ECOLOGICAL CONTEXT AS A PREDICTOR OF THIRD GRADE CHILDREN'S WEIGHT STATUS

By

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DEDICATION

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CHAPTER I

BACKGROUND/SIGNIFICANCE & RATIONALE

The Epidemic of Obesity

The population of the United States is continuously becoming more ethnically diverse (Phinney, 1996) and the rates of both childhood and adult obesity are rising simultaneously (Dietz, 2001). The NHANES III, using a nationally representative sample, determined that about one-third of this country's population between 20 and 74 years of age are overweight (Kuczmarski, Flegal, Campbell, & Johnson, 1994). When compared to NHANES II (1976-1980), NHANES III (1988-1994) revealed an 8% increase in adult overweight in the population. The changes in overweight among groups differentiated by gender and ethnicity are even more alarming (Broussard, Johnson, Himes, Story, Fichtner, Hauck, Bachman-Carter, Hayes, Frolich, & Gray, 1991; Dounchis, Hayden, & Wifley, 2001). Women are more overweight than men and approximately 66.4% of African-American women are overweight/obese compared to 45.9% of European American women (Flegal, Carroll, Kuczmarski, & Johnson, 1998). This disparity still remains when socioeconomic status (SES) and education are controlled (Baskin, Ahluwalia, & Resnicow, 2001). At present, according to data collected from the NHANES IV survey, 13% of children ages six to eleven years and 14% of adolescents ages 12-19 years are overweight (NCHS, 2002b). This is a 2.5% increase from the overweight estimates of 11% obtained from 1988-1994 via the NHANES III (NCHS, 2002b).

In the majority of overweight/obese persons, overweight/obesity results from an imbalance in the energy equation concerning energy intake and energy expenditure, which is basically represented by dietary intake and physical activity, respectively. A large proportion of the growing rate of obesity in children over the past 30 years can be likely attributed to changes in the environment (Warden & Warden, 2001; Young-Hyman, Herman, Scott, & Schlundt, 2000). More specifically, the environmental changes that have occurred promote decreased energy output and increased energy intake (Crawford, Story, Wang, Ritchie, & Sabry, 2001; Hill, Wyatt, Reed, & Peters, 2003).

For many adult individuals classified as overweight, the behaviors associated with overweight/obesity began during childhood (Berenson, Srinivasan, & Niklas, 1998; VanHorn & Kavey, 1997). Further, overweight/obesity is the most frequently seen nutritional problem in U.S. children (Dietz, 1998; Hill & Trowbridge, 1998). Several childhood behavior patterns may be contributing to this trend.

First, the activities that children participate in are becoming increasingly sedentary (Dietz & Gortmaker, 1985). Increased television viewing and video game usage in combination with a decrease in

physical education at school are becoming more frequent trends. A child's physical activity level has a profound effect upon their level of adiposity (Goran & Treuth, 2001) and physical activity rates differ significantly across self-reported ethnicities (Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998). According to data assessed from the NHANES III, African-American and Mexican-American girls exercise less each week than do Caucasian or Asian girls (Andersen et al., 1998). Further, African-American girls have the highest rates of television viewing, watching four or more hours per day. Those children who watch four or more hours of television per day have a greater body mass index (BMI) and body fat percentage than those children who watch less than two hours per day (Andersen et al., 1998; Robinson & Killen, 1995).

Researchers have thoroughly examined the process by which diet and exercise affects overweight/obesity but have had difficulty determining the impact of the environment on diet and exercise. For example, the specific causes of children's excessive calorie consumption, or overeating, have proven illusive. An increasing availability of fast foods and convenience foods has been cited as one possible reason for the rising rate of childhood obesity (Birch & Fisher, 1998). The concept behind this assertion is that energy intake in the form of fast-foods and convenience foods leads to higher rates of consumption of both fat and sugar and ultimately leads to obesity (Young-Hyman et al., 2000). Portion sizes have increased significantly over the past 30 years (Rolls, 2003) and these "super-sized" portions are being aggressively marketed to children on television (Wadden, Brownell, & Foster, 2002). Internal factors such as having a genetic predisposition towards becoming obese, have also been cited (Bar-Or, Foreyt, Bouchard, Brownell, Dietz, Ravussin, Salbe, Schwenger, St. Joer, & Torun, 1998).

Scientists estimate that the genetic contribution, or heritability, towards the progression of obesity is anywhere from 25% to 40% (Price, 2002; Bar-Or et al., 1998; Birch & Fisher, 1998). The genes involved in the development of obesity are thought to be polygenic, i.e., small variations in many genes creating an effect, but no specific gene has yet been uncovered (Sørensen & Echwald, 2001). Research is presently limited in how it goes about uncovering polygenic traits and no well-structured methodology to adequately uncover the polygenic nature of obesity is in sight (Sørensen & Echwald, 2001). It can only be currently concluded that the development of obesity is contingent upon a combination of genes, childhood environment, and later life experience (Brunner & McCarthy, 2001). The role of genes and environment is summed up well in the statement, "Genes load the gun, the environment pulls the trigger" (Bray, 1998).

Pediatric Overweight/Obesity Disparities

Recent reviews of weight and height trends in the United States have demonstrated that pediatric overweight/obesity occurs at different rates between ethnic groups (Rosner et al., 1998; Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). In 1998, Rosner and colleagues examined the height and weight of a large sample of five to 17 year old children and compared the data from African-American, Asian, Caucasian, and Hispanic children. The most pertinent finding to this project was that African-American and Hispanic females had the highest Body Mass Indices (BMI). In five to 17 year old girls, 27% of African-American and Hispanic girls were overweight/obese, as determined by having a BMI greater than the 85th percentile, compared to Asian and Caucasian girls, who respectively had average overweight/obesity rates of 23% and 25% (Rosner et al., 1998). This small, yet significant difference, between young girls is indicative of greater weight disparities between ethnic groups in adult women. Obesity is typically defined as having a BMI greater than the 95th percentile compared to same age/gender peers and overweight is defined as having a BMI greater then the 85th percentile. This divergence in the development of overweight/obesity, however, does not appear until approximately 9-10 years of age (Rosner et al., 1998; NCHS, 2002a; Strauss & Pollack, 2001). Developing overweight/obesity is a gradual process, however, and the underlying factors associated with overweight/obesity likely take shape in the preceding years. It is almost "after the fact" by the time the disparity becomes salient. At present, overweight/obesity is a problem of chief importance in ethnically diverse populations, especially in African-American girls (Brownell, Kelman, & Stunkard, 1983; Wadden, Stunkard, Rich, Rubin, Sweidel, & McKinney, 1990).

