identify relationships between the exogenous variables (independent variables) and mediating variables with endogenous (dependent variables). Multivariate simultaneous multiple regression analysis was conducted for each hypothesized path within each model (see Figure 13).

5.8. Results

5.8.1. Descriptive Analysis

Parent and child demographics and anthropometrics are presented in Table 14. The sample (mother-child dyads) consisted of a predominately Hispanic population (93%). Children had an average age of 4.36 years with 53% being male and 47% female. The sample consisted only of female parents, and mothers (100%), of which 73% had at least an education level of high school graduate or GED. Medium annual income was $30,000. The mean family size was 4.96 (*SD* = 1.49) persons, respectively.

Table 14

Characteristics of the Sample (n = 534)

Characteristic	Mother	Child
	M ± *SD*	
Age (y)	31.35 ± 5.96	4.34 ± .47
Annual Household Income (US dollars)	$30,000[b]	
Family Size	4.96 ± 1.49	
Poverty Index Ratio	1.42 ± 1.40	
Weight (kg)		18.84 ± 4.03
BMI[a] (kg/m^2)		16.66 ± 2.48
BMI[a] *z*-score		.57 ± 1.32
Gender	*n* (%)	
Male		281 (52.6%)
Female	534 (100%)	253 (47.4%)
Ethnicity		
Hispanic		498 (93.3%)
American Indian/Alaskan Native		6 (1.12%)
White/Caucasian		2 (.37%)
Two or more races		8 (1.50%)
Unknown		20 (3.72%)
Maternal Education[c]		
Less than High School Graduate/GED	132 (26.6%)	
High School Graduate/GED	127 (23.8%)	
Some College	125 (23.4%)	
College Graduate or higher	140 (26.2%)	
Parental Perception		
Selects Child A	524 (98.1%)	
Selects Child B	10 (1.9%)	

Note. [a]BMI = Body Mass Index. [b]Medium value reported. [c]Sample size for Maternal Education, *n* = 524.

Overall, children had a mean BMI of 16.64 kg/m^2. Weight classification can be found in Table 15. Ten percent (*n* = 56) of the children were underweight. Seventy-five percent (*n* = 401) of the children were of normal weight (NW), 10% (*n* = 53) were overweight, and 5% (*n* = 24) were obese. A greater portion of children at age five than at age 4 were characterized into the overweight (13.51% vs. 8.02%) or obese (5.95% vs. 3.72%) category. There were slightly more females than males classified as overweight (11.46% vs. 8.24%). However, there were more males in the obese category (6.76% vs. 1.98%) than females.

Table 15

Weight Characteristics of the Sample (n = 534)

	UW[a]	NW[b]	OW[c]	OB[d]
All	56 (10.48%)	401 (75.09%)	53 (9.93%)	24 (4.49%)
Age (y)				
4	45 (.12%)	263 (75.35%)	28 (8.02%)	13 (3.72%)
5	11 (.05%)	138 (74.59%)	25 (13.51%)	11 (5.95%)
Gender				
Male	30 (.10%)	208 (74.02%)	24 (8.24%)	19 (6.76%)
Female	26 (.10%)	193 (76.28%)	29 (11.46%)	5 (1.98)

Note. [a]UW = Underweight. [b]NW = Normal Weight. [c]OW = Overweight. [d]OB = Obese. Percentage value is shown as percentage of grand total across, age and gender.

Descriptive statistics (mean, standard deviation, and range) are displayed in Table 16. BMI *z*-scores ranged from -4.31 to 5.70, with a mean BMI *z*-score of .57. However, this was due to 1-child having a score of -4.31 and two children having a BMI *z*-score of 4.34 and 5.70, respectively. Additionally, 3% of children (*n* = 17) had a BMI *z*-score of < -2, while 14% of children (*n* = 77) had a BMI *z*-score of > +2. Overall, the mean BMI *z*-score of .57 is considered a “normal” weight status.

Table 16

Characteristics of Variables of Interest (n = 534)

Measure	*M* ± *SD*	Min	Max
Age	4.34 ± .47	4	5
Weight (kg)	18.84 ± 4.03	12.0	38.2
BMI[a]	16.66 ± 2.48	12.17	31.70
BMI[a] *z*-score	.57 ± 1.32	-4.32	5.70
Parent's Dieting Behaviors[b]	1.98 ± 1.10	0	3
Child's Dieting Behaviors[b]	.60 ± .86	0	3
Child's Food Behaviors[c]	9.8 ± 2.70	2	16

Note. [a]BMI = Body Mass Index. [b]Dieting survey used three closed-ended questions with lower scores reflecting lower use of this behavior, and higher scores reflecting greater use of this behavior. [c]Food behavior survey used a five-point Likert scale with lower scores reflecting lower use of this behavior, and higher scores reflecting greater use of this behavior.

5.8.2. Inferential Analysis

Pearson correlation coefficients were calculated to examine the relationship between variables. There were many positive linear correlations observed, see Table 17. For example, greater child's BMI *z*-score was significantly correlated with greater age (r = .117; $p < .05$), parent dieting (r = .191, $p < .05$) and child's dieting behaviors (r = .335; $p < .05$). Most relationships ranged weak to moderate in strength (r = .1 to .335). Measure of strength was gathered using acceptable guidelines for interpreting correlation coefficient (Ratner, 2009). The relationship with the greatest strength was between child's raw BMI and child's dieting behaviors (r = .392, $p < .05$). There were some relationships that were found to be insignificant.

Table 17

Pearson Correlation Coefficients Among Variables (n = 534)

	Age[a]	Parent's Perception[b]	Parent's Dieting[c]	Child's Dieting[d]	Child's Food[e]	BMI[f] *z*-score
Age[a]	-	-.043	-.041	.116*	-0.18	.117*
Parent's Perception[b]	-.043	-	.090*	.047	-.051	.084
Parent's Dieting[c]	-.041	.090*	-	.283*	.203*	.191*
Child's Dieting[d]	.116*	.047	.283*	-	.125*	.335*
Child's Food[e]	-.018	-.051	.203*	.125*	-	.016
BMI[f] *z*-score	.117*	.084	.191*	.335*	.016	-

Note. [a]Child’s age; [b]Parent’s perception of a healthy child’s body size; [c]Parent’s dieting behaviors; [d]Child’s dieting behaviors; [e]Child’s food behaviors; [f]BMI = Body Mass Index. *$p < 0.05$.

The conceptual model used within this research was identified as a complex model, holding various simple and mediated models (i.e., the age model, the perception model, the parent model, and the child model). Inside each of these models, paths were examined for significance. Several paths were found to be statistically significant within these models. Those paths that were not found to be consistently significant were removed from the model. Overall, age, parent's dieting, and child's dieting had the most potent effects on a child's BMI *z*-score. While the greatest effects on BMI *z*-scores are listed in Table 18, information on all models, significant and nonsignificant, will be explored. Perception and food behavior was not observed to have statistically significant models. However, both variables served as intervening variables in other models. Answers to the four questions proposed, the results are as follows.

Table 18

Greatest Effects on BMI z-scores

Parameters	Model[a]	Variables	R^2	β	*p*-Value
Age	Direct Relationship	Age[b] → BMI *z*-score[g]	.014	.117	.007
	Indirect Relationship	Age[b] → PDieting[d] → CDieting[e] → BMI *z*-score[g]	.130	.088 .112 .293	.032 .008 .000
		Age[b] → PDieting[d] → BMI *z*-score[g]	.052	.125 .197	.003 .000
		Age[b] → Perception[c] → BMI *z*-score[g]	.022	.121 .089	.005 .039
Parent Dieting	Direct Relationship	PDieting[d] → BMI *z*-score[g]	.037	.191	.000
	Indirect Relationship	PDieting[d] → CDieting[e] → BMI *z*-score[g]	.122	.105 .305	.013 .000
Child Dieting	Direct Relationship	CDieting[e] → BMI *z*-score[g]	.112	.335	.000
	Indirect Relationship	None		-	-

Note. For ease of interpretation, arrows and standardized β coefficients are presented for significant relationships. [a]Path Model Effect. [b]Child's age. [c]Parent's perception of a child's healthy body size. [d]Parent's dieting behaviors. [e]Child's dieting behaviors. [f]Child's food behaviors. [g]Child's Body Mass Index *z*-score.

5.8.3. The Age Model

The largest effect observed on BMI *z*-score was within the age model (see Table 19). Approximately 13% of the variance in BMI *z*-score was explained by child's age ($R^2 = .130$, $p < .05$). In total, age had four significant positive effects, direct and indirect, to BMI *z*-score. Taking each path in Figure 2, individually, there were significant unconditional effects of greater age on greater parent dieting ($\beta = .088$, $p < .05$), child dieting ($\beta = .112$, $p < .05$), and greater BMI *z*-scores ($\beta = .293$, $p < .05$). This indicates that for every 1-unit increase of age, parent dieting, child dieting and BMI *z*-score increased by .088, .112, and .293 units, respectively. The combined effect of age and parent dieting explained 5% of the variance in BMI *z*-score was explained by ($R^2 = .052$, $p < .05$). There were significant unconditional effects of greater age on parent dieting ($\beta = .125$, $p < .05$), and BMI *z*-scores ($\beta = .197$, $p < .05$) where for every 1-unit of increase in age, parent dieting and BMI *z*-scores increased by .125 and .197 units, respectively. The combined effect of age and perception explained 2% of the variance in BMI *z*-score ($R^2 = .022$, $p < .05$). There were significant unconditional effects of greater age on perception ($\beta = .121$, $p < .05$) and BMI *z*-score ($\beta = .089$, $p < .05$). This means that for every 1-unit increase of age, perception and BMI z-scores increase by .121 and .089 units, respectively. The fourth path accounted for 1% of the variance in BMI *z*-scores ($R^2 = .014$, $p < .05$). There was a significant direct effect of greater age on greater BMI z-scores ($\beta = .117$, $p < .05$), where for every 1-unit of age, child's BMI increased by .117 units.

Table 19

The Age Model (n = 534)

Effect	R^2	*B* (SE[a])	β	*p* value
Age[b] → BMI *z*-score[g]	**.014**	**-.842 (.524)**	**.117**	**.007**
Age[b] → Perception[c] → **PDieting[d]** → **CDieting[e]** → CFood[f] → BMI *z*-score[g]	.135	.249 (.114)	**.090**	**.029**
		.597 (.399)	.061	.135
		.137 (.052)	**.114**	**.008**
		.450 (.065)	**.294**	**.000**
		.019 (.020)	-.039	.348
Age[b] → **PDieting[d]** → **CDieting[e]** → CFood[f] → BMI *z*-score[g]	.132	**.242 (.114)**	**.087**	**.034**
		.144 (.052)	**.120**	**.005**
		.454 (.065)	**.296**	**.000**
		-.021 (.020)	-.044	.293
Age[b] → **PDieting[d]** → **CDieting[e]** → BMI *z*-score[g]	**.130**	**.244 (.114)**	**.088**	**.032**
		.135 (.051)	**.112**	**.008**
		.449 (.065)	**.293**	**.000**
Age[b] → **PDieting[d]** → CFood[e] → BMI *z*-score[g]	.053	**.348 (.118)**	**.125**	**.003**
		.242 (.052)	**.201**	**.000**
		-.011 (.021)	-.022	.605
Age[b] → **PDieting[d]** → BMI *z*-score[g]	**.052**	**.348 (.118)**	**.125**	**.003**
		.236 (.051)	**.197**	**.000**
Age[b] → **CDieting[e]** → CFood[f] → BMI *z*-score[g]	.119	.219 (.114)	.079	.056
		.503 (.063)	**.329**	**.000**
		-.011 (.020)	-.023	.568
Age[b] → **CDieting[e]** → **BMI *z*-score[g]**	.118	.221 (.114)	.079	.054
		.499 (.063)	**.326**	**.000**
Age[b] → Perception[c] → **CDieting[e]** → CFood[f] → BMI *z*-score[g]	.124	**.229 (.114)**	**.082**	**.046**
		.690 (.399)	.071	.084
		.497 (.063)	**.325**	**.000**
		-.009 (.020)	-.019	.640
Age[b] → **Perception[c]** → CFood[f] → BMI *z*-score[g]	.022	**.338 (.120)**	**.121**	**.005**
		.878 (.421)	**.090**	**.037**
		.011 (.021)	.023	.593
Age[b] → **Perception[c]** → BMI *z*-score[g]	**.022**	**.336 (.120)**	**.121**	**.005**
		.867 (.420)	**.089**	**.039**
Age[b] → CFood[f] → BMI *z*-score[g]	.014	**.327 (.120)**	**.117**	**.007**
		.009 (.021)	.018	.671

Note. **Bold** denotes significant effect. Gray shading denotes a significant path within the model. B = unstandardized beta coefficient. [a]SE = standard error. β = standardized beta coefficient. [b]Child's age. [c]Parent's perception of a child's healthy body size. [d]Parent's dieting behaviors. [e]Child's dieting behaviors. [f]Child's food behaviors. [g]Child's Body Mass Index *z*-score.

5.8.4. The Perception Model

Taking each path in Figure 13, individually, perception was not observed to be statistically significant on BMI *z*-scores (R^2 = .007, *p* = .054). Various paths within the "perception" model were explored, but no effects, direct or indirect, were observed (see Table 20). There was a significant direct effect of greater perception on greater parent dieting (β = .090,

$p < .05$), where for every 1-unit increase of perception, parent dieting increased by .090 units. Additionally, within other models, perception served as a mediating variable (i.e., Age → Perception → BMI *z*-score). Therefore, perception was not removed from the model.

Table 20

The Perception Model (n = 534)

Effect	R^2	*B* (SE[a])	β	*p* value
Perception[c] → BMI *z*-score[g]	.007	.816 (.422)	.084	.054
Perception[c] → **PDieting[d]** → **CDieting[e]** → CFood[f] → BMI *z*-score[g]	.128	.559 (.400)	.057	.163
		.130 (.052)	**.108**	**.013**
		.470 (.065)	**.307**	**.000**
		-.020 (.020)	-.041	.325
Perception[c] → **PDieting[d]** → **CDieting[e]** → BMI *z*-score[g]	.126	.587 (.398)	.060	.141
		.120 (.051)	**.100**	**.019**
		.465 (.065)	**.304**	**.000**
Perception[c] → CFood[f] → BMI *z*-score[g]	.007	.827 (.423)	.085	.051
		.010 (.021)	.021	.635
Perception[c] → PDieting[d]	**.008**	**.732 (.351)**	**.090**	**.038**
Perception[c] → CDieting[e]	.002	.303 (.276)	.047	.274
Perception[c] → CFood[f]	.003	-1.02 (.864)	-.051	.235
Perception[c] → **PDieting[d]** → CDieting[e]	.080	.141 (.267)	.022	.596
		.220 (.033)	**.281**	**.000**

Note. **Bold** denotes significant effect. Gray shading denotes a significant path within the model. B = unstandardized beta coefficient. [a]SE = standard error. β = standardized beta coefficient. [b]Child's age. [c]Parent's perception of a child's healthy body size. [d]Parent's dieting behaviors. [e]Child's dieting behaviors. [f]Child's food behaviors. [g]Child's Body Mass Index *z*-score.

5.8.5. The Parent Model

The second-largest effect observed on BMI *z*-scores was within the parent model (see Table 21). A total of 12% of the variance in BMI *z*-score was explained by parent's dieting ($R^2 = .122$, $p < .05$). Taking each path in Figure 13, individually, there were significant unconditional effects of greater parent dieting on greater child dieting (β = .105, $p < .05$), and greater BMI *z*-scores (β = .305, $p < .05$), where for every 1-unit increase of parent dieting, child dieting and BMI z-scores increased by .105 and .305 units, respectively. There were three significant direct effects. First, there was a significant direct effect of greater parent dieting on greater BMI *z*-scores (β = .191, $p < .05$), where for every 1-unit increase of perception, parent dieting increased by .191 units. Second, there was a significant direct effect of greater parent dieting on greater child dieting (β = .283, $p < .05$), where for every 1-unit increase of parent dieting, child dieting increased by .283 units. Third, there was a significant direct effect of greater parent dieting on greater food behaviors (β = .203, $p < .05$), where for every 1-unit increase of perception, parent dieting increased by .203 units.

Table 21

The Parent Model (n = 534)

Effect	R^2	*B* (SE[a])	β	*p* value
PDieting[d] → BMI *z*-score[g]	**.037**	**.230 (.051)**	**.191**	**.000**
PDieting[d] → CDieting[e] → CFood[f] → BMI *z*-score[g]	.124	**.136 (.052)**	**.113**	**.009**
		.472 (.065)	**.309**	**.000**
		-.022 (.020)	-.045	.276
PDieting[d] → CDieting[e] → BMI *z*-score[g]	**.122**	**.126 (.051)**	**.105**	**.013**
		.467 (.065)	**.305**	**.000**
PDieting[d] → CFood[f] → BMI *z*-score[g]	.037	**.236 (.052)**	**.196**	**.000**
		-.012 (.021)	-.024	.587
PDieting[d] → CDieting[e]	**.080**	**.222 (.033)**	**.283**	**.000**
PDieting[d] → CFood[f]	**.041**	**.497 (.104)**	**.203**	**.000**

Note. **Bold** denotes significant effect. Gray shading denotes a significant path within the model. B = unstandardized beta coefficient. [a]SE = standard error. β = standardized beta coefficient. [b]Child's age. [c]Parent's perception of a child's healthy body size. [d]Parent's dieting behaviors. [e]Child's dieting behaviors. [f]Child's food behaviors. [g]Child's Body Mass Index *z*-score.

5.8.6. The Child Model

Taking each path in Figure 13, individually, there were two significant direct effects (see Table 22). There was a significant direct effect of greater child dieting on greater BMI *z*-scores (β = .335, $p < .05$), where for every 1-unit increase of parent dieting, BMI z-scores increased by .335 units. There was a significant direct effect of greater child dieting on greater food behaviors (β = .125, $p < .05$), where for every 1-unit increase of child dieting, food behaviors increased by .125 units.

Table 22

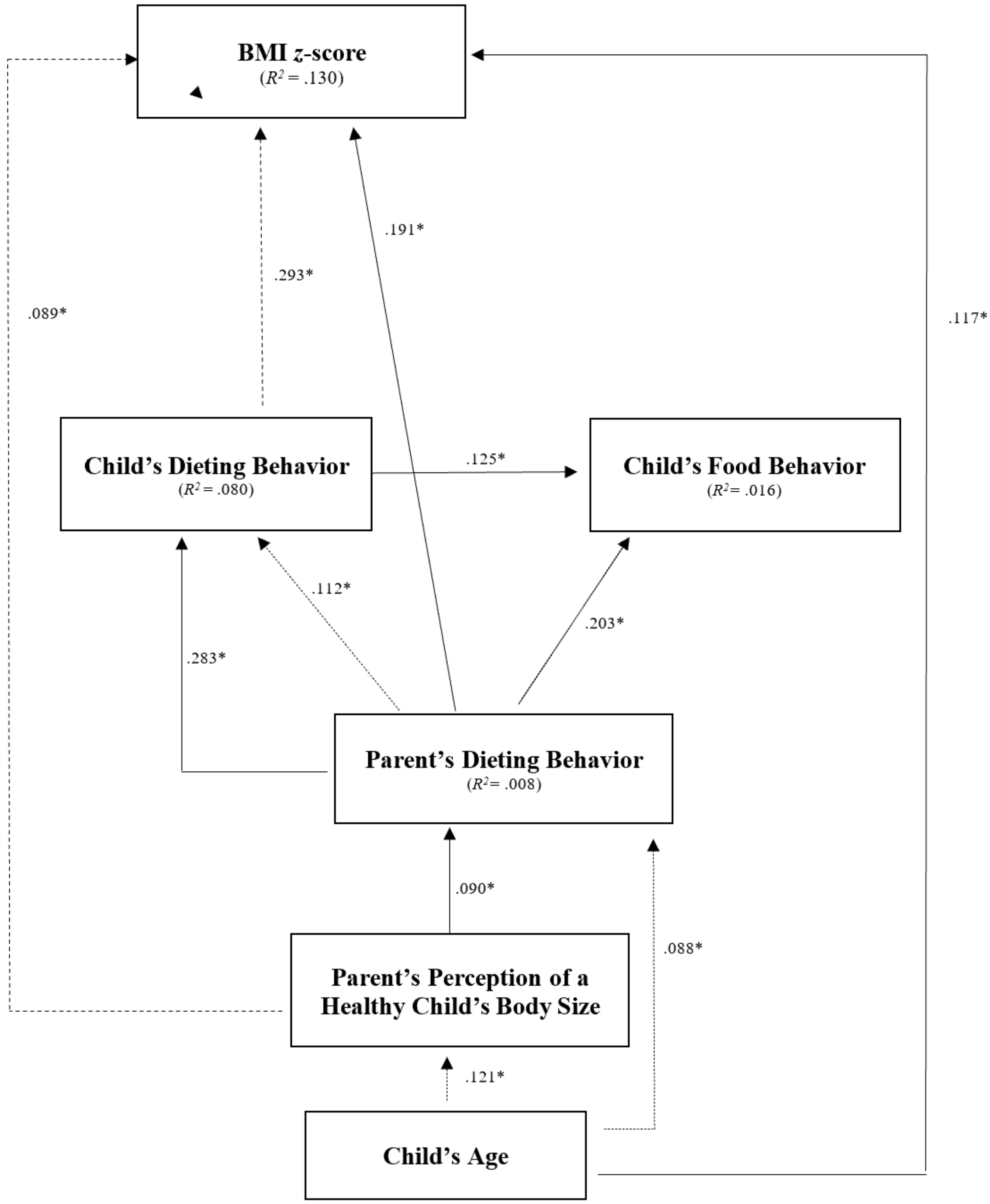
The Child Model (n = 534)

Effect	R^2	*B* (SE[a])	β	*p* value
CDieting[e] → BMI z-score[g]	**.112**	**.513 (.063)**	**.335**	**.000**
CDieting[e] → CFood[f] → BMI z-score[g]	.113	**.518 (.063)**	**.338**	**.000**
		-.013 (.020)	-.026	.527
CDieting[e] → CFood[f]	**.016**	**.390 (.134)**	**.125**	**.004**
CFood[f] → BMI z-score[g]	.000	.008 (.021)	.016	.709

Note. **Bold** denotes significant effect. Gray shading denotes a significant path within the model. B = unstandardized beta coefficient. [a]SE = standard error. β = standardized beta coefficient. [b]Child's age. [c]Parent's perception of a child's healthy body size. [d]Parent's dieting behaviors. [e]Child's dieting behaviors. [f]Child's food behaviors. [g]Child's Body Mass Index *z*-score.