Ethnicity is not a simple cause of obesity and differences in weight status cannot be attributed to "race", "ethnicity", or "culture". Culture can be conceptualized as a dynamic process which significantly incorporates a historical viewpoint and describes what communities of people do, as opposed to ethnicity, which typically represents an individual's race and/or continent-of-origin (Rogoff & Angelillo, 2002). It is insufficient to categorically label an individual's ethnicity or culture and use either as a sole predictor of overweight/obesity status (Manuel, 2000; Triandis & Brislin, 1984). An individual's environment is constantly interacting with that individual's "culture", as opposed to their ethnicity. Culture is a construct that has no reality yet it does describe a viewpoint that individuals consistently bring to the situation or environment (David Schlundt, personal communication, 2004). Long term memory and schemas are shaped by culture, e.g., beliefs about eating behavior (Westen, 2003). Culture is encoded into long term memory, carried by the individual, and colors how the individual perceives the environment and reacts to it (David Schlundt, personal communication, 2004). Culture describes the practices in which individuals have a history of participating yet the impact of culture depends or differs from one environment to the next (Rogoff & Angelillo, 2002). Culture implies that groups of people have shared beliefs, values, and

norms and that by sharing these ideas social interaction and social commerce is facilitated (David Schlundt, personal communication, 2004). Thus "culture" is a term that is fluid in nature, constantly evolving, and extremely difficult to psychometrically capture (Phinney, 1996). For the purposes of this work, ethnicity is a more confined marker and will be utilized as a surface level indicator of one's culture.

Psychosocial Review of Overweight/Obesity Disparities

The literature attempting to decipher the aspects of culture that perhaps lead to different rates of overweight/obesity between African-American females and Caucasian females is sparse. This is especially salient in the pediatric literature. As mentioned above, simply measuring a research participant's cultural identity is less than optimal. In a recent review of the general pediatric literature, it was determined that only 37% of studies in the pediatric psychology literature have examined cultural variables and only 18% have examined SES (Clay, Mordhorst, & Lehn, 2002). In this diminutive number of studies, self-reporting of ethnicity was the preferred method for determining one's culture. "Moderating cultural variables", i.e., beliefs, attitudes, values, and knowledge were seldom measured. Thus, in the few times that culture or ethnicity has been assessed, the self-reporting of ethnicity has been the norm in research practice and detailed measurement of cultural moderating variables has been left relatively unexplored.

This said, the existing literature, which has utilized self-reported ethnicity, has provided some interesting data, though their conclusions must be qualified for the above-mentioned reasons. It has been suggested that there is an elevated acceptance of a larger body habitus, i.e., a larger body with a greater proportion of weight from adipose tissue, a higher rate of energy intake, and a lower rate of physical activity within the African-American community (Kumanyika, 1987). These factors possibly lead to disparities in overweight/obesity levels (Kumanyika, 1987; Kumanyika, 1994) and ultimately to overweight/obesity related conditions such as CVD, diabetes, and high blood pressure, which also occur more in African-Americans than in Caucasians (Kumanyika, 1993; Kumanyika, 1995; Cook & Hurley, 1998).

In Caucasian women, there seems to be an inverse relationship between SES and overweight/obesity (Baskin et al., 2001), whereas in African-American women the relationship between SES and overweight/obesity has been found to be only slightly significant (Calle, Thun, & Petrelli, 1999; Jeffery, French, Forster, & Spry, 1991) or insignificant (Troiano & Flegal, 1998; Sobal & Stunkard, 1989). It has been suggested that ethnicity is simply an "ideological construct" concealing the shared characteristics that are erected by social class (Miles, 1982; Meyers, 1984). The construct of SES is as complex as the construct of ethnicity and the intermingling between the two provides further

complications. There is no clear distinction between the two constructs but at a fundamental level, each variable needs to be collected in order to prevent obvious confounding.

Differences in measures of body image between African-American and Caucasian women have been investigated with somewhat mixed findings (Neff, Sargent, McKeown, Jackson, & Valois, 1997; Parnell, Sargent, Thompson, Duhe, Valois, & Kemper, 1996; Singh, 1994). African-American women were less likely than Caucasian women to accurately perceive themselves as being overweight when they actually were well above the medical community's cutoff as being classified as overweight (Dawson, 1988). Such a tendency could decrease motivation to lose weight and could place African-American women at greater risk of obesity (Rand & Kuldau, 1990; Kumanyika, Wilson, & Guilford-Davenport, 1993).

African-American women have described the "thin" ideology of mainstream American culture as being directed towards Caucasians rather than themselves (Allan, Mayo, & Michael, 1993; Parker & Nichter, 1995; Striegel-Moore, Schreiber, Pike, Wifley, & Rodin, 1995). Compared to Caucasian women, African American women have reported favoring a fuller body type, a higher ideal body weight, and being more satisfied with their weight (Baskin et al., 2001). Additionally, the African-American community has experienced a disproportionate amount of poverty in their history, which makes them more likely to admire obesity as a positive trait (Brown & Konner, 1987) and thinness as a negative one (Friedman & Brownell, 1990).

Data from the National Heart, Lung, and Blood Institute Growth and Health Study indicate that African-American parents of children aged nine and ten are more accepting of their children having a larger body habitus than Caucasian parents (Brown, Schreiber, McMahon, Crawford, & Ghee, 1995). In this same study, African American girls had significantly greater BMIs and reported higher levels of body satisfaction than Caucasian girls. Lawrence & Thelan (1995) examined the issue of body image in African-American girls in the third, fourth, and fifth grades. After controlling for weight, the African-American girls chose their "ideal" body shape as being heavier than the images whereas the Caucasian girls considered their "ideal" to be thinner than the images. Similar results had been previously discovered, but the authors had not controlled for weight (Cohn, Adler, & Irwin, 1987). In a comparable study, African-American boys in the first, second, or third grades chose their "ideal" weight to be larger than the silhouettes but the African-American girls did not differ from the Caucasian girls in their thin "ideal" body image choice (Collins, 1991). The results of a cross sectional examination of 180, four to eleven year old, British children suggest that some children as young as four years old are dissatisfied with their body image (Wardle et al., 1994). Though Wardle et al., (1994) examined "social background", i.e., SES, they left ethnicity unexamined in relation to body image dissatisfaction. It may be that ethnicity has different significance in England, as dark-skinned people do not necessarily share a

common cultural origin in European countries as they typically do in the United States (Schlundt, personal communication, 2004).

At a surface level, the above mentioned literature suggests that there are potentially several factors contributing to the development of overweight/obesity in the African-American community as opposed to the Caucasian community. This is an imprudent assumption, however, in that the ecological context or moderating culturally related variables have been left unmeasured. Until such factors are measured, assumptions cannot be made regarding ethnic differences and their relation to disparities in overweight/obesity status. This work suggests that ethnic disparities in weight status are likely due to environmental differences. Identifying the environmental factors associated with overweight/obesity is best done via utilizing an approach that accounts for various levels of an individual's environment. Collecting an individual's beliefs, behaviors, and values in the context of their environment allows for researchers to examine interactions between the two. This is a large task, however, and requires a framework that describes the contextual influences on any given behavior (Newes-Adeyi et al., 2000).

The Ecological Model Applied to Uncovering the Disparities in Pediatric Overweight/Obesity

An "ecological approach" provides a framework for conceptualizing the integration of the environment into individual health knowledge and behavior (McLeroy et al., 1988; Glossop, 1989; Richard, Potvin, Kishchuk, Prlic, & Green, 1996; Sallis & Owen, 1997). Within this framework, individuals are recognized as a part of a variety of social systems/ecosystems (see figure one). This model provides a five-level, culturally sensitive, framework that examines the factors that may influence health related behaviors, such as eating and exercise, which affect overweight/obesity. Each circle is encompassed by the next so that the last, or fifth circle, surrounds the other four implying a hierarchical organization.

The five levels of the ecological model were depicted comprehensively by Newes-Ayedi et al. (2000) and are summarized as follows. The individual level includes beliefs (both cultural and otherwise), values, education level, skills, and other individual factors. The interpersonal level includes interpersonal relationships between individuals, especially between family members. The organizational level includes the manner in which relevant institutions are organized and managed. The community level includes the communities that the individual is active in. The policy level includes policies and regulations affecting the individual and the institutions in which they function. An essential element of the ecological model is the specification that intrapersonal variables, interpersonal variables, cultural variables, physical environment, political variables, and economic variables all influence behavior (Bronfenbrenner, 1979; Glossop, 1989; Sallis, Bauman, & Pratt, 1998). The elements of the ecological approach provide a logical framework for viewing the child "in context". By applying the ecological model to overweight/obesity, the predictors of weight status that much research has assumed to stem from

"ethnic" differences may be clarified. This framework guided the present systematic gathering of information for the purpose of evaluating the role of a child's environment in predicting their weight status.

Examining how variables across all five of these levels influence the beliefs and behaviors of individuals can provide information much richer than simply assessing their self-defined culture. Rather than being left with a conclusion such as "ethnicity A is more obese than ethnicity B because ethnicity A eats more", researchers can hopefully derive more accurate conclusions that define the values, beliefs, attitudes, behaviors, organizations, communities, and governmental policy that may be related to the behavior of interest. McLeroy and colleague's original ecological model (1988) was applied to pediatric weight status by Davison and Birch (2001). The present work expanded Davison and Birch's model (2001) to include additional factors supported by the most up to date trends in the pediatric literature related to child weight status, which can be observed in figure one.

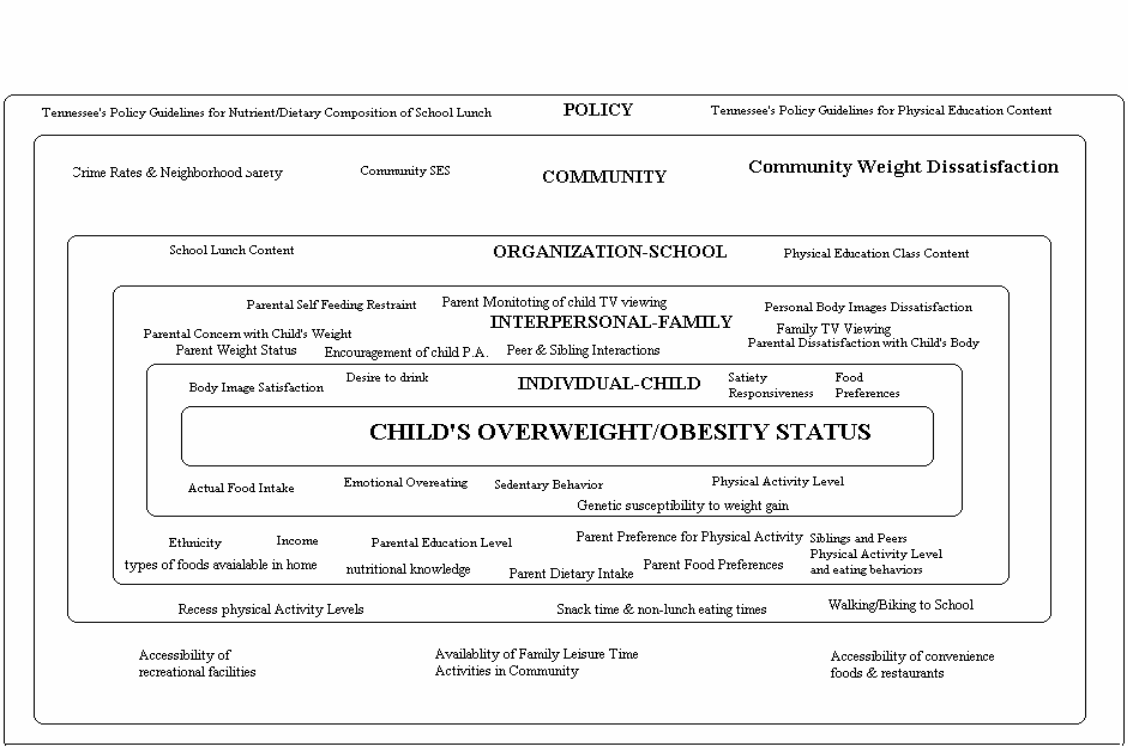


Figure 1. *Ecological Predictors of Childhood Overweight/Obesity**

**Adapted from Davison & Birch, 2001*

The causes of pediatric overweight/obesity are numerous and interrelated. Predictors of children's weight status were chosen throughout the five levels of the ecological model according to

current findings in the pediatric literature. It was hypothesized that characteristics at the children's individual, interpersonal, and community levels would provide a detailed picture of the relationship between child weight status and their environment. Characteristics at the policy level and school level likely influenced weight status as well. The design of the study was cross-sectional and no variance existed at either level. Nonetheless, the policy and school levels were investigated in order to provide a consummate view of the child's environment in relation to their weight status. Figure two represents the relationship between each level of the ecological model and child weight status.