Figure 16

Path Analysis of Simultaneous Regressions



Note. Solid lines denote direct effects. Dash lines denote indirect effects. R^2 = variance explained. For ease of interpretation, arrows and standardized β coefficients are presented for the greatest significant relationships (*$p < 0.05$).

5.9. Discussion

In this study, several variables were found to be significant, directly, and indirectly, to child’s BMI *z*-scores. Small yet significant, child’s age had the greatest observed effect on BMI z-scores (13%). The influence of other variables beyond those in this path model is 87%. In addition to those mentioned in Chapter 4, other variables that should be considered in relation to a child’s weight and diet are gender, family history, income, food intake, psychological health, perceived body image, parental involvement, and/or family environment, life transition, peer, and media influences (Anderson et al., 2019; Bayles, 2010; Berge et al., 2012; Coffman et al., 2016; Damiano, Paxton, et al., 2015; Duncan et al., 2015; Kelishadi & Azizi-Soleiman, 2014; Ling et al., 2018; Sahoo et al., 2015; Sosa, 2012; vander Wal & Mitchell, 2011; Yee et al., 2017). Additionally, “dieting” exhibits a wide range of behaviors. Most assessments rely simply on “*Yes*” or “*No*” responses in a questionnaire. This may limit the accuracy of determining if one is truly dieting. More on this will be explained in the limitation section of this paper. Nonetheless, in the literature, these factors have been associated with the development of dieting. Yet there is no specific reference to age. However, while this sample was made up of preschool children, research has shown dieting knowledge begins by the age of five (Abramovitz & Birch, 2000; Damiano, Gregg, et al., 2015; Damiano, Paxton, et al., 2015). Thirty-five percent (35%) of the children in this sample were 5. As primary caregivers, parents and/or other family members are probably the source of child’s diet knowledge. It has also been shown that during the preschool years, mothers' dieting behavior affects child dieting and weight status, either directly or indirectly through their influence on mothers' feeding practices (Abramovitz & Birch, 2000; Cutting et al., 1999; Birch & Fisher 2000).

In this study, it was found that the more parents dieted as their child increased with age. Also, more children dieted as their age increased. Ultimately, both of these relationships were related to higher BMI *z*-scores. Both parent and child dieting had a combined effect of 12% on BMI. These findings are consistent with what has been found in the research on mother-daughter dieting behaviors (Balantekin, 2019). The most influential research on parent-child dieting was that by Coffman & Balantekin (2016) who used propensity score estimation. Girls (M = 5.4) whose mothers were currently dieting were significantly more likely to diet before age 11 than those whose mothers were not currently dieting, and this effect did not vary by girls' or mothers' weight status. This was an observational study on 181 non-Hispanic White daughter-mother dyads, where data were collected on four occasions across 6 years, with 2-year intervals between assessments.

Parent's dieting on child's weight has also been explored. Despite their importance, very few studies have explored these relationships among young children. To my knowledge, only two studies on 5-year-old children have been done. Both studies demonstrated that parental dieting, either through modeling dieting and dietary restraint, or through encouraging children to diet, increases the risk for elevated child weight (Carper et al., 2000; Rodgers et al., 2013). Overall, these findings prove the importance of the role of the family, specifically mothers. Some research has affirmed that fathers are also influential in children's (both boys and girls) dieting behaviors (K. Davison et al., 2020; Hooper & Dallos, 2012; Rahill et al., 2020; Siegel et al., 2021). However, much of the research on early socialization involves child-mother dyads. Hence, the role of mothers in the development of children's eating habits is important, as they impart cultural values regarding weight, shape, and appearance to their daughters. It is important for the family's overall health to promote healthy weight control strategies over health-compromising factors.

It was also found that the more a child dieted (a higher score of dieting), the more likely they were to gain weight. Research on 4-year-olds is limited since dieting is not appropriate for this age group. However, these results are consistent with what has been found in the literature on older children (Balantekin, 2019; A. Field et al., 2003; Goldschmidt et al., 2018; Haines et al., 2010; Neumark-Sztainer, Wall, Story, et al., 2012; Stice, Agras, et al., 1999; Stice, Cameron, et al., 1999; Stice et al., 2006; Tanofsky-Kraff et al., 2006; Wall et al. 2018). This research was conducted on predominately non-Hispanic white adolescent girls using dieting questionnaires. Generally, most research has found that adolescent dieting is not effective in reducing weight or BMI over time.

As discussed in Chapter 4, parent's perception of a healthy child's body size was found nonsignificant to child's BMI *z*-score. Reasons for this were explained in Chapter 4. In addition, the direct effect of child food behavior on BMI was also found not to be significant. This was surprising. As the sample included young children, it was anticipated that food behavior would influence BMI. More so than child dieting. Based previous scientific (Hart et al., 2016; Kansra et al., 2021; Neumark-Sztainer et al., 2011) and anecdotal evidence, this outcome is contrary to what was expected. This finding is not consistent with what is seen in the literature regarding food intake. Obesity has been associated with increased dietary energy intake in children and adolescents, in addition to physical activity behaviors, biological factors, and environmental influences (Walker et al., 2018). Food intake was not addressed in this study. The questions that assessed food behavior focused on healthy eating practices (greater score = better healthy eating behavior). It was assumed that increased scores of "healthy" food behavior would influence BMI (negatively). Yet this was not observed (R^2 = .000; β = .008, *p* = .709). Healthy eating has been found effective in weight management in young children (Brown et al., 2019; Melis et al., 2015; Skouteris et al., 2010). However, as mentioned in Chapter 4, the majority (75%) of the children in dyads were within the normal weight category. Fifteen percent of children were either identified as overweight (10%) or obese (15%). Possibly, since most children were not obese/overweight, healthy eating may not have been a concern for parents. Nevertheless, when one examines the number of obese/overweight children (*n* = 159; 15%) in this sample, it is concerning that these practices are nonexistent.

5.9.1. Limitations

The use of path analysis relies on the researcher to examine a specific set of variables within a proposed model. This research had a total of five variables. This is one possible model for all five of these variables. The combined effects were significant, yet small. The largest effect observed had a variance of only 13%. As mentioned in Chapter 4, these significant findings are limited to young Hispanic children on the Texas-Mexico border. Hence, these results may not apply to other age groups, nor Hispanics in other areas of the state or country.

As mentioned in the previous chapter, this was a secondary analysis of the STEPS Pre-K Project data. The tools they used pose some limitations. The assessments used for parent perception of a healthy child's body size and parent dieting behaviors had limitations. More explicit information is available in Chapter 4. Additionally, the assessments used for child dieting behaviors, as well as for child food behaviors also had limitations. The child's dieting behavior was assessed using three questions taken from a national survey. In regard to dieting, most assessments rely on self-perception of dieting. As mentioned earlier, this is usually done through a response of "*Yes*" or "*No*" to specific questions. Because of the sensitivity of the issue, this may not garner true results. Individuals may not be truthful regarding these practices, especially if these practices have been identified as negative, harmful, or unhealthy. Also, child's food behavior was assessed using a specific set of questions taken from a national survey (total of 14-questions). This assessment was further limited in this research only 4-questions were used. Only questions that addressed healthy "*intake*" were used. Health surveys tend to collect general food consumption rather than specific intake. However, not using this tool in its entirety may limit validity. Last, this study was an exploratory cross-sectional study, not a longitudinal study. These results may not be sufficient for understanding disease trends. Refer to Chapter 4 for an additional listing of limitations.

5.10. Conclusion

Research is needed to understand how Hispanic children interact with behaviors associated with childhood obesity risk, as well as prevention. It has been found that Hispanics, compared to non-Hispanics have different attitudes, beliefs, and practices regarding weight, shape, and appearance. These perceptions inform a child's early socialization regarding their weight and dietary practices. However, familism was not examined in this study. Yet, it is important to explore. Researchers identified that Hispanic mothers of preschool children play an important role in obesity prevention messages (Davis et al., 2016). Educating mothers on healthful weight control strategies over health-compromising ones is imperative. This is not only for a mother's health but for the health of their children. It is however crucial to remember that fathers play a major role in diet-related behaviors. Both mothers' and fathers' communication provide protection against a child's dissatisfaction with their appearance and disordered eating behaviors (Taniguchi, 2019). As we know that children's dieting knowledge starts early, it is crucial to identify these strategies early to be able to address them with efficient methods, including using culturally grounded approaches. Ultimately, more work is needed in this area.

6. CONCLUSION

The obesity epidemic continues to be of great public concern, due to its high prevalence rates in adults and children. Obesity in adults has continued to be on a rapid rise. In 2017-2018, the adult obesity rate reached 42.4%, first-time surpassing the 40%-mark. In children, obesity rates have continued to increase, but at a slower rate. Currently, the national childhood obesity rate is 19.3%. However, obesity rates are far greater among certain populations, such as low socioeconomic status and minority groups. The obesity rate among Hispanic and Black children is 25.6% and 24.2%, respectively, compared with non-Hispanic White children (16.1%) (CDC, 2022c). However, it has been speculated that these numbers, both in adults and children, have doubled during the COVID-19 pandemic (CDC, 2022b & 2022c).

The continued increase in the prevalence of adult and child obesity highlights the need for more research. Childhood obesity is of particular concern because of its association with adult disease. Obesity in the adult population has been linked to coronary heart disease, hypertension, DM2, some types of cancers, and dyslipidemia among other chronic diseases. The association between childhood obesity and several short- and long-term adverse effects also calls for further study. There are several factors contributing to the development of obesity. Most, if not all, of the research, has focused on these factors. This research focused on protective factors for its prevention. *Familism* is a promising factor to examine considering that social constructs regarding weight, health, and food are formed in the family environment. Familism is a cultural value seen in Hispanic communities in which there is a higher emphasis on the family unit. It is assumed that due to familism, attitudes and beliefs regarding what is considered "*healthy*" is be perceived differently among the Hispanic community. This research examined the influence of parent perception of a healthy child's body size, parent dieting, child dieting, and child food behaviors on child's weight (assessed by BMI *z*-scores and raw BMI) and diabetes in predominately Hispanic families. A hypothesized model was constructed.

This research was a secondary analysis using baseline data collected in fall 2018 from the STEPS Pre-K Project. Children participating in this study were between the ages of 4 and 5 years. The initial sample consisted of 1,277 parent-child dyads. This sample was then reduced to 534 mother-child dyads due to exclusion criteria. All data except BMI was collected via self-administered questionnaires. Path analysis was conducted to identify relationships between the exogenous variables (independent variables) and mediating variables with endogenous (dependent variables). The hypothesized model was revised to exclude diabetes. Diabetes was removed from the model due to having only two diabetes diagnoses. Multivariate simultaneous multiple regression analysis was conducted for each hypothesized path. However, the proposed model failed to meet the criteria to generate path coefficients. Therefore, nonsignificant paths were omitted from the proposed model, and a revised model was generated.

The conceptual model used within this research was identified as a complex model, holding various simple and mediated models (i.e., the age model, the perception model, the parent model, and the child model). Inside each of these models, several paths were found to be statistically significant. Age, parent's dieting, and child's dieting had the most potent effects on child's BMI *z*-score. Children whose mothers were currently dieting are significantly more likely to diet and are more likely to increase in weight. This effect increased with age. These results are consistent with the previous findings from studies that have shown that there is a relationship among age, dieting, and weight. However, no relationships were found between parent perception of a healthy child's body size and child food behaviors on BMI *z*-scores. However, this may have been caused by multiple reasons.

In conclusion, parent and child dieting are important factors in the development of obesity in preschool Hispanic children. As much research has shown, the role of mothers in the development of children is vital. Regarding dietary behavior, mothers impart cultural values regarding weight, shape, and appearance. Therefore, promoting health-promoting weight control strategies early on is important. This will prevent children from incorporating health-compromising dieting behaviors into their concepts, ideas, and beliefs. As the population of Hispanics increases in the U.S., it is important to continue to examine this area. More research should focus on qualitative measures to better assess Hispanic mothers' perceptions of childhood obesity. This includes higher quality questionnaires and greater sensitivity to the Hispanic culture. Last, the results are from a sample consisting of almost all Hispanic mother-child dyads (97% Hispanic). In order to deliver culturally appropriate health promotion programs to Hispanic communities, this research is essential.

REFERENCES

Abraczinskas, M., Fisak, B., & Barnes, R. D. (2012). The relation between parental influence, body image, and eating behaviors in a nonclinical female sample. *Body Image*, 9(1), 93–100. https://doi.org/10.1016/J.BODYIM.2011.10.005.

Abramovitz, B. A., & Birch, L. L. (2000). Five-year-old girls' ideas about dieting are predicted by their mothers' dieting. *Journal of the American Dietetic Association*, 100(10), 1157–1163. https://doi.org/10.1016/S0002-8223(00)00339-4.

Academy of Nutrition and Dietetics. (2022, March). What is disordered eating? https://www.eatright.org/health/diseases-and-conditions/eating-disorders/what-is-disordered-eating.

Ajala, O., English, P., & Pinkney, J. (2013). Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. *American Journal of Clinical Nutrition.* Vol. 97, Issue 3, 505–516. https://doi.org/10.3945/ajcn.112.042457.

Alexander, M. A., & Blank, J. J. (1988). Factors related to obesity in Mexican-American preschool children. *The Journal of Nursing Scholarship*, 20(2), 79–82. https://doi.org/10.1111/J.1547-5069.1988.TB00035.

Alexander, M. A., Sherman, J. B., & Clark, L. (1991). Obesity in Mexican American preschool children-a population group at risk. *Public Health Nursing*, 8(1), 53–58. https://doi.org/10.1111/J.1525-1446.1991.TB00743.

Alfonso, F. (2019, October). McAllen ranked as America's fattest city in 2019. https://patch.com/texas/across-tx/mcallen-ranked-americas-fattest-city-2019.

Allen, K. L., Byrne, S. M., Blair, E. M., & Davis, E. A. (2006). Why do some overweight children experience psychological problems? The role of weight and shape concern.

International Journal of Pediatric Obesity, 1(4), 239–247. https://doi.org/10.1080/17477160600913552.

Almeida, J., Molnar, B. E., Kawachi, I., & Subramanian, S. (2009). Ethnicity and nativity status as determinants of perceived social support: Testing the concept of familism. *Social Science & Medicine*, 68(10), 1852–1858. https://doi.org/10.1016/J.SOCSCIMED.2009.02.029.

American Diabetes Association. (2022, April). Extra weight, extra risk. https://www.diabetes.org/healthy-living/weight-loss/extra-weight-extra-risk.

American Psychiatric Association. (2022, April). What are eating disorders? https://www.psychiatry.org/patients-families/eating-disorders/what-are-eating-disorders.

Anderson, P. M., Butcher, K. F., & Schanzenbach, D. W. (2019). Understanding recent trends in childhood obesity in the United States. *Economics & Human Biology*, 34, 16–25. https://doi.org/10.1016/J.EHB.2019.02.002.

Arce, C. (1978, October). Dimensions of familism and familial identification. In *National Conference on the Hispanic Family*.

Arias, E., Kochanek, K. D., & Anderson, R. N. (2015). How does cause of death contribute to the Hispanic mortality advantage in the United States? Key findings. Data from the National Vital Statistics System, *Mortality*.

Aristizabal, J. C., Barona, J., Hoyos, M., Ruiz, M., & Marín, C. (2015). Association between anthropometric indices and cardiometabolic risk factors in pre-school children. *Pediatrics*, 15(1), 1–8. https://doi.org/10.1186/S12887-015-0500-Y/FIGURES/1.

Arner, P. (2018). Fat tissue growth and development in humans. *Nestle Nutrition Institute Workshop Series*, 89, 37–45. https://doi.org/10.1159/000486491.

Arner, P., Bernard, S., Appelsved, L., Fu, K. Y., Andersson, D. P., Salehpour, M., Thorell, A., Rydén, M., & Spalding, K. L. (2019). Adipose lipid turnover and long-term changes in body weight. *Nature Medicine*, 25(9), 1385–1389. https://doi.org/10.1038/s41591-019-0565-5.

Arroyo, A., Segrin, C., & Andersen, K. K. (2017). Intergenerational transmission of disordered eating: Direct and indirect maternal communication among grandmothers, mothers, and daughters. *Body Image*, 20, 107–115. https://doi.org/10.1016/j.bodyim.2017.01.001.

Arslanian, S., & Suprasongsin, C. (1996). Insulin sensitivity, lipids, and body composition in childhood: is syndrome X present? *The Journal of Clinical Endocrinology & Metabolism*, 81(3), 1058–1062. https://doi.org/10.1210/JCEM.81.3.8772576.

Assari, S., Malek-Ahmadi, M. R., & Caldwell, C. H. (2020). Parental education or household income? Which socioeconomic status indicator can better reduce body mass index disparities among Latino children? *Journal of Economics and Public Finance*, 7(1), p19. https://doi.org/10.22158/JEPF.V7N1P19.

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.

Ayine, P., Selvaraju, V., Venkatapoorna, C. M. K., & Geetha, T. (2020). Parental feeding practices in relation to maternal education and childhood obesity. *Nutrients*, 12(4). https://doi.org/10.3390/nu12041033.

Balantekin, K. N. (2019). The influence of parental dieting behavior on child dieting behavior and weight status. *Obesity Reports*, 8(2), 137–144. https://doi.org/10.1007/s13679-019-00338-0.

Balantekin, K. N., Hohman, E. E., Adams, E. L., Marini, M. E., Ventura, A. K., Birch, L. L., & Savage, J. S. (2018). More rapid increase in BMI from age 5–15 is associated with elevated weight status at age 24 among non-Hispanic white females. *Eating Behaviors*, 31, 12–17. https://doi.org/10.1016/j.eatbeh.2018.07.007.

Balantekin, K. N., Savage, J. S., Marini, M. E., & Birch, L. L. (2014). Parental encouragement of dieting promotes daughters' early dieting. *Appetite*, 80, 190–196. https://doi.org/10.1016/J.APPET.2014.05.016.

Bandura, A. (1977). *Social Learning Theory* (1st ed.). Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health*, 13(4), 623–649. https://doi.org/10.1080/08870449808407422

Bandura, A., & Kupers, C.J. (1964). Transmission of patterns of self-reinforcement through modeling. *Journal of Abnormal and Social Psychology*, 69, 1–9.

Baranowski, T., & Perry, C. (1990). How individuals, environments, and health behavior interact: Social Cognitive Theory. *Health Behavior and Health Education-Theory Research, and Practice*, 153–178. https://www.ars.usda.gov/research/publications/publication/?seqNo115=172123.

Barlow, S. E., & Committee, and the E. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*, 120(4), S164–S192. https://doi.org/10.1542/PEDS.2007-2329C.

Basch, C. E., Zybert, P., & Shea, S. (2011). 5-A-DAY: Dietary behavior and the fruit and vegetable intake of Latino children. *American Journal of Public Health*, 84(5), 814–818. https://doi.org/10.2105/AJPH.84.5.814.

Bauer, K. W., Bucchianeri, M. M., & Neumark-Sztainer, D. (2013). Mother-reported parental weight talk and adolescent girls' emotional health, weight control attempts, and disordered eating behaviors. *Journal of Eating Disorders*, 1(1), 1–8. https://doi.org/10.1186/2050-2974-1-45/TABLES/2.

Baumgartner, R. N., Roche, A. F., Guo, S., Chumlea, W. C., & Ryan, A. S. (1990). Fat patterning and centralized obesity in Mexican-American children in the Hispanic Health and Nutrition Examination Survey (HHANES 1982–1984). *The American Journal of Clinical Nutrition*, 51(5), 936S-943S. https://doi.org/10.1093/AJCN/51.5.936.

Bayles, B. (2010). Perceptions of childhood obesity on the Texas-Mexico border. *Public Health Nursing*, 27(4), 320–328. https://doi.org/10.1111/j.1525-1446.2010.00861.

Beckert, T., Allgood, S., Finley, G., & Almeida, D. M. (2012). The role of father involvement in the perceived psychological well-being of young adult daughters: a retrospective... Perceptions of childhood relationships with mother and father: daily emotional and stressor experience…. *North American Journal of Psychology*, 14(1), 95–110.

Berge, J. M., Hanson-Bradley, C., Tate, A., & Neumark-Sztainer, D. (2016). Do parents or siblings engage in more negative weight-based talk with children and what does it sound like? A mixed-methods study. *Body Image*, 18, 27–33. https://doi.org/10.1016/j.bodyim.2016.04.008.

Berge, J. M., Loth, K., Hanson, C., Croll-Lampert, J., & Neumark-Sztainer, D. (2012). Family life cycle transitions and the onset of eating disorders: Retrospective grounded theory approach. *Journal of Clinical Nursing*, 21(9–10), 1355–1363. https://doi.org/10.1111/j.1365-2702.2011.03762.