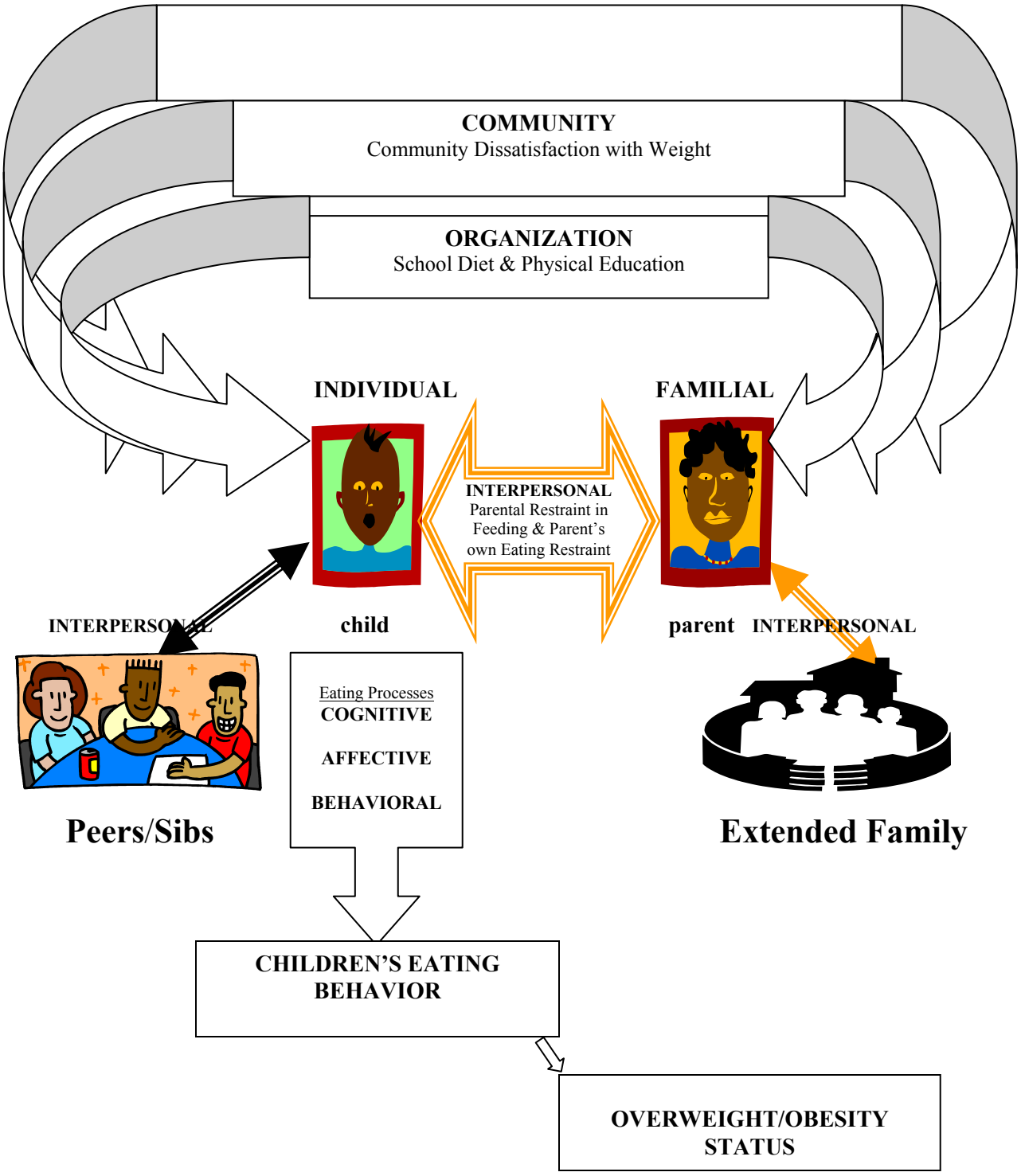


Figure 2. *The Ecological Model Applied to Pediatric Overweight/Obesity*

The variables at each level Figure two of this model, and the empirical evidence to support its' relationship to weight status (the primary dependent variable), were explored beginning at the base of the model, i.e., child eating behavior, which can be organized into cognitive, affective, and behavioral factors.

Level 1: The Individual Level

The individual cognitive factor hypothesized to be related to child weight status was child's body image dissatisfaction (Thompson & Gray, 1995). Body image dissatisfaction is a predictor of weight status in children as young as age nine (Hill, Draper, & Stack, 1992) and has only been lightly explored in children younger than age nine (Collins, 1991; Wardle, Volz & Golding, 1994; Lawrence & Thelan, 1995). Body image dissatisfaction has been suggested to appear in children as young as six (Collins, 1991) and four (Wardle et al., 1994). Children's bodies are going through extensive changes in the years preceding adolescence and no figural scale is appropriate for all ranges, though valid and reliable measures have been created for children age nine and above (Gardner, 2001; Hill et al., 1992). No existing scale has been standardized for children less than eight years old (Gardner, 2001). Collin's (1991) instrument, however, has demonstrated adequate reliability in four year old children (Wardle et al., 1994), five to seven year old children (Collins, 1991) and, third to fifth grade children (Lawrence & Thelan, 1995).

Affective factors in the overweight/obesity literature typically refer to feelings of mood, which are most often negative, that lead to "emotional overeating". Eating thus becomes a coping mechanism that diminishes negative affect via distraction from the affect or physiologically diminishing the negative affect, e.g., an increase in serotonin (Schlundt, Hargreaves, Buchowsky, & Bigelow, 2001). Emotional overeating has been associated with increased BMI (Blaire, Lewis, & Booth, 1990) and overeating in adults (Lowe & Fisher, 1983). It has also been established that, in high SES communities (Buchanan, 1973), low SES communities (Mendelson, Weinberg, & Stunkard, 1961), and across ethnicities (Stunkard, 1959), emotional overeating is associated with overweight/obesity (Ganley, 1989). Positive affect and boredom have also been examined relating to overweight/obesity but the results have been less conclusive (Lowe & Fisher, 1983; Schlundt et al., 1988).

Tanofsky, Wifley, Spurrell, Welch, & Brownell (1997) examined adult gender differences in the relationship between binge eating disorder and emotional overeating. Their results suggested that women emotionally overeat more than men (Tanofsky et al., 1997). In children, however, the relationship between emotional overeating and their weight status has only been lightly explored (Wardle et al., 2001a). Due to the notion that the affective factors that may influence a child's eating behavior are likely similar to those in adults (Wardle et al., 2001a), it was hypothesized that, in girls, there would be a positive association between the level of emotional overeating and weight status. Similar to the small

relationship between emotional overeating and weight status in men, this relationship was hypothesized to be less significant in boys than in girls.

The individual child's behavioral processes related to overweight/obesity are complex. As suggested by the literature, learned behaviors at the individual level of the ecological model that may be related to child overweight/obesity status are children's satiety responsiveness (Wardle et al., 2001a), children's preferences for calorically dense foods (Birch et al., 2001), and children's desire for drinks (Wardle et al., 2001a). Hunger, cravings, and preferences are learned behaviors that have a significant influence upon eating behavior (Schlundt et al., 2000). An individual's "hunger" can be influenced by external stimuli at both a basic physiological level, e.g., the smell of a palatable food, or via an entirely learned process, e.g., the ringing of a bell. The degree to which "hunger" behavior is learned as well as the degree that it can be "overridden" are both associated with overweight/obesity (Birch et al., 1987). A preference for calorically dense foods, particularly fatty foods (Drenowski, 1994) can be learned or unlearned (Brown, 1987; Rolls & Shide, 1994). Once learned, the preference for energy dense foods can be easily maintained in a food-rich environment such as the United States and lead to overweight/obesity.

Eating behaviors, or "eating style", in children and their relation to weight status has only been lightly explored. Infants are excellent at avoiding over-consumption, i.e., eating beyond what is required for the body to maintain a proper metabolic level including growth in children, but can be overridden by a parent (Johnson & Birch, 1994). Examinations of obesity prevention starting in infancy are rare but support the efficacy of adequate self-regulation in avoiding the development of obesity (Piscano, Lichter, Ritter, & Siegal, 1978). In children and adults, responding to internal food cues, i.e., their satiety cues, appropriately, is essential to avoiding obesity and learning or re-learning how to do so is an effective form of preventing obesity in both children (Satter, 1996) and adults (Carrier, Steinhardt, & Bowman, 1994). A child's satiety responsiveness can be overridden by parents who are overly controlling, or restrictive, in feeding their child (Birch et al., 2001). Before age three, children typically maintain energy balance by terminating eating when they reach satiety (Fisher & Birch, 1999). Satiety, however, can be overridden by a parental request that the child eat (Fisher & Birch 1999). Those children who stop eating when they reach satiety are less likely to become overweight (Birch et al., 2001).

It has also been recently demonstrated that drinking beverages, particularly sugar-sweetened beverages, was associated with childhood overweight/obesity as well (Ludwig, Peterson, & Gortmaker, 2001). Another study demonstrated that, in school age-children, total energy intake was positively associated with soft-drink consumption (Harnack, Stang, & Story, 1999). It is not being suggested that the consumption of the sugar in the soda causes obesity (Hill & Prentice, 1995) but that the energy consumed in the form of a liquid, i.e., soda, may be less likely to be compensated for in later meals than

for energy from the intake of solid food (Mattes, 1996). This in turn, may lead to a positive imbalance in children's overall energy levels and subsequent weight gain (Ludwig et al., 2001).

Level 2: The Interpersonal Level

The interpersonal environment in which a child develops can have a profound effect upon the probability of becoming overweight/obese (Bronner, 1996; Gable & Lutz, 2000). A child's family has a strong influence on a child's behavior patterns that can lead to overweight (Hecker, Martin, & Martin, 1986).

Eating behavior can be described as "restrained", the tendency to restrict food intake in order to control body weight, or "disinhibited", the inability to resist emotional and social eating cues when not hungry. Restrained eating behavior and the manner in which a parent feeds his/her child, i.e., his/her "feeding behavior", have been cited as contributory factors to child overweight/obesity (Drucker, Hammer, Agras, & Bryson, 1999; Saelens, Ernst, & Epstein, 2000; Birch et al., 2001). A strong predictor of a parent's "feeding behavior" is his/her own eating behavior (Birch & Fisher, 1998). Thus, research demonstrates that a parent who engages in restrained eating practices is more likely to feed their child in a restrictive manner. Further, as the child grows, the child begins to observe how his/her parent feeds him/herself and thus develops a series of eating behaviors that are determined by his/her parent both through direct learning, i.e., being fed, as well as social learning (Drenowski, 1991). In other words, restrictive parental eating not only models the restrictive eating behavior but also makes that parent more likely to be a restrained feeder (Costanzo & Woody, 1985). The restraint aspect of parental eating behavior likely has a stronger impact upon parental feeding practices than disinhibited eating behavior (Whitaker, Deeks, Baughcum, & Specker, 2000; Fisher & Birch, 1999). Thus, this project focused upon restrictive parental eating and restrictive parental feeding as opposed to disinhibited eating and feeding.

It is almost counterintuitive to state that dietary restraint may cause overweight/obesity because a certain level of dietary restraint is necessary in order to follow any nutritional regimen (Schlundt, Sbrocco, & Bell, 1988). The underlying association between dietary restraint and overweight/obesity is that when a person restricts their food intake to an extreme, unrealistic level, their chances of a "rule violation" increase (Schlundt et al, 2000). A pattern of All-or-None thinking may emerge. When an individual with All-or-None thinking experiences a cognition such as, "that was a *bad* food", they may become disinhibited in their eating and become more likely to overeat (Schlundt et al., 2000).

The control of food intake may have a profound impact upon food preferences (Birch & Fisher, 1998) and may interfere with a child's proper consumption (Oram, 1994). A child whose parents are overly controlling of his/her food intake may be at an increased risk for becoming overweight/obese (Birch, 1987). If a parent is overly restrictive in feeding, their child may not learn how to respond

appropriately to his/her internal appetite signals or satiety signals. Without an intrinsic mechanism of controlling food intake, the child's extrinsic environment becomes the basis of determining their food intake. In essence, the child learns to mistrust their own internal cues and is left without the "tools" to self-regulate their intake. In a "food-toxic" environment such as the United States (Horgan & Brownell, 2002), this could lead to overeating and consequently obesity. Thus, practices such as "cleaning up your plate" and "eating your vegetables" may lead to unfavorable consequences rather than to the healthy behaviors parents are typically attempting to promote (Costanzo & Woody, 1985; Birch, 1987; Birch & Fisher, 1998). Further, labeling foods as "forbidden" may lead to a child having an increased preference and consumption rate for that food (Birch & Fisher, 1998), i.e., restricting the food turns the food into "forbidden fruit" (Fisher & Birch, 2001). In turn, highly restrictive feeding patterns combined with greater parental concern over their child's weight may lead to a child who is concerned with his/her weight status but is left without the intrinsic tools for dealing with the problem (Costanzo & Woody, 1985). Additionally, there is a positive association between parent's restricting access to food and children's percentage of energy intake from fat (Zive, Frank-Spopher, Sallis, McKenzie, Elder, Berry, Broyles, & Nader, 1998) as well as overweight/obesity status (Fisher & Birch, 1999).