Berge, J. M., Miller, J., Watts, A., Larson, N., Loth, K. A., & Neumark-Sztainer, D. (2018). Intergenerational transmission of family meal patterns from adolescence to parenthood: longitudinal associations with parents' dietary intake, weight-related behaviours and psychosocial well-being. *Public Health Nutrition*, 21(2), 299–308. https://doi.org/10.1017/S1368980017002270.

Berge, J. M., Trofholz, A., Fong, S., Blue, L., & Neumark-Sztainer, D. (2015). A qualitative analysis of parents' perceptions of weight talk and weight teasing in the home environments of diverse low-income children. *Body Image*, 15, 8–15. https://doi.org/10.1016/j.bodyim.2015.04.006.

Birch, L. L., & Fisher, J. A. (1996). The role of experience in the development of children's eating behavior. In E. D. Capaldi (Ed.), Why we eat what we eat: The psychology of eating (pp. 113–141). *American Psychological Association*. https://doi.org/10.1037/10291-005.

Blissett, J. (2011). Relationships between parenting style, feeding style and feeding practices and fruit and vegetable consumption in early childhood. *Appetite*, 57, 826–831. https://doi.org/10.1016/j.appet.2011.05.318.

Boeke, C. E., Oken, E., Kleinman, K. P., Rifas-Shiman, S. L., Taveras, E. M., & Gillman, M. W. (2013). Correlations among adiposity measures in school-aged children. *Pediatrics*, 13(1). https://doi.org/10.1186/1471-2431-13-99.

Bojorquez-Chapela, I., Unikel, C., Mendoza, M. E., & de Lachica, F. (2014). Another body project: The thin ideal, motherhood, and body dissatisfaction among Mexican women. *Journal of Health Psychology*, 19(9), 1120–1131. https://doi.org/10.1177/1359105313484783.

Brady, L. M., Lindquist, C. H., Herd, S. L., & Goran, M. I. (2000). Comparison of children's dietary intake patterns with US dietary guidelines. *British Journal of Nutrition*, 84(3), 361–367. https://doi.org/10.1017/S0007114500001641.

Brechan, I., & Kvalem, I. L. (2015). Relationship between body dissatisfaction and disordered eating: Mediating role of self-esteem and depression. *Eating Behaviors*, 17, 49–58. https://doi.org/10.1016/J.EATBEH.2014.12.008.

Briefel, R. R., Deming, D. M., & Reidy, K. C. (2015). Parents' perceptions and adherence to children's diet and activity recommendations: the 2008 feeding infants and toddlers study. *Preventing Chronic Disease*, 12(E159). https://doi.org/10.5888/pcd12.150110.

Brooks-Gunn, J., & Duncan, G. J. (1997). The effects of poverty on children. *Future of Children*, 7(2), 55–71. https://doi.org/10.2307/1602387.

Brown, T., Overcash, F., & Reicks, M. (2019). Frequency of trying to lose weight and its association with children's weight perception and dietary intake (NHANES 2011-2012). *Nutrients*, 11(11). https://doi.org/10.3390/NU11112703.

Bucchianeri, M. M., Fernandes, N., Loth, K., Hannan, P. J., Eisenberg, M. E., & Neumark-Sztainer, D. (2016). Body dissatisfaction: Do associations with disordered eating and psychological well-being differ across race/ethnicity in adolescent girls and boys? *Cultural Diversity & Ethnic Minority Psychology*, 22(1), 137–146. https://doi.org/10.1037/CDP0000036.

Burgess, E. W., & Locke, H. J. (1945). *The family: From institution to companionship.* American Book Co.

Byely, L., Archibald, A. B., Graber, J., & Brooks-Gunn, J. (2000). A prospective study of familial and social influences on girls' body image and dieting. *Int J Eat Disorders*, 28.

Cain, A. S., Bardone-Cone, A. M., Abramson, L. Y., Vohs, K. D., & Joiner, T. E. (2008). Refining the relationships of perfectionism, self-efficacy, and stress to dieting and binge eating: Examining the appearance, interpersonal, and academic domains. *International Journal of Eating Disorders*, 41(8), 713–721. https://doi.org/10.1002/EAT.20563.

Carper, J. L., Orlet Fisher, J., & Birch, L. L. (2000). Young girls' emerging dietary restraint and disinhibition are related to parental control in child feeding. *Appetite*, 35(2), 121–129. https://doi.org/10.1006/APPE.2000.0343.

Cartagena, D., Ameringer, S. W., McGrath, J. M., Masho, S. W., Jallo, N., & Myers, B. J. (2015). Factors contributing to infant overfeeding in low-income immigrant Latina mothers. *Applied Nursing Research*, 28(4), 316–321. https://doi.org/10.1016/J.APNR.2015.03.007.

Cash, T. F., & Deagle, E. A. (1997). The nature and extent of body-image disturbances in anorexia nervosa and bulimia nervosa: A meta-analysis. *Int J Eat Disord*, 22, 107–125. https://doi.org/10.1002/(SICI)1098-108X(199709)22:2.

Centers for Disease Control and Prevention. (2018, June 14). CDC Releases 2017 Youth Risk Behavior Survey (YRBS) Results. https://www.cdc.gov/nchhstp/dear_colleague/2018/dcl-061418-YRBS.html.

Centers for Disease Control and Prevention. (2018, Aug 2). Strategies to Help Parents and Families Create Healthy and Supportive School Environments. https://www.cdc.gov/healthyschools/sec_parents.htm

Centers for Disease Control and Prevention. (2019, May). Texas State Nutrition, Physical Activity, and Obesity Profile 2016 National Center for Chronic Disease Prevention and Health Promotion Division of Nutrition, Physical Activity, and Obesity. http://www.census.gov/quickfacts/.

Centers for Disease Control and Prevention. (2021a, February). Childhood Nutrition Facts. https://www.cdc.gov/healthyschools/nutrition/facts.htm

Centers for Disease Control and Prevention. (2021b, April). Why it matters? https://www.cdc.gov/obesity/about-obesity/why-it-matters.html.

Centers for Disease Control and Prevention. (2022a, May). Adolescent connectedness. https://www.cdc.gov/healthyyouth/protective/youth-connectedness-important-protective-factor-for-health-well-being.htm.

Centers for Disease Control and Prevention. (2022b, May). Adult obesity facts. https://www.cdc.gov/obesity/data/adult.html.

Centers for Disease Control and Prevention. (2022c, May). Childhood overweight & obesity. https://www.cdc.gov/obesity/childhood/index.html.

Centers for Disease Control and Prevention. (2022d, May). Protective factors. https://www.cdc.gov/healthyyouth/protective/index.htm.

Center for National Health Statistics (2000). Vital and Health Statistics, Series 11, No. 246 (5/2002)-updated 6/30/2010. https://www.cdc.gov/nchs/data/series/sr_11/sr11_246.pdf.

Chen, Y., & Guzman, L. (2021). Latino children represent over a quarter of the child population nationwide and make up at least 40 percent in 5 southwest states. National Research Center on Hispanic Children & Families.

Cherry, K. (2022, June 3). Sociocultural Theory: Understanding Vygotsky's Theory. Verywellmind. https://www.verywellmind.com/what-is-sociocultural-theory-2795088.

Childress, A. C., Brewerton, T. D., Hodges, E. L., & Jarrell, M. P. (1993). The Kids' Eating Disorders Survey (KEDS): A study of middle school students. *Journal of the American Academy of Child & Adolescent Psychiatry*, 32(4), 843–850. https://doi.org/10.1097/00004583-199307000-00021.

Clausen, J. O., Ibsen, H., Ibsen, K. K., & Borch-Johnsen, K. (1996). Association of body mass index, blood pressure and serum levels of triglycerides and high-density lipoprotein cholesterol in childhood with the insulin sensitivity index in young adulthood: A 13-year follow-up. *Journal of Cardiovascular Risk*, 3(5), 427–433. https://doi.org/10.1177/174182679600300503.

Coffman, D. L., Balantekin, K. N., & Savage, J. S. (2016). Using propensity score methods to assess causal effects of mothers' dieting behavior on daughters' early dieting behavior. *Childhood Obesity*, 12(5), 334–340. https://doi.org/10.1089/chi.2015.0249.

Cole, T. (1990). The LMS method for constructing normalized growth standards. *Eur J Clinical Nutr.*, 44(1).

Cole, T. J. (2004). Children grow and horses race: Is the adiposity rebound a critical period for later obesity? *Pediatrics*, 4. https://doi.org/10.1186/1471-2431-4-6.

Collins, E. (1991). Body figure perceptions and preferences among preadolescent children. *International Journal of Eating Disorders*, 10(2), 199–208.

https://onlinelibrary.wiley.com/doi/epdf/10.1002/1098-108X%28199103%2910%3A2%3C199%3A%3AAID-EAT2260100209%3E3.0.CO%3B2-D.

Contento, I. R., Basch, C., & Zybert, P. (2003). Body image, weight, and food choices of Latina women and their young children. *Journal of Nutrition Education and Behavior*, 35(5), 236–248. https://doi.org/10.1016/S1499-4046(06)60054-7.

Cook, B., Alegría, M., Lin, J. Y., & Guo, J. (2009). Pathways and correlates connecting Latinos' mental health with exposure to the United States. *American Journal of Public Health*, 99(12), 2247–2254. https://doi.org/10.2105/AJPH.2008.137091.

Cooley, E., Toray, T., Wang, M. C., & Valdez, N. N. (2008). Maternal effects on daughters' eating pathology and body image. *Eating Behaviors*, 9(1), 52–61. https://doi.org/10.1016/J.EATBEH.2007.03.001.

Coulston, A. M., Rock, Cheryl., & Monsen, E. R. (2001). *Nutrition in the prevention and treatment of disease*. Academic Press.

Crooks, D. L. (2003). Trading nutrition for education: Nutritional status and the sale of snack foods in an eastern Kentucky school. *Medical Anthropology Quarterly*, 17(2), 182–199. https://doi.org/10.1525/MAQ.2003.17.2.182.

Cullen, K. W., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & de Moor, C. (2001). Child-reported family and peer influences on fruit, juice, and vegetable consumption: reliability and validity of measures. *Health Education Research*, 16(2), 187–200. https://doi.org/10.1093/HER/16.2.187.

Cutting, T. M., Fisher, J. O., Grimm-Thomas, K., & Birch, L. L. (1999). Like mother, like daughter: familial patterns of overweight are mediated by mothers' dietary disinhibition.

The American Journal of Clinical Nutrition, 69(4), 608–613. https://doi.org/10.1093/AJCN/69.4.608.

Damiano, S. R., Gregg, K. J., Spiel, E. C., McLean, S. A., Wertheim, E. H., & Paxton, S. J. (2015). Relationships between body size attitudes and body image of 4-year-old boys and girls, and attitudes of their fathers and mothers. *Journal of Eating Disorders*, 3(1), 1–10. https://doi.org/10.1186/S40337-015-0048-0/TABLES/4.

Damiano, S. R., Paxton, S. J., Wertheim, E. H., McLean, S. A., & Gregg, K. J. (2015). Dietary restraint of 5-year-old girls: Associations with internalization of the thin ideal and maternal, media, and peer influences. *International Journal of Eating Disorders*, 48(8), 1166–1169. https://doi.org/10.1002/EAT.22432.

Daniels, S. R., Khoury, P. R., & Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: differences by race and gender. *Pediatrics*, 99(6), 804–807. https://doi.org/10.1542/PEDS.99.6.804.

Daundasekara, S. S., Schuler, B. R., & Hernandez, D. C. (2020). Stability and change in early life economic hardship trajectories and the role of sex in predicting adolescent overweight/obesity. *Journal of Youth and Adolescence*, 49(8), 1645–1662. https://doi.org/10.1007/s10964-020-01249-3.

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., Haines, J., Garcia, E., Douglas, S., & McBride, B. (2020). Fathers' food parenting: A scoping review of the literature from 1990 to 2019. *Pediatric Obesity*, 15(10), e12654. https://doi.org/10.1111/IJPO.12654.

Davison, K. K., & Birch, L. L. (2002a). Processes linking weight status and self-concept among girls from ages 5 to 7 years. *Developmental Psychology*, 38(5), 735–748. https://doi.org/10.1037//0012-1649.38.5.735.

Davison, K. K., & Birch, L. L. (2002b). Obesigenic families: Parents' physical activity and dietary intake patterns predict girls' risk of overweight. *International Journal of Obesity*, 26(9), 1186–1193. https://doi.org/10.1038/SJ.IJO.0802071.

Davison, K. K., Markey, C. N., & Birch, L. L. (2003). A longitudinal examination of patterns in girls' weight concerns and body dissatisfaction from ages 5 to 9 years. *International Journal of Eating Disorders*, 33(3), 320–332. https://doi.org/10.1002/EAT.10142.

de La O, A., Jordan, K. C., Ortiz, K., Moyer-Mileur, L. J., Stoddard, G., Friedrichs, M., Cox, R., Carlson, E. C., Heap, E., & Mihalopoulos, N. L. (2009). Do parents accurately perceive their child's weight status? *Journal of Pediatric Health Care*, 23(4), 216–221. https://doi.org/10.1016/J.PEDHC.2007.12.014.

Detecto (n.d.). Stadiometer. https://www.detecto.com/product/product-overview/Stadiometers/Free-Standing-Portable-Height-Rod-Mechanical.

Deierlein, A. L., Malkan, A., Litvak, J., & Parekh, N. (2019). Weight perception, weight control intentions, and dietary intakes among adolescents ages 10–15 years in the United States. *International Journal of Environmental Research and Public Health,* 16(6). https://doi.org/10.3390/ijerph16060990.

Devaney, B. L., Gordon, A. R., & Burghardt, J. A. (1995). Dietary intakes of students. *The American Journal of Clinical Nutrition*, 61(1), 205S-212S. https://doi.org/10.1093/AJCN/61.1.205S.

Diaz, C. J., & Niño, M. (2019). Familism and the Hispanic Health Advantage: The role of immigrant status. *Journal of Health and Social Behavior*, 60(3), 274–290. https://doi.org/10.1177/0022146519869027.

Dietz, W. H. (1983). Childhood obesity: Susceptibility, cause, and management. *The Journal of Pediatrics*, 103(5), 676–686. https://doi.org/10.1016/S0022-3476(83)80457-0.

Dietz, W. H. (1994). Critical periods in childhood for the development of obesity. *The American Journal of Clinical Nutrition*, 59(5), 955–959. https://doi.org/10.1093/AJCN/59.5.955.

Dietz, W. H. (1997). Periods of risk in childhood for the development of adult obesity - What do we need to learn? *Journal of Nutrition*, 127(9). https://doi.org/10.1093/jn/127.9.1884s.

Dominguez, K., Penman-Aguilar, A., Chang, M., Moonesinghe, R., Castellanos, T., Rodriguez-Lainz, A., & Schieber, R. (2015). Vital Signs: Leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States, 2009–2013. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6417a5.htm.

Drewnowski, A., & Specter, S. E. (2004). Poverty and obesity: the role of energy density and energy costs. *The American Journal of Clinical Nutrition*, 79(1), 6–16. https://doi.org/10.1093/AJCN/79.1.6.

Duncan, D. T., Hansen, A. R., Wang, W., Yan, F., & Zhang, J. (2015). Change in misperception of child's body weight among parents of American preschool children. *Childhood Obesity*, 11(4), 384–393. https://doi.org/10.1089/chi.2014.0104.

Ehrman, J. K., Kerrigan, D. J., & Keteyian, S. J. (2017). *Advanced exercise physiology: Essential concepts and applications.* Human Kinetics.

Eisenberg, M. E., Berge, J. M., Fulkerson, J. A., & Neumark-Sztainer, D. (2011). Weight comments by family and significant others in young adulthood. *Body Image*, 8(1), 12–19. https://doi.org/10.1016/j.bodyim.2010.11.002.

Eisenberg, M. E., Neumark-Sztainer, D., Story, M., & Perry, C. (2005). The role of social norms and friends' influences on unhealthy weight-control behaviors among adolescent girls. *Social Science and Medicine*, 60(6), 1165–1173. https://doi.org/10.1016/j.socscimed.2004.06.055.

Eisenmann, J. C., Heelan, K. A., & Welk, G. J. (2004). Assessing body composition among 3- to 8-year-old children: Anthropometry, BIA, and DXA. *Obesity Research*, 12(10), 1633–1640. https://doi.org/10.1038/OBY.2004.203.

Eliason, J., Acciai, F., Deweese, R. S., Vega-López, S., & Ohri-Vachaspati, P. (2020). Children's consumption patterns and their parent's perception of a healthy diet. *Nutrients*, 12(8), 1–12. https://doi.org/10.3390/NU12082322.

Ellison, R. C., Moore, L. L., Oliveria, S. A., Ellison, C., Gil, M. W., Garrahie, E. J., & Singer, M. R. (1992). Parent-child relationships in nutrient intake: The Framingham Children's Study. *American Journal of Clinical Nutrition*, 56, 593–598. https://doi.org/10.1093/ajcn/56.3.593.

Erickson, S. J., Robinson, T. N., Farish Haydel, K., & Killen, J. D. (2000). Are overweight children unhappy? Body mass index, depressive symptoms, and overweight concerns in elementary school children. *Archives of Pediatrics and Adolescent Medicine,* 154(9), 931–935. https://doi.org/10.1001/archpedi.154.9.931.

Erinosho, T., Dixon, L. B., Young, C., Brotman, L. M., & Hayman, L. L. (2011). Nutrition practices and children's dietary intakes at 40 child-care centers in New York City. *Journal of the American Dietetic Association*, 111(9), 1391–1397. https://doi.org/10.1016/J.JADA.2011.06.001.

Evans, E. H., Tovée, M. J., Boothroyd, L. G., & Drewett, R. F. (2013). Body dissatisfaction and disordered eating attitudes in 7- to 11-year-old girls: Testing a sociocultural model. *Body Image*, 10(1), 8–15. https://doi.org/10.1016/J.BODYIM.2012.10.001.

Evans, J., & le Grange, D. (1995). Body size and parenting in eating disorders: A comparative study of the attitudes of mothers towards their children. *International Journal of Eating Disorders.* https://onlinelibrary.wiley.com/doi/epdf/10.1002/1098-108X%28199507%2918%3A1%3C39%3A%3AAID-EAT2260180105%3E3.0.CO%3B2-I.

Falkner, N. H., Neumark-Sztainer, D., Story, M., Jeffery, R. W., Beuhring, T., & Resnick, M. D. (2001). Social, educational, and psychological correlates of weight status in adolescents. *Obesity Research*, 9(1), 32–42. https://doi.org/10.1038/oby.2001.5.

Feskens, E. J. M., Vlrtanen, S. M., Rasanen, L., Tuomilehto, J., Stengard, J., Pekkanen, J., & Nssinen, A. (1995). Dietary factors determining diabetes and impaired glucose tolerance a 20-year follow-up of the Finnish and Dutch cohorts of the seven countries study. *Diabetes Care*, 18(8). http://diabetesjournals.org/care/article-pdf/18/8/1104/444147/18-8-1104.pdf.

Field, A., Austin, S., Taylor, C., Malspeis, S., Rosner, B., & Rockett, H. (2003). Relation between dieting and weight change among preadolescents and adolescents. *Pedatrics*, 112(4), 900–906. https://go-gale-com.ezproxy.lib.ndsu.nodak.edu/ps/i.do?p=PROF&u=ndacad_58105ztrn&id=GALE|A110227056&v=2.1&it=r.

Field, A. E., Aneja, P., Austin, S. B., Shrier, L. A., de Moor, C., & Gordon-Larsen, P. (2007). Race and gender differences in the association of dieting and gains in BMI among young adults. *Obesity*, 15(2), 456–464. https://doi.org/10.1038/oby.2007.560.

Field, A. E., Camargo, C. A., Taylor, C. B., Berkey, C. S., Roberts, S. B., & Colditz, G. A. (2001). Peer, parent, and media influences on the development of weight concerns and frequent dieting among preadolescent and adolescent girls and boys. *Pediatrics*, 107(1), 54–60. https://doi.org/10.1542/PEDS.107.1.54.

Findlay, S. (2018, February 28). Dieting in adolescence. *Paediatr Child Health*. https://cps.ca/en/documents/position/dieting-adolescence.

Fisher, A., Mary, Lange, A., Young-Cureton, V., & Canham, D. (2005). The relationship between perceived and ideal body size and body mass index in 3rd-grade low socioeconomic Hispanic children. *The Journal of School Nursing*, 21, 4.

Fisher, J. O., Mitchell, D. C., Smiciklas-Wright, H., & Birch, L. L. (2002). Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *Journal of the American Dietetic Association*, 102(1), 58–64. https://doi.org/10.1016/S0002-8223(02)90017-9.

Fisher, M., Golden, N. H., Katzman, D. K., Kreipe, R. E., Rees, J., Schebendach, J., Sigman, G., Ammerman, S., & Hoberman, H. M. (1995). Eating disorders in adolescents: A background paper. *Journal of Adolescent Health*, 16, 420–437.

Foster, C. E., Horwitz, A., Thomas, A., Opperman, K., Gipson, P., Burnside, A., Stone, D. M., & King, C. A. (2017). Connectedness to family, school, peers, and community in socially vulnerable adolescents. *Children and Youth Services Review*, 81, 321–331. https://doi.org/10.1016/j.childyouth.2017.08.011.

Fox, M. K., Gearan, E., Cannon, J., Briefel, R., Deming, D. M., Eldridge, A. L., & Reidy, K. C. (2016). Usual food intakes of 2-and 3-year-old U.S. children are not consistent with dietary guidelines. *Nutrition*. https://doi.org/10.1186/s40795-016-0106-2.