The interpersonal interactions surrounding feeding and eating behavior are important determinants of a child's weight status (Fisher & Birch, 1999). Another factor that may be associated with a child's weight status is how dissatisfied a parent is with their body image, i.e., the perception of the size and shape of one's body (Williamson, 1996; Thompson & Gray, 1995). Body image dissatisfaction may also be associated with a parent's degree of feeding restraint, their own restrained eating (Costanzo & Woody, 1985; Dounchis et al., 2001; Birch & Fisher, 1998), how concerned they are over a child's weight status (Birch & Fisher, 1998), and how they view their child's body (Birch & Fisher, 1998). In women, a poor body image has been found to impede appropriate levels of food intake for weight maintenance and be associated with patterns of disordered eating (Williamson, 1996). The reverse has also been found. That is, women content with their body image not only consume appropriate levels of food intake for weight maintenance but are more likely to overeat (Kumanyika, 1994).

It was thus hypothesized that children's weight status would be positively related to parental restrictive eating behaviors, restrictive feeding behaviors, concern over their child's weight status, and dissatisfaction with their child's bodyweight. Additionally, it was expected that the vast majority of caregivers participating in this study would be women as opposed to men, which would accurately depict the chief caregiver-child eating behavior relationship (Birch & Fisher, 2000; Oliveria, Ellison, Moore, Gillman, Garrahie, & Singer, 1992).

The relationship between parental feeding practices and eating behavior has been explored almost exclusively in Caucasian populations (Birch & Fisher, 1998). In particular, high levels of control in

parental feeding practices have been found to be associated with higher levels of children's overweight but only in non-Hispanic white populations (Birch & Fisher, 1998). In this population, restrictive parental feeding practices have been found to be strongly associated with child overeating behaviors (Birch & Fisher, 1998). The reverse has been discovered, though moderate in effect, in a Hispanic population (Birch et al., 2001). Costanzo & Woody's (1985) original model suggests that greater parental restrictive practices cause greater child overweight, yet Hispanic children, who nationally have a higher rate of overweight (Troiano et al., 1995), did not have parents who were more restrictive (Birch et al., 2001).

The interplay between restrictive feeding behavior and ethnicity is uncertain. The present work collected various factors in an attempt to elucidate the nature of the empirical disparities as mentioned above. Namely, a parent's SES (Sobal & Stunkard, 1989), educational level (Sobal & Stunkard, 1989), marital status (Birch & Fisher, 1998), employment status (Sobal & Stunkard, 1989), age (Birch & Fisher, 1998), cultural attitude towards appearance (Heinberg, Thompson, & Stormer, 1995), and nurturance of the child (Stice, Presnell, & Spengler, 2002) all may affect their child's weight status. Theses factors were collected in the present study in order to account for, or perhaps more fully explain, the disparities in the relationship between children's weight status, ethnicity, and parental feeding behaviors.

Additionally, a mother's breast feeding practices may also be related to her child's weight status (Dietz, 2001). The relationship between breastfeeding and childhood overweight is tenuous but it has been suggested that breastfeeding may enhance a child's ability to self-regulate his/her intake according to satiety (Dietz, 2001) and has been described as being "preventative" against overweight/obesity. The largest longitudinal study examining the relationship between breastfeeding and the development of obesity failed to find such a relationship, however (Parsons, Power, Logan, & Summerbell, 1999).

Level 3. The Organizational Level (school)

The third level of the ecological model, the organizational level, concentrates upon the role of any establishment who either directly or remotely affects a child's weight status. In the United Sates, the organization that likely has the most influence upon child weight status is the school.

School age children generally consume three meals and one to two snacks per day and, on average, one to two of these meals are eaten at school (Devaney, Gordon, & Burghardt, 1995). Children spend a good deal of time at school where there is a large amount of variance in eating behavior and physical activity. With a growing trend of schools in Nashville, TN offering class throughout the year, the impact that the school has upon the individual child's eating and physical activity levels is increasing (McKenzie, Sallis, Nader, Broyles, & Nelson, 1997). It was of interest to the present study to examine

the degree to which schools differed in the nutrient composition of their school lunch and their physical education program.

Level 4. The Community Level

Characteristics of the community likely influence the development of pediatric obesity and the ecological model accounts for the communities that both parent and child operate in. It has been suggested that overweight/obesity discrepancies between African-American women and Caucasian women originally stem from cultural differences in body image (Striegel-Moore, Schreiber, Pike, Wifley, & Rodin, 1995). The present study attempted to counter this concept. The disparity between overweight/obesity status between African-Americans and Caucasians was hypothesized to originate, not solely from differences between cultures per se, but reasoned differences between communities. The prevalence of overweight/obesity in a community is most likely determined by the both the physical and psychological characteristics of the environment in which an individual lives, perhaps even more so than that individual's culture (Dietz & Gortmaker, 1984). Applied to this work, differences in body image between communities were hypothesized to explain a significant proportion of the variance in child weight status. Measures of community body image in Nashville were unavailable but measures of community weight dissatisfaction were. It is likely that a community's level of body image dissatisfaction parallels their level of body weight dissatisfaction. It was thus hypothesized that community levels of weight dissatisfaction would likely explain a significant proportion of children's weight status and this relationship would perhaps be moderated by child eating behavior.

Besides, community weight dissatisfaction, other ecological factors are likely to affect the prevalence of overweight/obesity in a community (Dietz & Gortmaker, 1984). While this is obvious in theory, the pragmatics of deciphering community based behaviors is difficult. Recent attempts to collect weight related behaviors of communities have been made in Nashville, TN. In particular, community levels of emotional overeating, weight management behaviors and, psychological barriers to diet and exercise, were hypothesized to be associated with the eating behaviors of those children residing in the communities, e.g., child levels of emotional overeating. Additionally, community weight related behaviors were hypothesized to be associated with the weight status of children living in those communities.

It has been suggested the community SES is a strong predictor of the weight status of its residents (Crawford et al., 2001). In Caucasian families, parental SES seems to be inversely related with childhood overweight/obesity status (Crawford et al., 2001). In African American children, however, neither a high parental SES, nor income, shields against the child becoming overweight/obese (Crawford et al., 2001).

The data which presently exists is tenuous at best and, in the present study, it was cautiously hypothesized that SES would be inversely related to child weight status, regardless of ethnicity.

In sum, a community's average dissatisfaction with their weight, a community's weight related behaviors, and/or a community's average SES were all hypothesized to account for a portion of the variance in child weight status.

Level 5. The Policy Level

The final level of the ecological model is government-policy. State and federal policies focusing upon the identification and treatment of pediatric obesity are slowly beginning to develop. The Surgeon General has made a list of "suggestions" for the prevention, identification, and treatment of pediatric obesity (NCHS, 2002c) but no program has been established to convey this message on a large scale. The primary suggestion related to this work is that children exercise 60 minutes each day. Tennessee's policy regarding physical activity mirrors that of the Surgeon General's and recommends that youth receive a minimum of 60 minutes of physical activity per day as well (NCHS, 2002c).

In a similar manner, the state of Tennessee has not formally addressed the growing epidemic of overweight/obesity in children. A general policy of maintaining no more than 30-31% of the school lunch being composed of fat is in place (USDA School Lunch Guidelines, p. 17, 2002). The state of Tennessee's policy regarding nutrition in schools mirrors the USDA's guidelines. This, however, obviously falls short of preventing overweight/obesity in children and was not designed to do so. In order to detect any effect there must be variation in the both the exposure and outcome of a study, and it is debatable as to whether there is any variance in governmental policy. More specifically, the laws and/or guidelines regarding school diet and physical activity are slow to change and did not do so at the time this manuscript was written. It was of interest to examine if the schools followed the government's guidelines for both physical activity and school lunch dietary composition.

Child Weight Status

BMI, z-BMI, weight, body fat percentage, and waist circumference were used to assess child weight status. The validity of BMI in assessing childhood overweight/obesity has been validated in large-scale studies (Dietz & Robinson, 1998; Daniels, Khoury, & Morrison, 1997). BMI values change with age and gender and there are different normative values at each level. A possible answer to establish a higher predictive value of weight and height measures is to create a BMI score adjusted for both age and gender. Normative childhood means and standard deviations for age in yearly intervals and gender are available (Frisancho, 1990). From these values, a z-score can be calculated (z-BMI) for an individual child. To calculate the score, the difference between the child's BMI and the mean BMI of children of

the same age and gender is divided by the standard deviation of the mean BMI of the same age and gender children. This score is the z-BMI score and represents how many standard deviation units above or below the same age and gender mean that child is (Young-Hyman, Schlundt, Herman, De Luca, & Counts, 2001). Instead of using unreliable cutoff points, z-BMI was treated as a continuous variable and was considered the primary measure of child weight status. Weight, body fat percentage, and waist circumference are also considered to be valid measure of child weight status, but less so than z-BMI or BMI, and were utilized as additional dependent variables (NCHS, 2000a).

Hypotheses and Questions of Interest

Each level of the model was conceptualized to be interrelated. Analyses were primarily performed to decipher the direct relationship between each level of the model and child weight status. The factors hypothesized to be positively associated with child weight status at the individual-child level were emotional overeating, desire for drinks, preference for calorically dense foods, and dissatisfaction with body image. Child satiety responsiveness was hypothesized to be negatively associated with weight status. Since the rate of overweight/obesity is highest in African-American girls and Hispanic boys (Troiano & Flegal, 1998), it was hypothesized that there would be an interaction between ethnicity and child eating behavior in predicting weight status. Additionally, since there are gender differences in rates of emotional overeating in adults (Tanofsky et al., 1997), it was hypothesized that there would be an interaction between gender and emotional overeating in predicting the children's weight status.

The interpersonal behaviors hypothesized to be associated with child eating behavior were parental restrained feeding practices, parental concern over child weight, parent's own restrained eating, parental body image, and parental dissatisfaction with their child's body shape. Parent's level of restrictive feeding behavior, restrictive eating behavior, and concern over their child's weight were hypothesized to be positively associated with child weight status. Parental dissatisfaction with their child's body as well as their own body were hypothesized to be positively associated with child weight status. Additionally, it was hypothesized that there would be an interaction between parental ethnicity and parental dissatisfaction with their child's body in predicting child weight status. Finally, breast feeding was hypothesized to be negatively associated with child weight status.

Communities were represented by the census tracts that they were geocoded to reside in. The weight status and weight related behaviors of parents and children living in those communities were hypothesized to differ. Characteristics of the child's community, specifically a community's average dissatisfaction with their weight, was hypothesized to be associated with child weight status and further hypothesized to be moderated by child eating behavior. It was also hypothesized that community SES would be inversely related to child weight status, regardless of ethnicity. Finally, community levels of

emotional overeating, weight management behaviors, and psychological barriers to diet and exercise, were hypothesized to be associated with the eating behaviors of those children and/or parents residing in the communities.

In addition to the above mentioned hypotheses, two questions of interest were generated at the school and policy levels. At the school level, it was of interest to the present study to examine the degree to which schools differed in the nutrient composition of their school lunch program and something about their physical education program. At the policy level, it was of interest to examine if the schools followed the government's guidelines for both physical activity and school lunch dietary composition.

This study proposed a total of 11 hypotheses and two questions of interest thought to be associated with parameters of the individual child's weight status. The 11 hypotheses were at the child, parental, and community levels and data were collected in order to systematically address each of these hypotheses. No variance existed in school or policy level data but each level was explored and questions of interest generated. The 11 hypotheses and two questions of interest are summarized in table one.

Table 1. *Statement of Hypotheses and Questions of Interest*

Ecological Level	Hypothesis or Question of Interest
Child Level Hypotheses	1) Children who have an increased level of body image dissatisfaction, an increased desire to drink, increased emotional overeating, decreased satiety responsiveness, and an increased preference for calorically dense foods will be more likely to be overweight/obese. 2) There will be an interaction between gender and child eating behavior in predicting children's weight status and, in particular, the positive relationship between emotional overeating and weight status will be stronger in girls than in boys. 3) There will be an interaction between ethnicity and children's eating behaviors in predicting children's weight status.
Parental Level Hypotheses	4) Parents' level of restrictive feeding behavior, restrictive eating behavior, concern over child's weight, body image dissatisfaction, and dissatisfaction with their child's body will be positively associated with three child eating behaviors, i.e., emotional overeating, desire for drinks, dissatisfaction with body image, and negatively associated with one, i.e., satiety responsiveness. 5) Parent's level of restrictive feeding behavior, restrictive eating behavior, concern over child's weight, body image dissatisfaction, and dissatisfaction with their child's body will be positively associated with child weight status. 6) There will be an interaction between child ethnicity and parental dissatisfaction with their child's body in predicting child weight status. 7) Breast Feeding will be negatively associated with child weight status.
School Level Question of Interest	1) Will schools differ: a) in the nutrient composition of their school lunch programs?; or b) in the nature of their physical education programs?
Community Level Hypotheses	8) Weight status and weight related behaviors of children, parents, and community members will differ between communities, i.e., census tracts. 9) The health behaviors of communities, specifically community weight dissatisfaction, will positively predict childhood weight status and this will be moderated by child eating behavior. 10) Children's weight status will be inversely related to community SES. 11) Community levels of emotional overeating, weight management behaviors, and psychological barriers to diet and exercise, were hypothesized to be associated with the eating behaviors of those children and/or parents residing in the communities.
Policy Level Question of Interest	2) Will schools follow the government's guidelines for both physical activity and school lunch dietary composition?