Francis, L. A., & Birch, L. L. (2005). Maternal influences on daughters' restrained eating behavior. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 24(6), 548. https://doi.org/10.1037/0278-6133.24.6.548.

Frazier, L. D., Vaccaro, J. A., Garcia, S., Fallahazad, N., Rathi, K., Leslie Frazier, A. D., Shrestha, A., & Perez, N. (2015). Diet self-efficacy and physical self-concept of college students at risk for eating disorders. *Journal of Behavioral Health*. https://digitalcommons.fiu.edu/dietetics_nutrition_fac.

Freedman, D. S., Ogden, C. L., Flegal, K. M., Khan, L. K., Serdula, M. K., & Dietz, W. H. (2007). Childhood overweight and family income. Medscape General Medicine, 9(2), 26. http://pmc/articles/PMC1994830/.

Frieden, T. R., Harold Jaffe, D. W., Moolenaar, R. L., Leahy, M. A., Martinroe, J. C., Spriggs, S. R., Starr, T. M., Doan, Q. M., King, P. H., Roper, W. L., Hill, C., Matthew Boulton, C. L., Arbor, A., Virginia Caine, M. A., Barbara Ellis, I. A., Jonathan Fielding, G. E., Jones, T. F., Rima Khabbaz, T. F., Dennis Maki, G. G., … William Schaffner, W. (2013). CDC Health Disparities and Inequalities Report-United States, 2013 Supplement Morbidity and Mortality Weekly Report Supplement Centers for Disease Control and Prevention MMWR Editorial and Production Staff MMWR Editorial Board.

Fryar, C. D., Carroll, M. D., Ogden, C. L., Martin, C. B., Freedman, D. S., Gu, Q., & Hales, C. M. (2018). 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.

Fulkerson, J. A., Strauss, J., Neumark-Sztainer, D., Story, M., & Boutelle, K. (2007). Correlates of psychosocial well-being among overweight adolescents: The role of the family. *Journal of Consulting and Clinical Psychology*, 75(1), 181–186. https://psycnet.apa.org/record/2007-00916-020.

Galvin, G. (2018, May). A battle for community health in Texas' Rio Grande Valley. https://www.usnews.com/news/healthiest-communities/articles/2018-05-16/a-battle-for-community-health-in-texas-rio-grande-valley.

Garcìa De Amusquibar, A. M., García De Amusquibar, A. M., & de Simone, C. J. (2003). Some features of mothers of patients with eating disorders. *Eating Weight Disorders*, 8(3), 225–230.

Gardner, R. M., Friedman, B. N., & Jackson, N. A. (1998). Methodological concerns when using silhouettes to measure body image. *Perceptual and Motor Skills*, 86(2), 387–395. https://doi.org/10.2466/PMS.1998.86.2.387.

Gardner, R. M., Stark, K., Jackson, N. A., & Friedman, B. N. (1999). Development and validation of two new scales for assessment of body-image. *Perceptual and Motor Skills*, 89(3), 981–993. https://doi.org/10.2466/pms.1999.89.3.98.

Garfinkel, P., Goldbloom, D., Davis, R., Olmsted, M., Garner, D., & Halmi, K. (1992). Body dissatisfaction in bulimia nervosa: Relationship to weight and shape concerns and psychological functioning. *International Journal of Eating Disorders*, 11(2), 151–161.

https://web-s-ebscohost-com.ezproxy.lib.ndsu.nodak.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=94b170dc-fd14-4312-981f-b0106a3853b4%40redis.

Gebremariam, M. K., Vaqué-Crusellas, C., Andersen, L. F., Stok, F. M., Stelmach-Mardas, M., Brug, J., & Lien, N. (2017). Measurement of availability and accessibility of food among youth: A systematic review of methodological studies. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1). https://doi.org/10.1186/S12966-017-0477-Z.

Gibbs, B. G., & Forste, R. (2014). Socioeconomic status, infant feeding practices and early childhood obesity. *Pediatric Obesity*, 9(2), 135–146. https://doi.org/10.1111/J.2047-6310.2013.00155.x.

Gill, N., Gjelsvik, A., Mercurio, L. Y., & Amanullah, S. (2021). Childhood obesity is associated with poor academic skills and coping mechanisms. *Journal of Pediatrics*, 228, 278–284. https://doi.org/10.1016/j.jpeds.2020.09.004.x.

Glanz, K. (2001). *Nutrition in the Prevention and Treatment of Disease. In Nutrition in the Prevention and Treatment of Disease.* Academic Press. https://doi.org/10.1016/B978-012193155-1/50008-8.x.

Goldfield GS, Moore C, Henderson K, Buchholz A, Obeid N, Flament MF. Body dissatisfaction, dietary restraint, depression, and weight status in adolescents. *J Sch Health*. 2010 Apr;80(4):186-92. http://doi: 10.1111/j.1746-1561.2009.00485.x. PMID: 20433644.

Goldschmidt, A., Wall, M., Choo, T., Evans, E., Jelalian, E., Larson, N., & Neumark-Sztainer, D. (2018). Fifteen-year weight and disordered eating patterns among community-based adolescents. *American Journal of Preventive Medicine*, 54(1), e21–e29. https://doi.org/10.1016/J.AMEPRE.2017.09.005.

Gonzalez-Quiroz, Alicia (2009). The Relationship Among Weight Status and Physical Fitness with Body Dissatisfaction, Self-Leadership Rating and Self-Esteem in Predominately Mexican American Children using Structure Equation Modeling. Unpublished Dissertation, Our Lady of the Lake University (San Antonio, TX).

Gordon-Larsen, P. (2001). Obesity-related knowledge, attitudes, and behaviors in obese and non-obese urban Philadelphia female adolescents. *Obesity Research,* 9(2), 112–118. https://doi.org/10.1038/OBY.2001.14.

Gordon-Larsen, P., Harris, K. M., Ward, D. S., & Popkin, B. M. (2003). Acculturation and overweight-related behaviors among Hispanic immigrants to the US: The National Longitudinal Study of Adolescent Health. *Social Science & Medicine*, 57(11), 2023–2034. https://doi.org/10.1016/S0277-9536(03)00072-8.

Gow, M., Baur, L., Johnson, N., Cowell, C., & Garnett, S. (2017). Reversal of type 2 diabetes in youth who adhere to a very-low-energy diet: A pilot study. *Diabetologia*, 60(3), 406–415. https://doi.org/10.1007/S00125-016-4163-5/FIGURES/3.

Grant-Guimaraes, J., Feinstein, R., Laber, E., & Kosoy, J. (2016). Childhood Overweight and Obesity. *Gastroenterology Clinics of North America*, 45(4), 715–728. https://doi.org/10.1016/J.GTC.2016.07.007.

Guo, S. S., Huang, C., Maynard, L. M., Demerath, E., Towne, B., Chumlea, W. C., & Siervogel, R. M. (2000). Body mass index during childhood, adolescence and young adulthood in relation to adult overweight and adiposity: The Fels Longitudinal Study. *International Journal of Obesity*, 24:12, 24(12), 1628–1635. https://doi.org/10.1038/sj.ijo.0801461.

Guo, S. S., Roche, A. F., Chumlea, W. C., Gardner, J. D., & Siervogel, R. M. (1994). The predictive value of childhood body mass index values for overweight at age 35 y. *The American Journal of Clinical Nutrition*, 59(4), 810–819. https://doi.org/10.1093/AJCN/59.4.810.

Haines, J., Kleinman, K., Rifas-Shiman, S., Field, A., & Bryn, A. (2010). Examination of shared risk and protective factors for overweight and disordered eating among adolescents. *Archives of Pediatrics & Adolescent Medicine*, 164(4), 336–343. https://doi.org/10.1001/ARCHPEDIATRICS.2010.19.

Haines, J., Neumark-Sztainer, D., Hannan, P., & Robinson-O'Brien, R. (2008). Child versus parent report of parental influences on children's weight-related attitudes and behaviors. *Journal of Pediatric Psychology*, 33(7), 783–788. https://doi.org/10.1093/jpepsy/jsn016.

Halfon, N., Larson, K., Slusser, W., Halfon, D., & Larson, S. (2013). Associations between obesity and comorbid mental health development, and physical health conditions in a national representative sample of US children aged 10 to 17. *Academic Pediatrics*, 13(1), 6–13.

Han, E., & Powell, L. M. (2013). Consumption patterns of sugar-sweetened beverages in the United States. *Journal of the Academy of Nutrition and Dietetics*, 113(1), 43–53. https://doi.org/10.1016/J.JAND.2012.09.016.

Han, J. C., Lawlor, D. A., & Kimm, S. Y. (2010). Childhood Obesity – 2010: Progress and Challenges. *Lancet*, 375(9727), 1737. https://doi.org/10.1016/S0140-6736(10)60171-7.

Hanna, A. C., & Bond, M. J. (2006). Relationships between family conflict, perceived maternal verbal messages, and daughters' disturbed eating symptomatology. *Appetite*, 47(2), 205–211. https://doi.org/10.1016/J.APPET.2006.02.013.

Hart, L. M., Damiano, S. R., & Paxton, S. J. (2016). Confident body, confident child: A randomized controlled trial evaluation of a parenting resource for promoting healthy body image and eating patterns in 2- to 6-year-old children. *International Journal of Eating Disorders*, 49(5), 458–472. https://doi.org/10.1002/eat.22494.

Haynos, A. F., Wall, M. M., Chen, C., Wang, S. B., Loth, K., & Neumark-Sztainer, D. (2018). Patterns of weight control behavior persisting beyond young adulthood: Results from a 15-year longitudinal study. *International Journal of Eating Disorders*, 51(9), 1090–1097. https://doi.org/10.1002/eat.22963.

Hazrati, S., Khan, F., Huddleston, K., de La Cruz, F., Deeken, J. F., Fuller, A., Wong, W. S. W., Niederhuber, J. E., & Hourigan, S. K. (2019). Clinical and social factors associated with excess weight in Hispanic and non-Hispanic White children. *Pediatric Research*, 85, 256–261.

Healthy People 2030. (2022). Healthy People 2030 - Building a healthier future for all. https://health.gov/healthypeople.

Hill, A. J., & Silver, E. K. (1995). Fat, friendless and unhealthy 9-year-old children's perception of body shape stereotypes. *International Journal of Obesity and Related Metabolic Disorders*, 19, 423–430. https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx?ReferenceID=1458896.

Hitti, S. A., Avila, M., McDonald, S. E., Romo, S., Benzel, G. K., Hernandez, R. E., Vazquez, G., Sullivan, T. N., & Corona, R. (2020). The relation between body image perceptions, parental messages, and depressive symptoms among Latinx college students. *Cultural*

Diversity and Ethnic Minority Psychology, 26(3), 412–418. https://doi.org/10.1037/cdp0000309.

Hohman, E. E., Balantekin, K. N., Birch, L. L., & Savage, J. S. (2018). Dieting is associated with reduced bone mineral accrual in a longitudinal cohort of girls. *Public Health*, 18(1). https://doi.org/10.1186/s12889-018-6206-y.

Holub, S. C. (2008). Individual differences in the anti-fat attitudes of preschool-children: The importance of perceived body size. *Body Image*, 5(3), 317–321. https://doi.org/10.1016/J.BODYIM.2008.03.003.

Holub, S. C., Tan, C. C., & Patel, S. L. (2011). Factors associated with mothers' obesity stigma and young children's weight stereotypes. *Journal of Applied Developmental Psychology*, 32(3), 118–126. https://doi.org/10.1016/j.appdev.2011.02.006.

Hooper, A., & Dallos, R. (2012). Fathers and daughters: their relationship and attachment themes in the shadow of an eating disorder. *Contemporary Family Therapy*, 34(4), 452–467. https://doi.org/10.1007/S10591-012-9204-8.

Hu, F. B., van Dam, R. M., & Liu, S. (2001). Diet and risk of Type II diabetes: The role of types of fat and carbohydrate. *Diabetologia*, 44(7), 805–817. https://doi.org/10.1007/S001250100547.

Huon, G., Lim, J., & Gunewardene, A. (2000). Social influences and female adolescent dieting. *Journal of Adolescence*, 23(2), 229–232. https://doi.org/10.1006/JADO.2000.0310.

IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.

Intagliata, V., Ip, E. H., Gesell, S. B., & Barkin, S. L. (2008). Accuracy of self- and parental perception of overweight among Latino Preadolescents. *North Carolina Medical Journal*, 69(2), 88–91. http://www.iprc.unc.edu/longscan/pages/measures/.

Isong, I. A., Rao, S. R., Bind, M. A., Avendaño, M., Kawachi, I., & Richmond, T. K. (2018). Racial and Ethnic Disparities in Early Childhood Obesity. *Pediatrics*, 141(1). https://doi.org/10.1542/PEDS.2017-0865.

Isong, I. A., Richmond, T., Avendaño, M., & Kawachi, I. (2018). Racial/ethnic disparities: A longitudinal study of growth trajectories among US kindergarten children. *Journal of Racial and Ethnic Health Disparities*, 5:4, 5(4), 875–884. https://doi.org/10.1007/S40615-017-0434-1.

James, C., Moonesinghe, R., Wilson-Frederick, S. M., Hall, J. E., Penman-Aguilar, A., & Bouye, K. (2017). Racial/ethnic health disparities among rural adults — United States, 2012–2015. MMWR Surveillance Summaries, 66(23), 1. https://doi.org/10.15585/MMWR.SS6623A1.

Johnson, F., & Wardle, J. (2005). Dietary restraint, body dissatisfaction, and psychological distress: A prospective analysis. *Journal of Abnormal Psychology*, 114(1), 119–125. https://doi.org/10.1037/0021-843X.114.1.119.

Jones-Smith, J. C., Dieckmann, M. G., Gottlieb, L., Chow, J., & Fernald, L. C. H. (2014). Socioeconomic status and trajectory of overweight from birth to mid-childhood: The early childhood longitudinal study-birth cohort. *PLoS ONE*, 9(6). https://doi.org/10.1371/journal.pone.0100181.

Jyoti, D. F., Frongillo, E. A., & Jones, S. J. (2005). Food insecurity affects school children's academic performance, weight gain, and social skills. *The Journal of Nutrition*, 135(12), 2831–2839. https://doi.org/10.1093/JN/135.12.2831.

Kansra, A. R., Lakkunarajah, S., & Jay, M. S. (2021). Childhood and adolescent obesity: A review. *Frontiers in Pediatrics*, 8, 866. https://doi.org/10.3389/FPED.2020.581461/BIBTEX.

Kant, A. K. (2002). Association of self-perceived body weight status with dietary reporting by U.S. Teens. *Obesity Research*, 10(12), 1259–1269. https://doi.org/10.1038/OBY.2002.171.

Kaplowitzl, H., Martorelv, R., & Mendoza, F. S. (1989). Fatness and fat distribution in Mexican American children and youths from the Hispanic Health and Nutrition Examination Survey. *American Journal of Human Biology*, 1.

Katiria Perez, G., & Cruess, D. (2014). The impact of familism on physical and mental health among Hispanics in the United States. *Health Psychology Review*, 8(1), 95–127. https://doi.org/10.1080/17437199.2011.569936.

Keel, P. K., Mitchell, J. E., Davis, T. L., & Crow, S. J. (2001). Relationship between depression and body dissatisfaction in women diagnosed with bulimia nervosa. *International Journal of Eating Disorders*, 30(1), 48–56. https://doi.org/10.1002/EAT.1053.

Keery, H., Boutelle, K., van den Berg, P., & Thompson, J. K. (2005). The impact of appearance-related teasing by family members. *Journal of Adolescent Health*, 37(2), 120–127. https://doi.org/10.1016/J.JADOHEALTH.2004.08.015.

Kelishadi, R., & Azizi-Soleiman, F. (2014). Controlling childhood obesity: A systematic review on strategies and challenges. *Journal of Research in Medical Sciences*.

Kirk, S., Brehm, B., Saelens, B., Woo, J., Kissel, E., D'Alessio, D., Bolling, C., & Daniels, S. (2012). Role of Carbohydrate Modification in Weight Management among Obese Children: A Randomized Clinical Trial. *The Journal of Pediatrics*, 161(2), 320-327.e1. https://doi.org/10.1016/J.JPEDS.2012.01.041.

Kitagawa, T., Owada, M., Urakami, T., & Yamauchi, K. (1998). Dependent Diabetes Mellitus Among Japanese Schoolchildren Correlates with an Increased Intake of Animal Protein and Fat. *Clin Pediatr,* 37, 111–116.

Klein, K. M., Brown, T. A., Kennedy, G. A., & Keel, P. K. (2017). Examination of parental dieting and comments as risk factors for increased drive for thinness in men and women at 20-year follow-up. *International Journal of Eating Disorders*, 50(5), 490–497. https://doi.org/10.1002/EAT.22599.

Krebs, N., Gao, D., Gralla, J., Collins, J., & Johnson, S. (2010). Efficacy and safety of a high protein, low carbohydrate diet for weight loss in severely obese adolescents. *The Journal of Pediatrics*, 157(2), 252–258. https://doi.org/10.1016/J.JPEDS.2010.02.010.

Krebs-Smith, S. M., Guenther, P. M., Subar, A. F., Kirkpatrick, S. I., & Dodd, K. W. (2010). Americans do not meet Federal Dietary Recommendations. *The Journal of Nutrition*, 140(10), 1832–1838. https://doi.org/10.3945/JN.110.124826.

Kristof, N. (2020). Opinion | Now is a time to learn from Hispanic Americans. The New York Times. https://www.nytimes.com/2020/06/27/opinion/sunday/hispanic-americans.html.

LaFontana, K. M., & Cillessen, A. H. N. (2002). Children's perceptions of popular and unpopular peers: A multimethod assessment. *Developmental Psychology*, 38(5), 635–647. https://doi.org/10.1037/0012-1649.38.5.635.

Lamerz, A., Kuepper-Nybelen, J., Wehle, C., Bruning, N., Trost-Brinkhues, G., Brenner, H., Hebebrand, J., & Herpertz-Dahlmann, B. (2005). Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany. *International Journal of Obesity*, 29(4), 373–380. https://doi.org/10.1038/SJ.IJO.0802914.

Lampard, A. M., Maclehose, R. F., Eisenberg, M. E., Larson, N. I., Davison, K. K., & Neumark-Sztainer, D. (2016). Adolescents who engage exclusively in healthy weight control behaviors: Who are they? *International Journal of Behavioral Nutrition and Physical Activity*, 13(1), 1–10. https://doi.org/10.1186/S12966-016-0328-3/TABLES/4.

Larsen, J. K., Hermans, R. C. J., Sleddens, E. F. C., Engels, R. C. M. E., Fisher, J. O., & Kremers, S. S. P. J. (2015). How parental dietary behavior and food parenting practices affect children's dietary behavior. Interacting sources of influence? *Appetite*, 89, 246–257. https://doi.org/10.1016/J.APPET.2015.02.012.

Larson, N. I., Neumark-Sztainer, D., & Story, M. (2009). Weight control behaviors and dietary intake among adolescents and young adults: Longitudinal findings from Project EAT. *Journal of the American Dietetic Association*, 109(11), 1869–1877. https://doi.org/10.1016/j.jada.2009.08.016.

Lê-Scherban, F., Moore, J., Headen, I., Utidjian, L., Zhao, Y., & Forrest, C. B. (2021). Are there birth cohort effects in disparities in child obesity by maternal education? *International Journal of Obesity*, 45(3), 599–608. https://doi.org/10.1038/s41366-020-00724-y.

Liechty, J. M., Clarke, S., Birky, J. P., & Harrison, K. (2016). Perceptions of early body image socialization in families: Exploring knowledge, beliefs, and strategies among mothers of preschoolers. *Body Image*, 19, 68–78. https://doi.org/10.1016/j.bodyim.2016.08.010.

Lim, C. S., Gowey, M. A., Silverstein, J., Dumont-Driscoll, M., & Janicke, D. M. (2016). Depressive symptoms, ethnic identity, and health-related quality of life in obese youth. *Journal of Pediatric Psychology*, 41(4), 441–452. https://doi.org/10.1093/jpepsy/jsv014.

Lindsay, R. S. (2001). Body mass index as a measure of adiposity in children and adolescents: Relationship to adiposity by dual energy x-ray absorptiometry and to cardiovascular risk factors. *Journal of Clinical Endocrinology & Metabolism*, 86(9), 4061–4067. https://doi.org/10.1210/JC.86.9.4061.

Ling, J., Stommel, M., & Choi, S. H. (2018). Attempts to lose weight among us children: Importance of weight perceptions from self, parents, and health professionals. *Obesity*, 26(3), 597–605. https://doi.org/10.1002/OBY.22106.

Lino, M., Gerrior, S., Basiotis, P., & Anand, R. (1999). Report card on the diet quality of children. *Family Economics and Nutrition Review*, 12(3 & 4), 78–80. https://go-gale-com.ezproxy.lib.ndsu.nodak.edu/ps/i.do?p=PROF&u=ndacad_58105ztrn&id=GALE%7CA67583131&v=2.1&it=r.

Linville, D., Stice, E., Gau, J., & O'Neil, M. (2011). Predictive effects of mother and peer influences on increases in adolescent eating disorder risk factors and symptoms: A 3-year longitudinal study. *International Journal of Eating Disorders*, 44(8), 745–751. https://doi.org/10.1002/EAT.20907.

Loth, K. A., Maclehose, R., Bucchianeri, M., Crow, S., & Neumark-Sztainer, D. (2014). Predictors of dieting and disordered eating behaviors from adolescence to young adulthood. *Journal of Adolescent Health*, 55(5), 705–712. https://doi.org/10.1016/j.jadohealth.2014.04.016.

Lowes, J., & Tiggemann, M. (2003). Body dissatisfaction, dieting awareness and the impact of parental influence in young children. *British Journal of Health Psychology*, 8(2), 135–147. https://doi.org/10.1348/135910703321649123.

Lutter, C. K., & Rivera, J. A. (2003). Nutritional status of infants and young children and characteristics of their diets. *The Journal of Nutrition*, 133(9), 2941S-2949S. https://doi.org/10.1093/JN/133.9.2941S.

Lydecker, J. A., & Grilo, C. M. (2018). Are we listening? Parents' perspectives on treating pediatric obesity. *Journal of Adolescent Health*, 62(2), S90. https://doi.org/10.1016/J.JADOHEALTH.2017.11.182.

Lydecker, J. A., Riley, K. E., & Grilo, C. M. (2018). Associations of parents' self, child, and other "fat talk" with child eating behaviors and weight. *International Journal of Eating Disorders*, 51(6), 527–534. https://doi.org/10.1002/eat.22858.

Lydecker, J. A., Simpson, L., Smith, S. R., White, M. A., & Grilo, C. M. (2022). Preoccupation in bulimia nervosa, binge-eating disorder, anorexia nervosa, and higher weight. *International Journal of Eating Disorders*, 55(1), 76–84. https://doi.org/10.1002/EAT.23630.

Lydecker, J., White, M., & Grilo, C. (2017). Form and formulation: Examining the distinctiveness of body image construct. *Journal of Consulting and Clinical Psychology*, 85(11), 1095–1103. https://web-s-ebscohost-com.ezproxy.lib.ndsu.nodak.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=81d9131d-9129-4108-9f0e-93f4d9c24ae9%40redis.

Lytle, L. A., Himes, J. H., Feldman, H., Zive, M., Dwyer, J., Hoelscher, D., Webber, L., & Yang, M. (2002). Nutrient intake over time in a multi-ethnic sample of youth. *Public Health Nutrition*, 5(2), 319–328. https://doi.org/10.1079/PHN2002255.

Ma, Z., & Hample, D. (2018). Modeling parental influence on teenagers' food consumption: An analysis using the family life, activity, sun, health, and eating (FLASHE) Survey. *Journal of Nutrition Education and Behavior*, 50(10), 1005–1014. https://doi.org/10.1016/J.JNEB.2018.07.005.

Maffeis, C., & Morandi, A. (2018). Body composition and insulin resistance in children. *European Journal of Clinical Nutrition*, 72 (9), 1239–1245. Nature Publishing Group. https://doi.org/10.1038/s41430-018-0239-2.

Malina, R., Zavaleta, A., & Little, B. (1987). Secular changes in the stature and weight of Mexican American school children in Brownsville, Texas, between 1928 and 1983. *Human Biology*, 59(3), 509–522. https://www.jstor.org/stable/41464822.

Mann, J. I., de Leeuw, I., Hermansen, K., Karamanos, B., Karlström, B., Katsilambros, N., Riccardi, G., Rivellese, A. A., Rizkalla, S., Slama, G., Toeller, M., Uusitupa, M., & Vessby, B. (2004). Evidence-based nutritional approaches to the treatment and prevention of diabetes mellitus. *Nutrition, Metabolism and Cardiovascular Diseases*, 14(6), 373–394. https://doi.org/10.1016/S0939-4753(04)80028-0.

Marchi, M., & Cohen, P. (1990). Early childhood eating behaviors and adolescent eating disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(1), 112–117. https://doi.org/10.1097/00004583-199001000-00017.

Markey, C. H., & Gillen, M. M. (2022). Dieting. *Neuroscience and Biobehavioral Psychology*. Elsevier. https://doi.org/10.1016/B978-0-323-91497-0.00007-2.

Markey, C. N., & Gillen, M. M. (2016). Dieting. *In Encyclopedia of Mental Health: Second Edition* (pp. 46–50). Academic Press. https://doi.org/10.1016/B978-0-12-397045-9.00061-6.

Marshall, J. A., Bessesen, D. H., & Hamman, R. F. (1997). High saturated fat and low starch and fiber are associated with hyperinsulinemia in a non-diabetic population: The San Luis Valley Diabetes Study. *Diabetologia* 1997 40:4, 40(4), 430–438. https://doi.org/10.1007/S001250050697.

Marshall, J. A., Hoag, S., Shetterly, S., & Hamman, R. F. (1994). Dietary fat predicts conversion from impaired glucose tolerance to NIDDM: The San Luis Valley Diabetes Study. *Diabetes Care*, 17(1), 50–56. https://doi.org/10.2337/DIACARE.17.1.50.

Martinez, S. M., Rhee, K. E., Blanco, E., & Boutelle, K. (2017). Latino mothers' beliefs about child weight and family health. *Public Health Nutrition*, 20(6), 1099. https://doi.org/10.1017/S1368980016002962.

Masheb, R. M., & Grilo, C. M. (2000). On the relation of attempting to lose weight, restraint, and binge eating in outpatients with binge eating disorder. *Obesity Research*, 8(9), 638–645. https://doi.org/10.1038/OBY.2000.82.

Maynard, L. M., Wisemandle, W., Roche, A. F., Chumlea, W. C., Guo, S. S., & Siervogel, R. M. (2001). Childhood body composition in relation to body mass index. *Pediatrics*, 107(2), 344–350. https://doi.org/10.1542/peds.107.2.344.

McCormack, L. A., Laska, M. N., Gray, C., Veblen-Mortenson, S., Barr-Anderson, D., & Story, M. (2011). Weight-related teasing in a racially diverse sample of sixth-grade children. *Journal of the American Dietetic Association*, 111(3), 431–436. https://doi.org/10.1016/J.JADA.2010.11.021.

Mech, P., Hooley, M., Skouteris, H., & Williams, J. (2016). Parent-related mechanisms underlying the social gradient of childhood overweight and obesity: A systematic review. *Child: Care, Health and Development*, 42(5), 603–624. https://doi.org/10.1111/CCH.12356.

Melnik, T. A., Rhoades, S. J., Wales, K. R., Cowell, C., & Wolfe, W. S. (1997). Overweight school children in New York City: Prevalence estimates and characteristics. *International Journal of Obesity*, 22(1), 7–13. https://doi.org/10.1038/sj.ijo.0800537.

Mendoza, F. S. (2009). Health disparities and children in immigrant families: A research agenda. *Pediatrics*, 124(3), S187–S195. https://doi.org/10.1542/PEDS.2009-1100F.

Meyer, K. A., Kushi, L. H., Jacobs, D. R., & Folsom, A. R. (2001). Dietary fat and incidence of type 2 diabetes in older Iowa women. *Diabetes Care*, 24(9), 1528–1535. https://doi.org/10.2337/DIACARE.24.9.1528.

Micali, N., Solmi, F., Horton, N. J., Crosby, R. D., Eddy, K. T., Calzo, J. P., Sonneville, K. R., Swanson, S. A., & Field, A. E. (2015). Adolescent eating disorders predict psychiatric, high-risk behaviors and weight outcomes in young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*, 54(8), 652. https://doi.org/10.1016/J.JAAC.2015.05.009.

Miller, M., Saldarriaga, E. M., & Jones-Smith, J. C. (2020). Household socioeconomic status modifies the association between neighborhood SES and obesity in a nationally representative sample of first grade children in the United States. *Preventive Medicine Reports*. https://doi.org/10.1016/j.pmedr.2020.101207.

Mirza, N. M., Davis, D., & Yanovski, J. A. (2005). Adolescent health brief body dissatisfaction, self-esteem, and overweight among inner-city Hispanic children and adolescents. *Journal of Adolescent Health*, 36, 267. https://doi.org/10.1016/j.jadohealth.2004.02.033.

Mirza, N. M., Palmer, M. G., Sinclair, K. B., McCarter, R., He, J., Ebbeling, C. B., Ludwig, D. S., & Yanovski, J. A. (2013). Effects of a low glycemic load or a low-fat dietary intervention on body weight in obese Hispanic American children and adolescents: a randomized controlled trial. *The American Journal of Clinical Nutrition*, 97(2), 276–285. https://doi.org/10.3945/AJCN.112.042630.

Montoya, C., Boursaw, B., Tigges, B., & Lobo, M. L. (2016). Mirror, mirror on the wall: Children's preferences and self-perceptions of weight in a rural Hispanic community. *Journal of Pediatric Health Care*, 30(6), 528–534. https://doi.org/10.1016/j.pedhc.2015.11.010

Morandi, A., Miraglia Del Giudice, E., Martino, F., Martino, E., Bozzola, M., & Maffeis, C. (2014). Anthropometric indices are not satisfactory predictors of metabolic comorbidities in obese children and adolescents. *Journal of Pediatrics*, 165(6), 1178-1183.e2. https://doi.org/10.1016/j.jpeds.2014.07.004.

Moreno-Black, G., & Stockard, J. (2015). Two worlds of obesity: Ethnic differences in child overweight/obesity prevalence and trajectories. *Journal of Racial and Ethnic Health Disparities*, 3(2), 331–339. https://doi.org/10.1007/s40615-015-0150-7.

Murphy, S. P., Subar, A. F., & Block, G. (1990). Vitamin E intakes and sources in the United States. *The American Journal of Clinical Nutrition*, 52(2), 361–367. https://doi.org/10.1093/AJCN/52.2.361.

Musher-Eizenman, D. R., Holub, S. C., Edwards-Leeper, L., Persson, A., & Goldstein, S. E. (2003). The narrow range of acceptable body types of preschoolers and their mothers. *Journal of Applied Developmental Psychology*, 24(2), 259–272. https://doi.org/10.1016/S0193-3973(03)00047-9.

National Center for Health Statistics. (2015). Health, United States, 2015: With special feature on racial and ethnic health disparities. https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_04.pdf.

National Eating Disorders Collaboration. (2022). Body Image. https://nedc.com.au/assets/Fact-Sheets/NEDC-Fact-Sheet-Body-Image.pdf.

National Institutes of Health. (1994, June 6-8). Optimal Calcium Intake. *NIH Consensus Statement Online*. https://consensus.nih.gov/1994/1994optimalcalcium097html.htm.

Neumark-Sztainer, D. (2006). Eating among teens: Do family mealtimes make a difference for adolescents' nutrition? *New Directions for Child and Adolescent Development* ,111, 91–105. https://doi.org/10.1002/CD.157.

Neumark-Sztainer, D., Hannan, P. J., Story, M., & Perry, C. L. (2004). Weight-control behaviors among adolescent girls and boys: Implications for dietary intake. *Journal of the American Dietetic Association*, 104(6), 913–920. https://doi.org/10.1016/j.jada.2004.03.021.

Neumark-Sztainer, D., Story, M., Hannan, P. J., & Croll, J. (2002). Overweight status and eating patterns among adolescents: Where do youths stand in comparison with the Healthy People 2010 Objectives? *American Journal of Public Health*, 92(5), 844–851. https://doi.org/10.2105/AJPH.92.5.844.

Neumark-Sztainer, D., Story, M., Hannan, P. J., Perry, C. L., & Irving, L. M. (2002). Weight-related concerns and behaviors among overweight and nonoverweight adolescents implications for preventing weight-related disorders. *Arch Pediatr Adolesc Med*, 156(2), 171-178.

Neumark-Sztainer, D., Wall, M., Eisenberg, M. E., Story, M., & Hannan, P. J. (2006). Overweight status and weight control behaviors in adolescents: Longitudinal and secular trends from 1999 to 2004. *Preventive Medicine*, 43(1), 52–59. https://doi.org/10.1016/J.YPMED.2006.03.014.

Neumark-Sztainer, D., Wall, M. M., Larson, N., Story, M., Fulkerson, J. A., Eisenberg, M. E., & Hannan, P. J. (2012). Secular trends in weight status and weight-related attitudes and behaviors in adolescents from 1999 to 2010. *Preventive Medicine*, 54(1), 77–81. https://doi.org/10.1016/J.YPMED.2011.10.003.

Neumark-Sztainer, D., Wall, M., Story, M., & Standish, A. R. (2012). Dieting and unhealthy weight control behaviors during adolescence: Associations with 10-year changes in body mass index. *Journal of Adolescent Health*, 50(1), 80–86. https://doi.org/10.1016/j.jadohealth.2011.05.010.

Nguyen, Q. M., Srinivasan, S. R., Xu, J. H., Chen, W., Kieltyka, L., & Berenson, G. S. (2010). Utility of childhood glucose homeostasis variables in predicting adult diabetes and related cardiometabolic risk factors: The Bogalusa Heart Study. *Diabetes Care*, 33(3), 670–675. https://doi.org/10.2337/DC09-1635.

Nip, A. S. Y., Reboussin, B. A., Dabelea, D., Bellatorre, A., Mayer-Davis, E. J., Kahkoska, A. R., Lawrence, J. M., Peterson, C. M., Dolan, L., & Pihoker, C. (2019). Disordered eating behaviors in youth and young adults with type 1 or type 2 diabetes receiving insulin therapy: The SEARCH for diabetes in youth study. *Diabetes Care*, 42(5), 859–866. https://doi.org/10.2337/dc18-2420.

Ogden, C. L., & Carroll, M. D. (2015). Overweight, obesity, and extreme obesity among adults 2007-2008. https://www.cdc.gov/nchs/data/hestat/obesity_adult_07_08/obesity_adult_07_08.htm.

Ogden, C. L., Carroll, M. D., Fakhouri, T. H., Hales, C. M., Fryar, C. D., Li, X., & Freedman, D. S. (2018). Prevalence of obesity among youths by household income and education level of head of household - united states 2011-2014. MMWR Morb Mortal Wkly, Rep. https://www.cdc.gov/mmwr/volumes/67/wr/mm6706a3.htm?s_cid=mm6706a3_w.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA*, 288(14), 1728–1732. https://doi.org/10.1001/JAMA.288.14.1728.

Ogden, C. L., Lamb, M. M., Carroll, M. D., & Flegal, K. M. (2005). Obesity and socioeconomic status in children and adolescents: United States, 2005-2008 key findings data from the National Health and Nutrition Examination Survey, 2005-2008.

Ottova, V., Erhart, M., Rajmil, L., Dettenborn-Betz, L., & Ravens-Sieberer, U. (2012). Overweight and its impact on the health-related quality of life in children and adolescents: results from the European KIDSCREEN survey. *Research*, 21(1), 59–69. https://doi.org/10.1007/sl.

Paeratakul, S., White, M. A., Williamson, D. A., Ryan, D. H., & Bray, G. A. (2002). Sex, race/ethnicity, socioeconomic status, and BMI in relation to self-perception of overweight. *Obesity Research*, 10(5), 345–350. https://doi.org/10.1038/OBY.2002.48.

Palfreyman, Z., Haycraft, E., & Meyer, C. (2013). Unintentional role models: Links between maternal eating psychopathology and the modeling of eating behaviours. *European Eating Disorders Review*, 21(3), 195–201. https://doi.org/10.1002/ERV.2219.

Palfreyman, Z., Haycraft, E., & Meyer, C. (2014). Development of the parental modelling of eating behaviours scale (PARM): Links with food intake among children and their mothers. *Maternal and Child Nutrition*, 10(4), 617–629. https://doi.org/10.1111/J.1740-8709.2012.00438.

Palfreyman, Z., Haycraft, E., & Meyer, C. (2015). Parental modeling of eating behaviors: Observation validation of the parental modeling of eating behaviors scale (PARM). *Appetite*, 86, 31–37.

Park, S. (2017). Comparison of body composition between fashion models and women in general. *Journal of Exercise Nutrition & Biochemistry*, 21(4), 22. https://doi.org/10.20463/JENB.2017.0032.

Patrick, H., Nicklas, T. A., Hughes, S. O., & Morales, M. (2005). The benefits of authoritative feeding style: Caregiver feeding styles and children's food consumption patterns. *Appetite*, 44(2), 243–249. https://doi.org/10.1016/J.APPET.2002.07.001.

Patton, G. C., Selzer, R., Coffey, C., Carlin, J. B., & Wolfe, R. (1999). Onset of adolescent eating disorders: Population based cohort study over 3 years. *British Medical Journal*, 318(7186), 765–768. https://doi.org/10.1136/bmj.318.7186.765.

Pearson, N., Timperio, A., Salmon, J., Crawford, D., & Biddle, S. J. H. (2009). Family influences on children's physical activity and fruit and vegetable consumption. *International Journal of Behavioral Nutrition and Physical Activity*, 6(1), 1–7. https://doi.org/10.1186/1479-5868-6-34/TABLES/1.

Pedersen, S., Grønhøj, A., & Thøgersen, J. (2015). Following family or friends: Social norms in adolescent healthy eating. *Appetite*, 86, 54–60. https://doi.org/10.1016/j.appet.2014.07.030.

Phillips, R. G., & Hill, A. J. (1998). Fat, plain, but not friendless: self-esteem and peer acceptance of obese pre-adolescent girls. *International Journal of Obesity*, 22(4), 287–293. https://doi.org/10.1038/sj.ijo.0800582.

Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumello, G., & Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: a validation study. *The Journal of Pediatrics*, 132(2), 204–210. https://doi.org/10.1016/S0022-3476(98)70433-0.

Pinhas-Hamiel, O., & Levy-Shraga, Y. (2013). Eating disorders in adolescents with type 2 and type 1 diabetes. *Current Diabetes Reports*, 13(2), 289–297. https://doi.org/10.1007/s11892-012-0355-7.

Prichard, I., Hodder, K., Hutchinson, A., & Wilson, C. (2012). Predictors of mother-daughter resemblance in dietary intake: The role of eating styles, mothers' consumption, and closeness. *Appetite*, 58(1), 271–276. https://doi.org/10.1016/j.appet.2011.10.012.

Prickett, K. C., & Augustine, J. M. (2016). Maternal education and investments in children's health. *Journal of Marriage and Family*, 78(1), 7–25. https://doi.org/10.1111/JOMF.12253.

Pulgarón, E. R., Patiño-Fernández, A. M., Sanchez, J., Carrillo, A., & Delamater, A. M. (2013). Hispanic children and the obesity epidemic: Exploring the role of abuelas. *Families, Systems and Health*, 31(3), 274–279. https://doi.org/10.1037/a0034208.

Qi, Q., Hua, S., Perreira, K. M., Cai, J., van Horn, L., Schneiderman, N., Thyagarajan, B., Delamater, A. M., Kaplan, R. C., & Isasi, C. R. (2017). Sex differences in associations of adiposity measures and insulin resistance in US Hispanic/Latino youth: The Hispanic Community Children's Health Study/Study of Latino Youth (SOL Youth). *The Journal of*

Clinical Endocrinology and Metabolism, 102(1), 185. https://doi.org/10.1210/JC.2016-2279.

Rahill, S., Kennedy, A., & Kearney, J. (2020). Fathers' perception of child's weight and paternal feeding practices in relation to child's gender. *Proceedings of the Nutrition Society*, 79(OCE2), 350. https://doi.org/10.1017/S0029665120002980.

Rasmussen, M., Krølner, R., Klepp, K. I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006). Determinants of fruit and vegetable consumption among children and adolescents: A review of the literature. Part I: Quantitative studies. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 1–19. https://doi.org/10.1186/1479-5868-3-22/TABLES/4.

Ratner, B. (2009). The correlation coefficient: Its values range between 1/1, or do they. *Journal of Targeting, Measurement and Analysis for Marketing*, 17(2), 139–142. https://doi.org/10.1057/JT.2009.5/TABLES/2.

Rawana, J. S., Morgan, A. S., Nguyen, H., Craig, S. G., Rawana, J. S., Morgan, A. S., Nguyen, Á. H., & Craig, Á. S. G. (2010). The relation between eating-and weight-related disturbances and depression in adolescence: A review. *Clin Child Fam Psychol Rev*, 13, 213–230. https://doi.org/10.1007/s10567-010-0072-1.

Reedy, J., & Krebs-Smith, S. M. (2010). Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *Journal of the American Dietetic Association*, 110(10), 1477–1484. https://doi.org/10.1016/J.JADA.2010.07.010.

Reifsnider, E., Flores-Vela, A. R., Beckman-Mendez, D., Nguyen, H., Keller, C., & Dowdall-Smith, S. (2006). Perceptions of children's body sizes among mothers living on the

Texas-Mexico Border (La Frontera). *Public Health Nursing*, 23(6), 488–495. https://doi.org/10.1111/J.1525-1446.2006.00588.

Reinehr, T., Kiess, W., Kapellen, T., & Andler, W. (2004). Insulin sensitivity among obese children and adolescents, according to degree of weight loss. *Pediatrics*, 114(6), 1569–1573. https://doi.org/10.1542/peds.2003-0649-F.

Reinehr, T., Stoffel-Wagner, B., & Roth, C. (2008). Retinol-binding protein 4 and its relation to insulin resistance in obese children before and after weight loss. *The Journal of Clinical Endocrinology & Metabolism*, 93(6), 2287–2293. https://doi.org/10.1210/JC.2007-2745.

Rezaei-Dehaghani, A., Paki, S., & Keshvari, M. (2015). The relationship between family functioning and self-esteem in female high school students of Isfahan, Iran, in 2013-2014. *Iranian Journal of Nursing and Midwifery Research*, 20, 3. http://www.ijnmrjournal.net.

Ricciardelli, L. A., & McCabe, M. P. (2001). Children's body image concerns and eating disturbance: A review of the literature. *Clinical Psychology Review*, 21(3), 325–344. https://doi.org/10.1016/S0272-7358(99)00051-3.

Richardson, S. A., Goodman, N., Hastorf, A. H., & Dornbusch, S. M. (1961). Cultural uniformity in reaction to physical disabilities. *American Sociological Review*, 26(2), 241. https://doi.org/10.2307/2089861.

Rierdan, J., & Koff, E. (1997). Weight, weight-related aspects of body image, and depression in early adolescent girls. *Adolescence*, 32(127), 615+. https://link.gale.com/apps/doc/A20413254/CSIC?u=ndacad_58105ztrn&sid=bookmark-CSIC&xid=70e0e462.

Robinson, T. N., Chang, J. Y., Haydel, K. F., & Killen, J. D. (2001). Overweight concerns and body dissatisfaction among third-grade children: The impacts of ethnicity and socioeconomic status. *Journal of Pediatrics*, 138(2), 181–187. https://doi.org/10.1067/mpd.2001.110526.

Roche, A. F., Guo, S., Baumgartner, R. N., Chumlea, W. C., Ryan, A. S., & Kuczmarski, R. J. (1990). Reference data for weight, stature, and weight/stature2 in Mexican Americans from the Hispanic Health and Nutrition Examination Survey (HHANES 1982-1984). *American Journal of Clinical Nutrition*, 51 (5). https://doi.org/10.1093/ajcn/51.5.917.

Rodgers, R. F., Paxton, S. J., Massey, R., Campbell, K. J., Wertheim, E. H., Skouteris, H., & Gibbons, K. (2013). Maternal feeding practices predict weight gain and obesogenic eating behaviors in young children: A prospective study. *International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 1–10. https://doi.org/10.1186/1479-5868-10-24/TABLES/4.

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. https://doi.org/10.1089/CHI.2015.0029.

Romero, A., Robinson, T., Haydel, K., & Farish, B. A. (2004). Associations among familism, language preference, and education. *Journal of Developmental & Behavioral Pediatrics*, 25(1), 34–40. https://journals.lww.com/jrnldbp/Abstract/2004/02000/Associations_Among_Familism,_Language_Preference,.6.aspx.

Romo, L. F., & Mireles-Rios, R. (2016). Latina immigrant mother–daughter communication about their body self-esteem and weight dissatisfaction: An exploratory video-observational study. *Journal of Latina/o Psychology*, 4(1), 18–31. https://doi.org/10.1037/lat0000044.

Romo, L. F., Mireles-Rios, R., & Hurtado, A. (2016). Cultural, media, and peer influences on body beauty perceptions of Mexican American adolescent girls. *Journal of Adolescent Research*, 31(4), 474–501. https://doi.org/10.1177/0743558415594424.

Ronald, E., Kleinman, M., Frank, R., & Greer, M. (2019). Pediatric Nutrition, 8th Ed. https://www.eatrightstore.org/product-type/books/pediatric-nutrition-8th-edition.

Roncolato, W., Huon, G., Braganza, C., & Ritchie J. (1998). Nutritional knowledge, food-related and body-related attitudes among preadolescents. *Australian Journal of Nutrition and Dietetics*, 55(4), 195–202. https://web-s-ebscohost-com.ezproxy.lib.ndsu.nodak.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=26df5e92-3df3-469f-9c66-8d481d796539%40redis.

Rosen, D. S., Blythe, M. J., Braverman, P. K., Breuner, C. C., Levine, D. A., Murray, P. J., O'Brien, R. F., & Seigel, W. M. (2010). Clinical report - Identification and management of eating disorders in children and adolescents. *Pediatrics*, 126(6),1240–1253. https://doi.org/10.1542/peds.2010-2821.

Rosenbaum, M., & Leibel, R. L. (1998). The physiology of body weight regulation: Relevance to the etiology of obesity in children. *Pediatrics*, 101(2), 525–539. https://doi.org/10.1542/PEDS.101.S2.525.

Rossen, L. M. (2014). Neighborhood economic deprivation explains racial/ethnic disparities in overweight and obesity among children and adolescents in the USA. *J Epidemiol Community Health*, 68(2), 123–129. https://doi.org/10.1136/JECH-2012-202245.

Ryan, A. S., Martinez, G. A., & Roche, A. F. (1990). An evaluation of the association between socioeconomic status and the growth of Mexican American children: Data from the Hispanic Health and Nutrition Examination Survey (HHANES 1982-1994). *American Journal of Clinical Nutrition*, 51, 944S-952S.

Sabogal, F., Marín, G., Otero-Sabogal, R., Marín, B. V. O., & Perez-Stable, E. J. (1987). Hispanic familism and acculturation: What changes and what doesn't? Hispanic *Journal of Behavioral Science*, 9(4), 397–412. https://doi.org/10.1177/07399863870094003.

Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: Causes and consequences. *Journal of Family Medicine and Primary Care*, 4(2), 187. https://doi.org/10.4103/2249-4863.154628.

Salvy, S.-J., & Bowker, J. C. (2014). Peers and obesity during childhood and adolescence: A review of the empirical research on peers, eating, and physical activity. *Journal of Obesity & Weight Loss Therapy*, 4(1). https://doi.org/10.4172/2165-7904.1000207.

Santoro, N. (2013). Childhood obesity and type 2 diabetes: The frightening epidemic. *World Journal of Pediatrics*, 9(2), 101–102. https://doi.org/10.1007/s12519-013-0410-8.

Sarafrazi, N., Hughes, J. P., Borrud, L., Burt, V., & Paulose-Ram, R. (2014). Perception of weight status in U.S. children and adolescents aged 8–15 years, 2005– 2012. http://www.cdc.gov/nchs/data/databriefs/db158_table.pdf#3.

Sarwono, J. (2017). Path Analysis: Data Analysis Application: Using IBM SPSS and Stata: 9781549677236.

Saunders, J. F., Leslie, •, Frazier, D., & Nichols-Lopez, K. A. (2016). Self-esteem, diet self-efficacy, body mass index, and eating disorders: modeling effects in an ethnically diverse sample. *Eat Weight Disord*, 21, 459–468. https://doi.org/10.1007/s40519-015-0244-6.

Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior: conception to adolescence. *A Journal of the American Society of Law, Medicine & Ethics*, 35(1), 22–34. https://doi.org/10.1111/J.1748-720X.2007.00111.

Sawka, K. J., McCormack, G. R., Nettel-Aguirre, A., & Swanson, K. (2015). Associations between aspects of friendship networks and dietary behavior in youth: Findings from a systematized review. *Eating Behaviors*, 18, 7–15. https://doi.org/10.1016/j.eatbeh.2015.03.002.

Schur, E. A., Sanders, M., & Steiner, H. (2000). Body dissatisfaction and dieting in young children. *Disord*, 27, 74–82. https://doi.org/10.1002/(SICI)1098-108X(200001)27:1.

Sepúveda, A. R., Botella, J., & Leon, J. (2002). Body-image disturbance in eating disorders: A meta-analysis. *Psychology in Spain*, 6, 83–95. https://psycnet.apa.org/record/2003-03358-009.

Sheppard, K. W., & Cheatham, C. L. (2018). Omega-6/omega-3 fatty acid intake of children and older adults in the U.S.: Dietary intake in comparison to current dietary recommendations and the Healthy Eating Index. *Lipids in Health and Disease*, 17(1), 1–12. https://doi.org/10.1186/S12944-018-0693-9/TABLES/3.

Siegel, J. A., Ramseyer Winter, V., & Cook, M. (2021). “It really presents a struggle for females, especially my little girl”: Exploring fathers’ experiences discussing body image with their young daughters. *Body Image,* 36, 84–94. https://doi.org/10.1016/J.BODYIM.2020.11.001.

Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2016). Predicting adult obesity from childhood obesity: A systematic review and meta-analysis. *Obesity Reviews*, 17(2), 95–107. https://doi.org/10.1111/obr.12334.

Skemp-Arlt, K. M., Rees, K. S., Mikat, R. P., & Seebach, E. E. (2006). Body image dissatisfaction among third, fourth, and fifth grade children. *Californian Journal of Health Promotion*, 4(3), 58–67. https://doi.org/10.32398/CJHP.V4I3.1958.

Skouteris, H., McCabe, M., Swinburn, B., & Hill, B. (2010). Healthy eating and obesity prevention for preschoolers: A randomized controlled trial. *Public Health*, 10(1), 1–9. https://doi.org/10.1186/1471-2458-10-220/TABLES/1.

Snethen, J. A., & Broome, M. E. (2007). Weight, exercise, and health: children's perceptions. *Clinical Nursing Research*, 16(2), 138–152. https://doi.org/10.1177/1054773806298508.

Snorgaard, O., Poulsen, G. M., Andersen, H. K., & Astrup, A. (2017). Systematic review and meta-analysis of dietary carbohydrate restriction in patients with type 2 diabetes. *Diabetes Research and Care*, 5(1). https://doi.org/10.1136/bmjdrc-2016-000354.

Sobal, J., & Stunkard, A. J. (1989). Socioeconomic status and obesity: A review of the literature. *Psychological Bulletin*, 105(2), 260–275. https://doi.org/10.1037/0033-2909.105.2.260.

Society for Adolescent Health and Medicine. (2020). Preventing nutritional disorders in adolescents by encouraging a healthy relationship with food. *The Journal of Adolescent Health*, 67(6), 875–879. https://doi.org/10.1016/J.JADOHEALTH.2020.09.022.

Sosa, E. T. (2012). Mexican American mothers' perceptions of childhood obesity: A theory-guided systematic literature review. *Health Education and Behavior*, 39 (4), 396–404. https://doi.org/10.1177/1090198111398129.

Sosa, E. T., Lisako Mckyer, E., Pruitt, B., & Lisako, E. (2015). The complexities of childhood obesity: A qualitative study among Mexican American mothers. *Journal of Health Disparities Research and Practice*, 8(3). https://digitalscholarship.unlv.edu/jhdrpAvailableat:https://digitalscholarship.unlv.edu/jhdrp/vol8/iss3/1.

Spiel, E. C., Paxton, S. J., & Yager, Z. (2012). Weight attitudes in 3-to 5-year-old children: Age differences and cross-sectional predictors. *Body Image*, 9, 524–527. https://doi.org/10.1016/j.bodyim.2012.07.006.

State of Childhood Obesity. (2021, April). Obesity rates for youth ages 10 to 17. https://stateofchildhoodobesity.org/children1017/.

State of Childhood Obesity. (2022, April). National obesity monitor. https://stateofchildhoodobesity.org/monitor/.

Statista. (2022). U.S. Hispanic population, by state 2019. https://www.statista.com/statistics/259850/hispanic-population-of-the-us-by-state/.

Stein, G. L., Gonzalez, L. M., Cupito, A. M., Kiang, L., & Supple, A. J. (2013). The protective role of familism in the lives of Latino adolescents. *Journal of Family Issues*, 36(10), 1255–1273. https://doi.org/10.1177/0192513X13502480.

Steiner, R. J., Sheremenko, G., Lesesne, C., DIttus, P. J., Sieving, R. E., & Ethier, K. A. (2019). Adolescent connectedness and adult health outcomes. *Pediatrics*, 144(1). https://doi.org/10.1542/PEDS.2018-3766/37106.

Steinhilber, K. M., Ray, S., Harkins, D. A., & Sienkiewicz, M. E. (2020). Father–daughter relationship dynamics & daughters' body image, eating patterns, and empowerment: An exploratory study. *Women & Health*, 60(10), 1083–1094. https://doi.org/10.1080/03630242.2020.1801554.

Stevens, J., Cornell, C. E., Story, M., French, S. A., Levin, S., Becenti, A., Gittelsohn, J., Going, S. B., & Reid, R. (1999). Development of a questionnaire to assess knowledge, attitudes, and behaviors in American Indian children. *The American Journal of Clinical Nutrition*, 69(4). https://doi.org/10.1093/AJCN/69.4.773S.

Stice, E., Agras, W. S., & Hammer, L. D. (1999). Risk factors for the emergence of childhood eating disturbances: A five-year prospective study. *Int J Eat Disord*, 25, 375–387. https://doi.org/10.1002/(SICI)1098-108X(199905)25:4.

Stice, E., Cameron, R., Killen, J., Hayward, C., & Taylor, B. (1999). Naturalistic weight-reduction efforts prospectively predict growth in relative weight and onset of obesity among female adolescents. *Journal of Consulting and Clinical Psychology*, 67(6), 967–974. https://web-p-ebscohost-com.ezproxy.lib.ndsu.nodak.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=2edd1b7f-0b43-4664-83d8-06c2a0cf1361%40redis.

Stice, E., Davis, K., Miller, N. P., & Marti, C. N. (2008). Fasting increases risk for onset of binge eating and bulimic pathology: A 5-year prospective study. *Journal of Abnormal Psychology*, 117(4), 941–946. https://doi.org/10.1037/A0013644.

Stice, E., Marti, C. N., Rohde, P., & Shaw, H. (2011). Testing mediators hypothesized to account for the effects of a dissonance-based eating disorder prevention program over longer term follow-up. *Journal of Consulting and Clinical Psychology,* 79(3), 398–405. https://doi.org/10.1037/A0023321.

Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology: A synthesis of research findings. *Journal of Psychosomatic Research*, 53(5), 985–993. https://doi.org/10.1016/S0022-3999(02)00488-9.

Stice, E., Shaw, H., & Marti, N. (2006). A meta-analytic review of obesity prevention programs for children and adolescents. *Psychological Bulletin*, 132, 667–691. https://web-s-ebscohost-com.ezproxy.lib.ndsu.nodak.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=3cc3b560-7dd4-4a0e-b40c-447ba36da3d8%40redis.

Story, M., Neumark-Sztainer, D., Sherwood, N., Stang, J., & Murray, D. (1998). Dieting status and its relationship to eating and physical activity behaviors in a representative sample of US adolescents. *Journal of the American Dietetic Association*, 98(10), 1127–1135. https://doi.org/10.1016/S0002-8223(98)00261-2.

Story, M., Stevens, J., Evans, M., Cornell, C. E., Juhaeri, Gittelsohn, J., Going, S. B., Clay, T. E., & Murray, D. M. (2001). Weight loss attempts and attitudes toward body size, eating, and physical activity in American Indian children: Relationship to weight status and gender. *Obesity Research*, 9(6), 356–363. https://doi.org/10.1038/OBY.2001.46.

Strauss, R. S. (2000). Childhood obesity and self-esteem. *Pediatrics*, 105(1). http:// 10.1542/peds.105.1.e15.

Suisman, J., & Klump, K. (2012, October 2013). Thin ideal internalization: An interview with Jessica Suisman and Kelly Klump. https://www.news-medical.net/news/20121023/Thin-ideal-internalization-an-interview-with-Jessica-Suisman-and-Kelly-Klump.aspx.

Suisman, J. L., O'Connor, S. M., Sperry, S., Thompson, J. K., Keel, P. K., Burt, S. A., Neale, M., Boker, S., Sisk, C., & Klump, K. L. (2012). Genetic and environmental influences on thin-ideal internalization. *International Journal of Eating Disorders*, 45(8), 942–948. https://doi.org/10.1002/EAT.22056.

Taniguchi, E. (2019). Parental confirmation, body dissatisfaction, and disordered eating behaviors among female college students. *Family Relations*, 68(5), 624–637. https://doi.org/10.1111/fare.12389.

Tanita (n.d.). Weight scale. https://www.tanita.com/en/.

Tanofsky-Kraff, M., Cohen, M., Yanovski, S., Cox, C., Theim, K., Keil, M., Reynolds, J., & Yanovski, J. (2006). A prospective study of psychological predictors of body fat gain among children at high risk for adult obesity. *Pediatrics*, 117(4), 1203–1209. https://doi.org/10.1542/PEDS.2005-1329.

Tay, J., Thompson, C. H., Luscombe-Marsh, N. D., Wycherley, T. P., Noakes, M., Buckley, J. D., Wittert, G. A., Yancy, W. S., & Brinkworth, G. D. (2018). Effects of an energy-restricted low-carbohydrate, high unsaturated fat/low saturated fat diet versus a high-carbohydrate, low-fat diet in type 2 diabetes: A 2-year randomized clinical trial. *Diabetes, Obesity and Metabolism*, 20(4), 858–871. https://doi.org/10.1111/dom.13164.

Texas Department of State Health Services. (2018). Prevalence of obesity among adults, by demographic characteristics, risk factors / comorbid conditions, and place of residence, Texas, 2018. https://www.dshs.texas.gov/obesity/pdf/2018-BRFSS-Obesity-Tables.pdf.

The Academy for Eating Disorders. (2021). Guidebook for nutrition treatment of eating disorders guidebook for nutrition treatment of eating disorders authored by Academy for Eating Disorders Nutrition Working Group. http:// https://higherlogicdownload.s3.amazonaws.com/AEDWEB/27a3b69a-8aae-45b2-a04c-

2a078d02145d/UploadedImages/Publications_Slider/FINAL_AED_Purple_Nutrition_Book.pdf.

Thompson, J. K., Heinberg, L. J., Altabe, M., & Tantleff-Dunn, S. (1999). *Exacting beauty: Theory, assessment, and treatment of body image disturbance.* American Psychological Association. https://doi.org/10.1037/10312-000.

Thompson, J. K., Shroff, H., Herbozo, S., Cafri, G., Rodriguez, J., & Rodriguez, M. (2007). Relations among multiple peer influences, body dissatisfaction, eating disturbance, and self-esteem: a comparison of average weight, at risk of overweight, and overweight adolescent girls. *Journal of Pediatric Psychology*, 32(1), 24–29. https://doi.org/10.1093/JPEPSY/JSL022.

Thompson, S. H., Corwin, S. J., & Sargent, R. G. (1997). Ideal body size beliefs and weight concerns of fourth-grade children. *Int J Eat Disord* (Vol. 21). John Wiley & Sons, Inc.

Tibbs, T., Haire-Joshu, D., Schechtman, K. B., Brownson, R. C., Nanney, M. S., Houston, C., & Auslander, W. (2001). The relationship between parental modeling, eating patterns and dietary intake among African American parents. *Journal of the American Dietetic Association*, 101(5), 535–541.

Trahms, C.M. & Pipes, P.L. (1997). Nutrient needs of infants and children. *Nutrition in Infancy and Childhood 6th ed.* (pp.35-67). McGraw-Hill.

Treviño, R. P., Fogt, D. L., Wyatt, T. J., Leal-Vasquez, L., Sosa, E., & Woods, C. (2008). Diabetes risk, low fitness, and energy insufficiency levels among children from poor families. *Journal of the American Dietetic Association*, 108(11), 1846–1853. https://doi.org/10.1016/j.jada.2008.08.009.

Treviño-Peña, R., Wang, X., Wang, L., Romero, Z., Alanis, E., & Li, H. (2021). Social and health risk factor levels of preschool children living along the Texas-Mexico Border. *Journal of School Health*, 91(2), 87–93. https://doi.org/10.1111/josh.12979.

Trichopoulou, A., Costacou, T., Bamia, C., & Trichopoulos, D. (2003). Adherence to a Mediterranean diet and survival in a Greek population. *N Engl J Med*, 348(26), 2599–2608. https://doi.org/10.1056/NEJMOA025039.

Truby, H., & Paxton, S. J. (2002). Development of the children's body image scale. *British Journal of Clinical Psychology*, 41(2), 185–203. https://doi.org/10.1348/014466502163967.

Truby, H., & Paxton, S. J. (2008). The children's body image scale: Reliability and use with international standards for body mass index. *The British Journal of Clinical Psychology*, 47(Pt 1), 119–124. https://doi.org/10.1348/014466507X251261.

United States Census Bureau. (2020, May). 2020 Census frequently asked questions about race and ethnicity. https://www.census.gov/programs-surveys/decennial-census/decade/2020/planning-management/release/faqs-race-ethnicity.html.

U.S. Census Bureau. (2018, May). QuickFacts: Texas. https://www.census.gov/quickfacts/TX.

U.S. Department of Health & Human Services. (2020, May). Healthy Border. https://www.hhs.gov/sites/default/files/res_2805.pdf.

van Geel, M., Vedder, P., & Tanilon, J. (2014). Are overweight and obese youths more often bullied by their peers? A meta-analysis on the relation between weight status and bullying. *International Journal of Obesity*, 38(10), 1263–1267. Nature Publishing Group. https://doi.org/10.1038/ijo.2014.117.

vander Wal, J. S., & Mitchell, E. R. (2011). Psychological complications of pediatric obesity. *Pediatric Clinics of North America*, 58(6), 1393–1401. https://doi.org/10.1016/j.pcl.2011.09.008.

Vaughn, A. E., Martin, C. L., & Ward, D. S. (2018). What matters most - What parents' model or what parents eat? *Appetite*, 126, 102–107. https://doi.org/10.1016/J.APPET.2018.03.025.

Vazquez, C. E., & Cubbin, C. (2020). Socioeconomic status and childhood obesity: A review of literature from the past decade to inform intervention research. *Current Obesity Reports*, 9(4), 562–570. Springer. https://doi.org/10.1007/s13679-020-00400-2.

Ventura, A. K., Loken, E., & Birch, L. L. (2009a). Developmental trajectories of girls' BMI across childhood and adolescence. *Obesity*, 17(11), 2067–2074. https://doi.org/10.1038/oby.2009.123.

Vessby, B., Uusitupa, M., Hermansen, K., Riccardi, G., Rivellese, A. A., Tapsell, L. C., Nälsén, C., Berglund, L., Louheranta, A., Rasmussen, B. M., Calvert, G. D., Maffetone, A., Pedersen, E., Gustafsson, I. B., & Storlien, L. H. (2001). Substituting dietary saturated for monounsaturated fat impairs insulin sensitivity in healthy men and women: The KANWU study. *Diabetologia*, 44(3), 312–319. https://doi.org/10.1007/S001250051620.

Vygotsky, L. 1978. *Mind in Society: The development of higher psychological processes*, Edited by: Cole, John-Steiner, Scribner and Souberman. Cambridge, MA: Harvard University Press.

Walker, J. L., Ardouin, S., & Burrows, T. (2018). The validity of dietary assessment methods to accurately measure energy intake in children and adolescents who are overweight or obese: A systematic review. *European Journal of Clinical Nutrition*, 72(2), 185–197. Nature Publishing Group. https://doi.org/10.1038/s41430-017-0029-2.

Wambogo, E. A., Ansai, N., Ahluwalia, N., & Ogden, C. L. (2015). Fruit and vegetable consumption among children and adolescents in the united states, 2015-2018 key findings data from the National Health and Nutrition Examination Survey, 2015-2018. https://www.cdc.gov/nchs/products/index.htm.

Wang, F., Wild, T. C., Kipp, W., Kuhle, S., & Veugelers, R. J. (2009). The influence of childhood obesity on the development of self-esteem. *Health Reports*, 20(2), 21–27.

Wang, Y., Beydoun, M. A., Li, J., Liu, Y., & Moreno, L. A. (2011). Do children and their parents eat a similar diet? Resemblance in child and parental dietary intake: Systematic review and meta-analysis. *Journal of Epidemiology and Community Health*, 65(2), 177–189. https://doi.org/10.1136/JECH.2009.095901.

Wang, Y., & Chen, X. (2011). How much of racial/ethnic disparities in dietary intakes, exercise, and weight status can be explained by nutrition- and health-related psychosocial factors and socioeconomic status among us adults? *Journal of the American Dietetic Association*, 111(12), 1904–1911. https://doi.org/10.1016/J.JADA.2011.09.036.

Wang, Y., & Zhang, Q. (2006). Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overeight and family income between 1971 and 2002. *American Journal of Clinical Nutrition*, 84, 707–716.

Ward, Z. J., Long, M. W., Resch, S. C., Giles, C. M., Cradock, A. L., & Gortmaker, S. L. (2017). Simulation of growth trajectories of childhood obesity into adulthood. *New England Journal of Medicine*, 377(22), 2145–2153. https://doi.org/10.1056/NEJMOA1703860.

Wardle, J., Volz, C., & Golding, C. (1995). Social variation in attitudes to obesity in children. *Int J Obes Relat Metab Disord.*, 562–569. https://pubmed.ncbi.nlm.nih.gov/7489027/.

Weber Cullen, K., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & de Moor, C. (2001). Child-reported family and peer influences on fruit, juice and vegetable consumption: Reliability and validity of measures assumption. *Health Education Research*, 16(2).

Wertheim, E. H., Koerner, J., & Paxton, S. J. (2001). Longitudinal predictors of restrictive eating and bulimic tendencies in three different age groups of adolescent girls. *Journal of Youth and Adolescence*, 30(1), 69–81. https://doi.org/10.1023/A:1005224921891.

Whitney, E. Noss., & Rolfes, S. Rady. (1999). *Understanding Nutrition*. West/Wadsworth.

Wilfley, D., Berkowitz, R., Goebel-Fabbri, A., Hirst, K., Ievers-Landis, C., Lipman, T. H., Marcus, M., Ng, D., Pham, T., Saletsky, R., Schanuel, J., & van Buren, D. (2011). Binge eating, mood, and quality of life in youth with type 2 diabetes: Baseline data from the TODAY study. *Diabetes Care*, 34(4), 858–860. https://doi.org/10.2337/dc10-1704.

Williams, A. S., Ge, B., Petroski, G., Kruse, R. L., McElroy, J. A., & Koopman, R. J. (2018). Socioeconomic status and other factors associated with childhood obesity. *Journal of the American Board of Family Medicine*, 31(4), 514–521. https://doi.org/10.3122/jabfm.2018.04.170261.

Wood, K. C., Becker, J. A., & Thompson, J. K. (1996). Body image dissatisfaction in preadolescent children. *Journal of Applied Developmental Psychology*, 17(1), 85–100. https://doi.org/10.1016/S0193-3973(96)90007-6.

World Health Organization. (2022, April). Obesity and overweight. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.

World Health Organization. (2008). World Health Organization Interpreting Growth Indicators. https://www.who.int/tools/child-growth-standards.

Worobey, J., & Lopez, M. I. (2005). Perceptions and preferences for infant body size by low-income mothers. *Journal of Reproductive and Infant Psychology,* 23(4), 303–308. https://doi.org/10.1080/02646830500273210.

Wu, S., Ding, Y., Wu, F., Li, R., Hu, Y., Hou, J., & Mao, P. (2015). Socio-economic position as an intervention against overweight and obesity in children: a systematic review and meta-analysis. *Scientific Reports*, 5(1), 1–11. https://doi.org/10.1038/srep11354.

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 (1). BioMed Central Ltd. https://doi.org/10.1186/s12966-017-0501-3.

Young, E. M., Fors, S. W., & Hayes, D. M. (2004). Associations between perceived parent behaviors and middle school student fruit and vegetable consumption. *Journal of Nutrition Education and Behavior,* 36(1), 2–12. https://doi.org/10.1016/S1499-4046(06)60122.

Zeller, M. H., & Modi, A. C. (2006). Predictors of health-related quality of life in obese youth. *Obesity*, 14(1), 122–130. https://doi.org/10.1038/oby.2006.15.

Zeller, M. H., Reiter-Purtill, J., & Ramey, C. (2012). Negative Peer Perceptions of Obese Children in the Classroom Environment. *Obesity*, 16(4), 755–762. https://doi.org/10.1038/oby.2008.4?sid=vendor%3Adatabase.

APPENDIX A. SOUTH TEXAS EARLY PREVENTION STUDY - PRE-K PROJECT (STEPS) IRB APPROVAL LETTER

The University of Texas
Rio Grande Valley

To: Dr. Roberto Trevino

From: Office of Research Compliance

Subject: Notice of Receipt

IRBNet ID: 1100614-1
IRB# 2017-175-07
Project Title: South Texas Early Prevention Study – Pre-k Project

Dear Principal Investigator,

This is to acknowledge the receipt of your IRB submission titled "South Texas Early Prevention Study – Pre-k Project". Your application is incomplete and is currently pending your revisions. Once your protocol has been revised, it will be forwarded to an assigned member for review and approval.

Sincerely,

Lynne Depeault
Interim Manager
Office of Research Compliance
UTRGV

7-24-2017

APPENDIX B. NORTH DAKOTA STATE UNIVERSITY IRB APPROVAL LETTER

NDSU NORTH DAKOTA STATE UNIVERSITY

09/03/2021

Dr. Elizabeth Dianne Hilliard
Health, Nutrition & Exercise

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #IRB0003689, "The Relationship Among the Perception of Healthy Body Weight, Parent's Dieting Behavior and Child's Dieting Behavior to Body Mass Index and Diabetes."

NDSU Co-investigator(s) and research team:

- Elizabeth Dianne Hilliard
- Alicia Gonzalez Quiroz

Approval Date: 09/03/2021
Expiration Date: 09/02/2024
Study site(s): Not applicable. All STEPS Project data has been collected and is being secured by STEPS Project. I will only conduct data analysis on data that has been already collected.
Funding Agency:
The above referenced human subjects research project has been determined exempt (category 4) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*).

Please also note the following:

- The study must be conducted as described in the approved protocol.
- Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Promptly report adverse events, unanticipated problems involving risks to subjects or others, or protocol deviations related to this project.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

RESEARCH INTEGRITY AND COMPLIANCE
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | ndsu.research@ndsu.edu

Shipping Address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

APPENDIX C. STEPS CONSENT FORM

Title of Study:
South Texas Early Prevention Study Pre-K" (STEPS Pre-K)

Consent to be part of the South Texas Prevention Study (STEPS)
To be conducted at:
Pharr-San Juan-Alamo Independent School Districts (PSJAISD)
La Joya Independent School Districts (LJISD)
University of Texas Rio Grande Valley (UTRGV)

Information about this form

If you are providing consent for someone else, for example your child, your next-of-kin or someone for whom you are the legal guardian or are designated as a surrogate decision-maker on a medical power of attorney, please note that in the sections that follow the word "you" refers to the person you are providing consent for.

You may be eligible to take part in a 2-year research study. This form gives you important information about the study.

Please take time to review this information carefully. Please feel free to talk to the researchers about the study and ask them any questions you have. You may also wish to talk to others (for example, your friends, family, or a doctor) about your participation in this study. If you decide to take part in the study, you will be asked to sign this form. Before you sign this form, be sure you understand what the study is about, including the risks and possible benefits to you. Any information included in this form will not be shared with any other agency outside this study.

Please tell the researchers or study staff if you are taking part in another research study.

Voluntary Participation – You do not have to participate if you don't want to. You may also leave the study at any time. If you leave the study before it is finished, there will be no penalty to you, and you will not lose any benefits to which you are entitled.

General Information – "Who is conducting this research?"

Principal Investigator
The Principal Investigator (PI) and Co PIs are the researchers directing this study; they are responsible for protecting your rights, safety and welfare as a participant in the research. The PI for this study is Roberto P. Treviño, M.D., with UTRGV Department of Health and Human Performance (DHHP); the Co-PIs are Drs. Lin Wang and Zasha Romero with UTRGV DHHP and Dr. Xiaohui Wang with UTRGV School of Mathematical and Statistical Sciences.

Study Sponsor: U.S. Department of Health and Human Service (DHHS)
DHHS is a federal government agency that promotes scientific research and is funding this study (the sponsor). The sponsor reviewed the study plan and is providing money to UTRGV so that the researchers can conduct the study.

Purpose of this study – "Why is this study being done?"

The researchers are asking you to take part in a 2-year study of a children's obesity prevention program to understand its effectiveness. We believe that a combination of teaching, modeling healthy behaviors, and community support in childhood can reduce the risk of developing obesity. Together, working with school staff from LJISD and PSJAISD, we hope to improve the health of children. We will be asking students, parents, teachers, school administrators, cafeteria staff, and nurses for their thoughts and recommendations on how to improve the Bienestar coordinated school health program.

The University of Texas Rio Grande Valley
IRB APPROVED
IRB# 2017-175-07
Expires: 03/26/2019

Title of Study:
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This is a research study to evaluate the effectiveness of a school-based obesity prevention program. Bienestar is a health program that combines an instructional portion of health classes, P.E. classes, parent newsletters, communications and cafeteria classes.

Researchers hope to learn about best methods for implementation and how effective the Bienestar is in the schools. Your feedback will help the researchers improve the Bienestar school health program.

Information about Study Participants – "Who is participating in this research?"

You are being asked to be a participant in this study because you or your child is enrolled in pre-kindergarten at LJISD and PSJAISD.

How many people are expected to take part in this study?
This study will enroll approximately 5068 study participants [2352 children, 2352 parents (1 parent per child) and 364 school staff].

Information about Study Procedures – "What will be done if you decide to be in the research?"

While your child is taking part in this study, we will plan on seeing him/her with his/her class during the school years 2018 – 2019 and 2019 - 2020, at their school: once at the beginning of the year for baseline data collection and then at the end of the school year with post data collection (4 data collection periods). The visits will be scheduled with the school staff of LJISD and PSJAISD.

Study Procedures - as a participant, you will undergo some of the following procedures 4 times:

- We will ask you about your child's medical history.
- We will ask about your demographic information. For example, we will ask for parent educational attainment and/or how many people live in your household.
- We will measure your child's height, and weight. Each measurement will take 5 minutes. We will use your child's height and weight to calculate their body mass index (BMI). Every child will be asked to take off their shoes, socks, and may be asked to adjust their hair so that an accurate height and weight measurement can be obtained.
- We will be recording the meals which your child consumes at school through the use of digital imagery. This will be of breakfast, lunch, and dinner for three days.
- We will send home a parental health practices questionnaire for you to fill out. This questionnaire(s) will take about 30 minutes to complete.
- We will measure physical activity of the child using the PACER test. This test will measure the number of laps your child can do within a certain period of time.
- We will schedule parent face-to-face meeting with parents to check on their child's health progress and to provide you reports on your child's health screenings.
- We will schedule one end-of-the-year meet to evaluate the health program.
- We will collect your child's academic performance from the school records.

All children in your child's grade will receive the health program, even if they choose not to take part in the health exams.

Agreeing to participate in this study also means that you will allow us to contact and speak with you. We will call/text you before we collect data from your child (only four times throughout the study), as a reminder. We will also call/text you to remind you about the parent meetings we will hold. In addition, you will receive a copy of your child's results. Finally, we will also speak with you to answer any questions that you might have about our research or the study.

Risks – "What are the risks of participation in the research?"

There are no reasonably expected risks associated with the study procedures. To protect your child's privacy, physical measurements are taken behind a screen with clothing on. All study related documents will be stored by the study team in a secure location and nobody outside of the research team will have access to the information collected as part of this study.

For more information about risks, ask one of the researchers or study staff.

Are there Risks related to withdrawing from the study?
If you decide to withdraw from this study early, please discuss your decision with the Co-Investigator, Dr. Zasha Romero. The researcher may ask you to complete study withdrawal procedures at a final study visit. This visit includes completion of forms stating your withdrawal. There is no risk to you if you do not complete the final withdrawal procedures and you can choose not to participate in them.

What if a research-related injury occurs?
The investigators have taken the necessary measures to minimize known or expected risks. Nonetheless, you may experience some secondary problems or risks even if the investigators have carefully tried to prevent them. In the event of a research-related injury or if you experience an adverse reaction, please immediately contact your doctor and the investigators. See the section "Contact Information" for phone numbers and additional information.

If you are injured or made sick from taking part in this research study, we will contact the parents immediately. You will be responsible for any cost. We have no plans to give you money if you are injured.

If you sign this form, you do not give up your right to seek additional compensation if you are harmed as a result of being in this study.

Benefits – "How could you or others benefit from your taking part in this study?"

You may not receive any personal benefits from being in this study. However, with the gained knowledge from the Bienestar Coordinated Health Program, you may be able to lead a healthier lifestyle and be aware of risks associated with obesity and type 2 diabetes.

If we find out that your child is at risk for diabetes or obesity we will inform you immediately. We will provide you with a health report card that will inform you of your child's results.

We hope the information learned from this study will benefit other people with similar conditions in the future.

Alternative procedures or course of treatment – "What other options are there to participation in this study?"

All children attending the LJISD and PSJAISD and who participate in the program will benefit from the education received. Only children that are consented will take part in data collections.

Payments – Will there be any payments for participation?

There are no payments for your participation.

Costs – Will taking part in this study cost anything?

You will not have to pay any money to take part in this study.

Confidentiality – How will your records be kept confidential?

Information we learn about you in this study will be handled in a confidential manner, within the limits of the law. If we publish the results of the study in a scientific journal or book, we will not identify you. The Institutional Review Board and other groups that have the responsibility of monitoring research may want to see study records which identify you as a subject in this study.

The University of Texas Rio Grande Valley
IRB APPROVED
IRB# 2017-175-07
Expires: 03/26/2019

IRB APPROVED UTRGV

Title of Study:
South Texas Early Prevention Study Pre-K" (STEPS Pre-K)

Contact Information – Who can you contact if you have questions, concerns, comments or complaints?

If you have questions now, feel free to ask us. If you have additional questions, concerns, comments or complaints later or you wish to report a problem which may be related to this study please contact:

Primary contact:
Zasha Romero, Ph.D. can be reached at (956) 665-2881 or zasha.romero@utrgv.edu.

If primary is not available or it is after normal work hours, contact:
Lin Wang, Ph. D. at (956) 665-5263 or lin.wang@utrgv.edu.

The UTRGV committee that reviews research on human subjects (Institutional Review Board) will answer any questions about your rights as a research subject, and take any comments or complaints you may wish to offer. You can contact the IRB by calling (956) 665-2093 or by mail to IRB, UTRGV, 1201 University Drive, Edinburg, TX 78539.

Research Consent & Authorization Signature Section

If you agree to participate in this research and agree to the use of your protected health information in this research, sign this section. You will be given a signed copy of this form to keep. You do not waive any of your legal rights by signing this form.

SIGN THIS FORM ONLY IF THE STATEMENTS LISTED BELOW ARE TRUE

- You have read the above information.
- Your questions have been answered to your satisfaction about the research and about the collection, use and sharing of your protected health information.

Adult Signature Section

- You have voluntarily decided to take part in this research study.
- You authorize the collection, use and sharing of your protected health information as described in this form.

			AM PM
Printed Name of Subject	Signature of Subject	Date	Time
			AM PM
Printed Name of Witness	Signature of Witness	Date	Time

☐ *Check if consent and authorization obtained from an individual who is unable to read and/or write but can otherwise communicate and/or comprehend English. Have witness initial below.*
Declaration of witness: I was present for the entire consent process. ________ ←(initials of witness)

			AM PM
Printed Name of Person Obtaining Consent and Authorization	Signature of Person Obtaining Consent and Authorization	Date	Time

☐ Consent and authorization was obtained from this individual who is unable to read and/or write but can otherwise communicate and/or comprehend English. The method used for communication with the subject was: ______________________________.
The specific means by which the subject communicated agreement to participate was:
____

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Surrogate Signature Section

- You are voluntarily giving your consent for another person to participate in this study because you believe this person would want to take part if able to make the decision and you believe it is in this person's best interest.
- You also authorize the collection, use and sharing of another person's protected health information as described in this form.

			AM PM
Printed Name of Subject	Signature of **Subject**, indicating Assent *(If incapable of signing, person obtaining consent should initial here)*	Date	Time
			AM PM
Printed Name of Person Giving Consent & Authorization for Subject	Signature of Person Giving Consent & Authorization ☐Parent/☐Guardian/☐Legally Authorized Representative	Date	Time
			AM PM
Printed Name of Witness	Witness Signature	Date	Time
			AM PM
Printed Name of Person Obtaining Consent and Authorization	Signature of Person Obtaining Consent & Authorization	Date	Time

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APPENDIX D. UTRGV STEPS DHHS PRE-K SURVEYS 2018-2019

UTRGV STEPS DHHS Pre-K Surveys 2018-2019

UTRGV STEPS office use ONLY:
STEPS Project ID#: ______________

Family Demographics Survey
(Demografía Familiar)

Please use a pen to fill out survey. Favor de llenar el formulario con bolígrafo.

Child's name *(nombre del niño/a):* ______________________________ Date/*fecha*:_____
Parent's Name *(nombre del padre/tutor):* ______________________________
School's name *(nombre de la escuela):* ______________________________

☐ Check if survey is done with intensive help by others
Indicar si la encuesta se completó con ayuda de alguna otra persona.

****

Check ☑ that apply. *Indicar con un ☑ las respuestas.*

1. **What is your relationship to this child?** *¿Cuál es el Parentesco con el niño(a)?*
   - ☐ Mother / *Madre*
   - ☐ Father / *Padre*
   - ☐ Grandmother / *Abuela*
   - ☐ Grandfather / *Abuelo*
   - ☐ Aunt / *Tía*
   - ☐ Uncle / *Tío*
   - ☐ Other Relative /*Otro pariente*
   - ☐ Other Non-Relative /*Otro, no pariente*

2. **How old are you (the parent)?** *¿Cuál es su edad (padre o madre)?*
   ☐☐
   Years /*Años*

3. **What is ethnic background of the child's mother or female guardian?**
   ¿Cuál es su origen étnico de la madre/tutora?
   - ☐ American Indian/Alaskan Native / *Nativo Americano/Nativos de Alaska*
   - ☐ Asian or Pacific Islander / *Asiático o Islas del Pacífico*
   - ☐ African American / *Afroamericano*
   - ☐ Hispanic / *Hispano*
   - ☐ Caucasian / *Caucásico*
   - ☐ Two or more ethnicities / *Dos o más etnias*
   - ☐ Other/ otro: ____________
   - ☐ Do not wish to answer / *prefiero no contestar*

4. **What is ethnic background of the child's father or male guardian?**
   ¿Cuál es su origen étnico del padre/tutor)?
   - ☐ American Indian /Alaskan Native / *Nativo Americano/Nativos de Alaska*
   - ☐ Asian or Pacific Islander / *Asiático o Islas del Pacífico*
   - ☐ African American / *Afroamericano*

1

- ☐ Hispanic / *Hispano*
- ☐ Caucasian / *Caucásico*
- ☐ Two or more ethnicities / *Dos o más etnias*
- ☐ Other/ otro: ___________
- ☐ Do not wish to answer / *prefiero no contestar*

5. **What is this child's ethnic background?**
¿Cuál es el origen étnico de este niño/a?

- ☐ American Indian/Alaskan Native / *Nativo Americano/Nativos de Alaska*
- ☐ Asian or Pacific Islander / *Asiático o Islas del Pacífico*
- ☐ African American / *Afroamericano*
- ☐ Hispanic / *Hispano*
- ☐ Caucasian / *Caucásico*
- ☐ Two or more ethnicities / *Dos o más etnias*
- ☐ Other/ otro: ___________
- ☐ Do not wish to answer / *prefiero no contestar*

6. **What is the highest level of education achieved by the child's MOTHER (or female guardian)?**
¿Cuál es el nivel de educación de la MADRE (o tutora) del niño(a)?

- ☐ No Education / *No educación escolar*
- ☐ Some Elementary School / *Parte de la Primaria*
- ☐ Elementary School / *Primaria*
- ☐ Some Middle School / *Parte de la Secundaria*
- ☐ Middle School / *Secundaria*
- ☐ Some High School / *Parte de la Preparatoria*
- ☐ High School o GED / *Preparatoria (o GED)*
- ☐ Some College/Technical School / *Parte de cursos universitarios/escuelas técnicas*
- ☐ Graduated College or Higher / *Grado universitario o más alto*

7. **What is the highest level of education achieved by the child's FATHER (or male guardian)?**
¿Cuál es el nivel de educación del PADRE (o tutor) del niño(a)?

- ☐ No Education / *No educación escolar*
- ☐ Some Elementary School / *Parte de la Primaria*
- ☐ Elementary School / *Primaria*
- ☐ Some Middle School / *Parte de la Secundaria*
- ☐ Middle School / *Secundaria*
- ☐ Some High School / *Parte de la Preparatoria*
- ☐ High School o GED / *Preparatoria (o GED)*
- ☐ Some College/Technical School / *Parte de cursos universitarios/escuelas técnicas*
- ☐ Graduated College or Higher / *Grado universitario o más alto*

8. **What is your family's total household monthly income (all sources, before taxes)?**
¿Cuál es el ingreso mensual total de todos los que viven en su casa (total de todas las fuentes de ingreso, antes de los impuestos)?

- ☐ $0 to $999
- ☐ $1000 to $1999
- ☐ $2,000 to $2,999
- ☐ $3,000 to $3,999

- □ $4,000 to $4,999
- □ $5,000 to $5,999
- □ $6,000 to $6,999
- □ $7,000 $7,999
- □ $8000 or more/*o más*

9. How many people live in your household? ¿Cuántas personas viven en su casa?

a. Number of children (under age 18)
Número de niños (menores de 18 años) ☐☐

b. Number of adults (age 18 or over)
Número de Adultos (18 años o mayores) ☐☐

10. What is your main form of transportation? Check only one.
¿Cuál es su principal forma de transporte? Indicar con ☑ UNO solamente.

- □ Car / *Automóvil-carro*
- □ Bus / *Autobus*
- □ Walk / *Caminar-*
- □ A ride from friends / *Amigos lo transportan*
- □ Other / *Otro* ____________________

11. Does your family participate in any or all of the following programs? Check all that apply.
¿En qué programas familiares participa? Indicar con un ☑ todas las opciones apropiadas.

- □ WIC (Women, Infants and Children Program) / *(Programa de Mujeres, Bebes, y Niños)*
- □ Food Stamps / *Estampillas de Comida*
- □ Food Bank Assistance Programs / *Programas de Asistencia Alimenticia*
- □ Other / *Otro*____________________
- □ None/ ninguno

12. Does anyone in the child's family have Hypertension (high blood pressure)? This includes the child's parents, brothers, sisters, grandparents, aunts and uncles, cousins, etc.
¿Hay alguna persona en la familia del niño(a) que tiene hipertensión (presión alta)? Ya sean los papás, hermanos(as), abuelos(as), tíos(as), primos(as), etc.

Family members *Familiares*	about Hypertension		
	Yes, with Hypertension *Sí, tiene hipertensión*	No, without Hypertension *No tiene hipertensión*	I don't know *No sé*
Child's siblings/ *hermanos*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*
Child's mother/ *madre*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*
Child's father/ *padre*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*
Grandma father-side/ *abuela paterna*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*
Grandpa father-side/ *abuelo paterno*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*
Grandma mother-side/ *abuela paterna*	□ Yes, *Sí*	□ No	□ I don't know*No sé*
Grandpa mother-side/ *abuelo paterno*	□ Yes, *Sí*	□ No	□ I don't know/ *No sé*

13. Has this child been diagnosed with hypertension (meaning you were told by a doctor or a medical worker that this child has hypertension)? ○Yes ○No

Su niño(a), ¿ha sido diagnosticado/a con hipertensión? (Por un médico)
○ *Sí* ○ *No*

14. Does anyone in the child's family have Diabetes? This includes the child's parents, brothers, sisters, grandparents, aunts and uncles, cousins, etc.
¿Hay alguna persona en la familia del niño(a) que tiene Diabetes? Ya sean los papás, hermanos(as), abuelos(as), tíos(as), primos(as), etc.

Family members Familiares	about Diabetes		
	Yes, with Diabetes *Sí, tiene diabetes*	No, without Diabetes *No tiene diabetes*	I don't know *No sé*
Child's siblings/ *hermanos*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Child's mother/ *madre*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Child's father/ *padre*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Grandma father-side/ *abuela paterna*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Grandpa father-side/ *abuelo paterno*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Grandma mother-side/ *abuela paterna*	□ Yes, Sí	□ No	□ I don't know/ *No sé*
Grandpa mother-side/ *abuelo paterno*	□ Yes, Sí	□ No	□ I don't know/ *No sé*

15. Has this child been diagnosed with diabetes (meaning you were told by a doctor or a medical worker that this child has diabetes)? ○Yes ○No
Su niño(a),¿ha sido diagnosticado/a con diabetes? (Por un médico) ○ *Sí* ○ *No*

16. If this child was diagnosed with diabetes, which type was it?
○ Type 1 diabetes ○ Type 2 diabetes ○ I don't know which type.
¿Si el niño(a) fue diagnosticado con diabetes, que tipo?
○ *Diabetes tipo 1* ○ *Diabetes tipo 2* ○ *No sé.*

17.Which child looks healthier? *¿cuál niño ve usted más sano?* Child A / *Niño A* Child B / *Niño B*

Child A / *Niño A* Child B / *Niño B*

4

UTRGV STEPS DHHS Pre-K Surveys 2018-2019

Household Health Characteristics Survey
(Encuesta de la salud familiar)

This is a survey about ways you plan and prepare meals for your family. As you read each question, think about meals you prepared recently. This is not a test! There are no wrong answers.

En esta encuesta indique las maneras que usted planea y prepara alimentos para su familia. Al leer cada pregunta, piense en las comidas que preparó recientemente. ¡Esto no es una prueba! Así que no existen respuestas incorrectas.

Please tell us your relationship with the child. Are you the __________: mother, father, grandmother, grandfather, aunt, uncle, or guardian; Other, please specify: __________)

Es usted: madre, padre, abuela, abuelo, tía, tío o guardián, otra persona indicar ____________) del niño/a.

EFNEP

Please mark how often . . YOU .

Por favor, marque qué tan a menudo ... usted . .

1. You plan your meals ahead of time? *¿Planea sus comidas por adelantado?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
2. You compare prices before you buy food? *¿Hace comparación de precios antes de comprar los alimentos?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
3. You run out of food before the end of the month? *¿Se le acaben los alimentos (despensa) antes de que termine el mes?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
4. You shop with a grocery list? *¿Compra alimentos escritos en una lista?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
5. You let meat and dairy foods sit out for more than two hours? *¿Deja carne y productos lácteos a temperatura ambiente por más de dos horas?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas Veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*

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6. You defrost (thaw) frozen foods at room temperature? *¿Descongela alimentos a temperatura ambiente?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*

Please mark how often . YOU . .
Porfavor, indique qué tan seguido… usted..

7. You think about healthy food choices when deciding what to feed your family? *¿Piensa en opciones de alimento saludables, para alimentar a su familia?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
8. You prepare foods without adding salt? *¿Prepara comidas sin sal?*	□ Never *Nunca*	□ Seldom *Rara vez vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
9. You use the "Nutrition Facts" on the food label to make food choices? *¿Usa la etiqueta de datos nutricionales para elegir alimentos?*	□ Never *Nunca*	□ Seldom *Rara vez vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
10. Your children eat breakfast at home? *¿Desayunan sus niños/as en casa?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
11. You eat whole wheat bread, cereal, or pasta? *¿Consume pan, cereal, o pasta integral?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
12. You serve more than one kind of fruit to your family each day? *A su familia, ¿Sirve más de un tipo de fruta al día?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*
13. You serve two or more kinds of vegetables during your family's main meal? *A su familia, ¿sirve dos o más tipos de verduras en el platillo principal del día?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*

14. You use reduced fat (2%), low fat (1%), or non-fat (skim) milk? *¿Consume leche baja en grasa (2%), o (1%), o descremada?*	□ Never *Nunca*	□ Seldom *Rara vez*	□ Sometimes *Algunas veces*	□ Most of the time *La mayoría de las veces*	□ Almost always *Casi siempre*

CDC) Hours/horas						
15. Over the past 30 days, on average how many hours per day did <u>YOU</u> sit and watch TV or videos? *En los últimos 30 días ¿cuántas horas al día permaneció sentado frente a la TV o*	□ Less than 1hr menos de 1hora	□ 1 hr. 1hora	□ 2 hrs. 2 horas	□ 3 hrs. 3 horas	□ 4 hrs. 4 horas	□ More than 5hrs. Más de 5 hrs.
16. Over the past 30 days, on average how many hours per day did <u>YOU</u> use a computer, iPad, smart phone, or any electronic device or play games on computer, ipad, or any electronic device? *En los últimos 30 días, ¿cuántas horas al día usó la computadora, iPad, teléfono celular o jugó juegos en la computadora, ipad o cualquier aparato electrónico? De un promedio de horas.*	□ Less than 1hr menos de 1hora	□ 1 hr. 1hora	□ 2 hrs. 2 horas	□ 3 hrs. 3 horas	□ 4 hrs. 4 horas	□ More than 5hrs. Más de 5 hrs.
17. Over the past 30 days, on average how many hours per day did <u>YOUR CHILD</u> sit and watch TV or videos? *En los últimos 30 días, ¿cuántas horas al día, paso su niño/a sentado viendo TV o videos? De un promedio de horas.*	□ Less than 1hr menos de 1 hora	□ 1 hr. 1hora	□ 2 hrs. 2 horas	□ 3 hrs. 3 horas	□ 4 hrs. 4 horas	□ More than 5hrs. Más de 5 hrs.
18. Over the past 30 days, on average how many hours per day did <u>YOUR CHILD</u> use a computer, ipad, or any electronic device or play games on computer, ipad, or any electronic device outside of school? *En los últimos 30 días, ¿cuántas horas al día, uso su niño/a la computadora, ipad o jugó juegos en la computadora? No incluye horas de escuela. De un promedio de horas.*	□ Less than 1hr menos de 1 hora	□ 1 hr. 1hora	□ 2 hrs. 2 horas	□ 3 hrs. 3 horas	□ 4 hrs. 4 horas	□ More than 5hrs. Más de 5 horas

NHANES 19. Do you know if consumed regularly, soda (even diet or sugar-free soda) has significant impact on a child's health such as overweight, diabetes, tooth decays, calcium absorption? *¿Sabía que el consumir refrescos (sodas), aun los de dieta o sin azúcar, causan problemas en la salud de su niño/a? Enfermedades de sobrepeso, diabetes, caries dentales y en absorción de calcio.*	☐ Yes *Sí*	☐ No
20. Over the **past 12 months**, did **YOU** drink soft drinks, soda, or pop? *En los últimos 12 meses, ¿bebió usted refrescos, sodas, o gaseosas?*	☐ Yes *Sí*	☐ No [Go to Question 21] *No [Pase a la pregunta 21]*

Please mark how often . . . YOU..
Por favor, indique que tan seguido usted....

20a. How often did YOU drink soft drinks, soda, or pop IN THIS SUMMER?
En el verano, ¿Qué tan seguido bebe refrescos, sodas, o gaseosas?

☐ Never *Nunca*	☐ 1 time per month or less *1 vez al mes o menos*	☐ 2-3 times per month *2-3 veces al mes*	☐ 1-2 times per week *1-2 veces a la semana*	☐ 3-4 times per week *3-4 veces a la semana*	☐ 5-6 times per week *5-6 veces a la semana*	☐ 1 time per day *1 vez al día*	☐ 2-3 times per day *2-3 veces al día*	☐ 4-5 times per day *4-5 veces al día*	☐ 6 or more times per day *6 ó más veces al día*

20b. How often did YOU drink soft drinks, soda, or pop DURING THE REST OF THE YEAR?
En el resto del año, ¿Qué tan seguido bebe refrescos, sodas, o gaseosas?

☐ Never *Nunca*	☐ 1 time per month or less *1 vez al mes o menos*	☐ 2-3 times per month *2-3 veces al mes*	☐ 1-2 times per week *1-2 veces a la semana*	☐ 3-4 times per week *3-4 veces a la semana*	☐ 5-6 times per week *5-6 veces a la semana*	☐ 1 time per day *1 vez al día*	☐ 2-3 times per day *2-3 veces al día*	☐ 4-5 times per day *4-5 veces al día*	☐ 6 or more times per day *6 ó más veces al día*

20c. How often were these soft drinks, soda, or pop diet or sugar free?
¿Qué tan seguido los refrescos/sodas son de dieta o sin azúcar?

☐ Almost never or never *Casí nunca o nunca*	☐ About ¼ of the time *Como ¼ de las veces*	☐ About ½ of the time *Como ½ de las veces*	☐ About ¾ of the time *Como las ¾ de las veces*	☐ Almost always or always *Casí siempre o siempre*

21. During the past 7 days, how many minutes were YOU physically active (i.e. brisk walk, heavy housework, mow lawn)?
En los últimos 7días, ¿cuántos minutos se mantuvo usted físicamente activo (i.e. caminar vigoroso, tarea del hogar intensa, corta el zacate/césped)? _______________Minutes/Minutos

22. During the past 7 days, how many minutes were YOUR CHILD physically active when she/he were at home (i.e. playing outside or on the playground, helping in heavy housework such as gardening etc.)?
*En los últimos 7 días, ¿cuántos minutos se mantuvo su niño/a físicamente activo en casa (por ejemplo: jugar en el patio o en el parque, ayudar con las tareas del hogar o jardinería, etc.)*_______________Minutes/Minutos

CDC's BRFSS 23. Are YOU now trying to lose weight? *¿Está usted intentando bajar de peso?*	□ Yes [Go to Question 25] *Sí [Pase a la pregunta 25]*		□ No	
24. Are YOU now trying to maintain your current weight (that is to keep from gaining weight)? *¿Está usted intentando mantener su peso actual (no subir de peso)?*	□ Yes *Sí*		□ No	
25. Are YOU eating either fewer calories or less fat to lose weight or keep from gaining weight? *¿Está usted comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso?*	□ Yes, fewer calories *Sí,menos calories*	□ Yes, less fat *Sí, menos grasa*	□ Yes, fewer calories and less fat *Sí, menos calorías y menos grasa*	□ No
26. Are YOU using physical activity or exercise to lose weight or keep from gaining weight? *¿Está usted haciendo alguna actividad física para bajar de peso o no subir de peso?*	□ Yes *Sí*		□ No	
27. Is YOUR CHILD now trying to lose weight? *¿Está intentando que su niño/a, baje de peso?*	□ Yes [Go to Question 29] *Sí [Pase a la pregunta 29]*		□ No	
28. Is YOUR CHILD now trying to maintain your current weight (that is to keep from gaining weight)? *¿Está manteniendo el peso actual (no subir de peso) de su niño/a?*	□ Yes *Sí*		□ No	

29. Is YOUR CHILD eating either fewer calories or less fat to lose weight or keep from gaining weight? *¿Está su niño/a comiendo menos calorías o menos grasa para bajar de peso o evitar subir de peso?*	□ Yes, fewer calories *Sí, menos calorías*	□ Yes, less fat *Sí, menos grasa*	□ Yes, fewer calories and less fat *Sí, menos calorías y menos grasa*	□ No
30. Is YOUR CHILD using physical activity or exercise to lose weight or keep from gaining weight? *¿Está su niño/a haciendo alguna actividad física para bajar de peso o no subir de peso?*	□ Yes *Sí*		□ No	

Sleeping/Dormir

31. (A) On weekdays (i.e. school days), about what time does YOUR CHILD go to bed at night? (Note: please enter the time when your child lies down and closes his/her eyes, not the time when she/he goes to bed but with a book, iPAD, TV, etc.) __________pm *Durante los días de la semana (días de escuela), a qué hora de la noche se duerme su niño/a? (Nota: Por favor indicar la hora cuando el niño/a cierra sus ojos para dormir) __________pm*
B) On weekdays (i.e. school days), about what time does YOUR CHILD get up in the morning? __________am *Durante los días de la semana (días de escuela), a qué hora de la mañana se levanta su niño/a? ____am __________am*
32. A) On weekends or holidays (i.e. no school days), about what time does YOUR CHILD go to bed at night? (Note: please enter the time when your child lies down and closes his/her eyes, not the time when she/he goes to bed but with a book, iPAD, TV, etc.) __________pm *Durante el fin de semana o días festivos (no días escolares), a qué hora de la noche se duerme su niño/a? (Nota: Por favor indicar la hora cuando el niño/a cierra sus ojos para dormir)_________pm*
B) On weekends or holidays (i.e. no school days), about what time does YOUR CHILD get up in the morning? __________am *Durante el fin de semana o días festivos (no días escolares), a qué hora de la mañana se levanta su niño/a? __________am*

APPENDIX E. SUPPLEMENTAL TABLES

Table E1

Household Demographic Survey – Questions Pertaining to Parent's Dieting Behavior

Source	Question	Used In: STEPS Pre-K Project	Used In: This Study
"1996 Behavioral Risk Factor Questionnaire – Section 7: Weight Control" from the Centers for Disease Control and Prevention	Q36. Are you now trying to lose weight?	Used	Used
	Q37. Are you now trying to maintain your current weight (that is to keep from gaining weight)?	Used	Not Used
	Q38. Are you eating either fewer calories or less fat to lose weight or keep from gaining weight?	Used	Used
	Q39. Are you using physical activity or exercise to lose weight or keep from gaining weight?	Used	Used
	Q40. In the past 12 months, has a doctor, nurse, or other health professional given you advice about your weight?	Not Used	Not Used

Table E2

Household Demographic Survey – Questions Pertaining to Child's Food Behavior

Source	Section	Question	Used By: By STEPS Pre-K Project	Used By: This Study
"2012 Behavior Checklist" from The United States Department of Agriculture's (USDA)	Not Applicable	Q1. How often do you plan meals ahead of time?	Used	Not Used
		Q2. How often do you compare prices before you buy food?	Used	Not Used
		Q3. How often do you run out of food before the end of the month?	Used	Not Used
		Q4. How often do you shop with a grocery list?	Used	Not Used
		Q5. How often do you let these foods sit out for more than two hours?	Used	Not Used
		Q6. How often do you thaw frozen foods at room temperature?	Used	Not Used
		Q7. When deciding what to feed your family, how often do you think about healthy food choices?	Used	Not Used
		Q8. How often have you prepared foods without adding salt?	Used	Not Used
		Q9. How often do you use the "Nutrition Facts" on the food label to make food choices?	Used*	Used
		Q10. How often do your children eat something in the morning within 2 hours of waking up?	Used	Not Used
"2012 Behavioral Checklist" from The Expanded Food and Nutrition Education Program (EFNEP)	Section: Whole Grains	Q1. When you eat bread, do you eat whole wheat bread?	Used	Not Used
		Q2. How often do you make main dished from scratch?	Used	Not Used
		Q3. How often do you prepare dishes from scratch?	Not Used	NA
	Section: Fat	Q4. Do you use low-fat (2%), very low-fat (1%) or nonfat milk?	Used	Used
		Q5. How often do you eat low-fat foods instead of high-fat foods?	Not Used	NA
		Q6. Do you eat low-fat foods instead of high fat foods?	Not Used	NA
		Q7. How often do you eat fried foods?	Not Used	NA
		Q8. Do you eat a lower-fat food instead of a regular-fat food?	Not Used	NA
		Q9. How often do you make main dished from scratch?	Not Used	NA
		Q10. Do you take the skin off chicken before eating it?	Not Used	NA
		Q11. How often do you trim fat from meat (such as beef, chicken, or pork) before cooking or eating?	Not Used	NA
		Q12. In the past month, how often did you read food labels to select foods with less fat?	Not Used	NA
		Q13. How often do you prepare dishes from scratch?	Not Used	NA
	Section: Fruits & Vegetables	Q1. Do you eat more than one kind of fruit each day?	Not Used	NA
		Q2. Do you eat more than one kind of vegetable each day?	Not Used	NA
		Q3. Do you serve different vegetables and fruits every day?	Not Used	NA
		Q4. How often are 5 servings of fruits and vegetables offered to your family, to eat each day?	Not Used	NA
		Q5. Do you eat 3 or more servings of Vegetables each day?	Not Used	NA
		Q6. Do you currently eat 2 or more servings of fruit every day? This includes fresh, frozen, canned, and 100% fruit juice.	Not Used	NA
		Q7. Do you currently eat 3 or more servings of vegetables every day, including fresh, frozen, canned, and 100% juice?	Not Used	NA
		Q8. Do you serve more than one kind of vegetable to your family each day?	Not Used	NA
		Q9. How often do you serve more than one kind of fruit to your family each day?	Used	Used
		Q10. Do you eat 2 or more servings of fruits each day?	Not Used	NA
		Q11. How often do you serve more than one kind of vegetable to your family each day?	Not Used	NA
		Q12. How often do you serve 2 or more kinds of vegetables during your family's main meal?	Used	Used
		Q13. Do you try new ways of preparing vegetables and fruits?	Not Used	NA

Table E2. *Household Demographic Survey – Questions Pertaining to Child's Food Behavior (continued)*

Source	Section	Question	Used By: By STEPS Pre-K Project	Used By: This Study
	Section: Fruits & Vegetables (continued)	Q14. Do you have enough time to prepare vegetables as often as you want?	Not Used	NA
		Q15. Do fresh vegetables spoil before you can use them?	Not Used	NA
		Q16. How often do you consume foods like these: green, leafy vegetables; grains; orange juice; and beans?	Not Used	NA
		Q17. Do you eat five or more servings of vegetables and fruits each day?	Not Used	NA
		Q18. Do you serve more than one kind of fruit to your family each day?	Not Used	NA
		Q19. Do you know how to tell if a fresh vegetable is of good quality?	Not Used	NA