CHAPTER II

METHODS

Subjects

Inclusion/Exclusion Criterion

Inclusion criteria for each child in this study were written consent from a parent, assent from the child, and the ability to read or write English. The minimum age for inclusion was five years due to the inaccuracy of BMI when a person is less than one meter tall. A maximum age limit of ten years was implemented, as at this age parents are still typically the primary means of deciding their children's intake (Birch et al., 1987). Further, African-American girls typically begin puberty between eight and nine years of age and Caucasian girls by ten years of age (Herman-Giddens, Slora, Wasserman, Bourdony, Bhapkar, Koch, & Hasemeier, 1997) and weight relevant data collected in children older than ten years of age could be confounded by the changes associated with the onset of puberty.

Reasons for exclusion were children having a chronic medical illness, children currently using insulin or oral medications that impact metabolism, and parents labeling themselves as following a medically prescribed diet, e.g., a renal or diabetic diet. All measures and procedures were approved by Vanderbilt's Institutional Review Board before beginning the study.

Recruitment

Three schools in the Metropolitan Nashville school district agreed to participate in the study. These were: West Meade elementary located in the Western area of Metropolitan Nashville; Stratton elementary located in the Madison area of Nashville; and Hattie Cotton elementary located in the Northern area of Metropolitan Nashville. 333 third-grade students and the parent primarily responsible for feeding the child were invited to participate in the study. 50% of the families invited to participate enrolled and the final sample consisted of 167 children and the parent responsible for feeding him/her.

Child Level Measures

Demographics

Information regarding ethnicity, age, and gender were collected directly from the children.

Weight, Height, Body Fat Percentage (%), & Waist Circumference

Weight was measured to the nearest 0.1 kg using an electronic Pro Plus metric scale (Healthometer Medical, Bridgewater, IL). Height was measured to the nearest 0.1cm using a stadiometer (Perspective Enterprises, Kalamazoo, MI) with the children shoeless and with heels against the base of the stadiometer and their head in the Frankfort plane (Lohman, 1982). BMI was calculated by dividing their weight in kilograms by their height in meters squared. Normative childhood means and standard deviations for age in yearly intervals and sex are available (Frisancho, 1990). From these values, a z-score can be calculated (z-BMI) for an individual child. To calculate the score, the difference between the child's BMI and the mean BMI of children of the same age and sex is divided by the standard deviation of the mean BMI of the same age and sex children. This score is the z-BMI score and represents how many standard deviation units above or below the same age and sex mean that child is (Young-Hyman, Schlundt, Herman, De Luca, & Counts, 2001). The percent of a child's body composition that consist of adipose tissue, i.e., their body fat %, was calculated using triceps and subscapular skinfolds and calculated using the method of Slaughter, Lohman, & Boileau (1988). Waist circumference was measured three times on each child and the average of these three measures calculated.

Food Frequency Questionnaire

The consumption of calorically dense foods/drinks was assessed using a calorically dense subscale of the Eating Habits Questionnaire (EHQ), a food frequency questionnaire designed for children. The EHQ asked children to report how frequently they consumed a particular food: "Almost every day", "a lot of times last week", "not many times last week", "not last week", and "never eat it". Foods are listed in categories-factors such as beverages, meats, snacks, and vegetables. Internal reliability of the questionnaire is adequate, having coefficient alphas ranging from .60-.89 (Speck et al., 1998). A calorically dense food factor was created from the EHQ, which provided the number of times per week that a child consumed calorically dense foods. This entailed 19 foods whose majority of calories came from fat and/or sugar. A trained research assistant administered the EHQ to small groups, ~12 children per group, of third graders.

Child Eating Behavior

Each parent completed the Satiety Responsiveness (CEBQ-S), Emotional Overeating (CEBQ-E), and Desire for drinks (CEBQ-D) subscales of the Child Eating Behavior Questionnaire ([CEBQ], Wardle et al., 2001a). The CEBQ is a 35-item instrument that includes eight subscales (food responsiveness; enjoyment of eating; emotional overeating; desire for drinks; satiety responsiveness; slowness in eating;

emotional undereating; and food fussiness), and at the time this manuscript was written, had only been pilot-tested (Wardle et al., 2001a).

The internal reliability of the total CEBQ is high with Chronbach's α's ranging from 0.74 to 0.91 (Wardle et al., 2001a). The internal reliability of the CEBQ-S, CEBQ-E, and CEBQ-D subscales are also high, with corresponding Chronbach's α's of .79, .76, and .9. Additionally, the CEBQ-S and CEBQ-D subscales have demonstrated high test-retest reliability, having test-retest correlation coefficients (Pearson's *r*) of .85 for the CEBQ-S and .85 for the CEBQ-D. The CEBQ-E had only moderate stability with a correlation coefficient of .52.

Child Body Image Dissatisfaction

Children rated their dissatisfaction with their body image using a modified version of the instrument of Collins (1991). The present study modified Collin's (1991) instrument by creating silhouettes from the Caucasian drawings that Collins used, so as to allow a diverse population of children to identify their present and desired body image (Appendix C). Collin's (1991) measure has demonstrated to be both valid and reliable in children ages four to nine (Collins, 1991; Wardle et al., 1994; Lawrence & Thelan, 1995). In the actual-ideal discrepancy task, a.k.a. the Contour Drawing Rating Scale (CDRS), subjects are shown illustrations, silhouettes that are the same gender as the subject, that incrementally vary in level of adiposity from low to high. The subject then selects the illustration that represents his/her current size and the illustration that represents his/her ideal size. The difference between the two figures chosen provides a dissatisfaction index.

Parent Level Measures

Demographics

Gender, address, age, present marital status, level of education, and family income (SES) were collected directly from parents. These measures were primarily collected in order to control for their influence while examining the central hypotheses. A partial Hollingshead coefficient (1958), i.e., the educational component but not the occupational component, was calculated as another measure of SES. The complete Hollingshead coefficient delineates five levels of status based on parental occupation and education. The primary parent reported a score corresponding to their education as follows: less than 7 years of schooling = 1; junior high school (7th to 9th grade) = 2; partial high school training = 3; high school graduate = 4; partial college training = 5; standard college or university graduate = 6; graduate professional training = 7. The other measure of SES collected was annual family income, which was collected on a nine point scale in the following intervals: less than $5,000 = 1; $5,000-$9,999 = 2;

$10,000-$19,999 = 3; $20,000-$29,999 = 4; $30,000-$39,999 = 5; $40,000-$49,999 = 6; $50,000-$74,999 = 7; $75,000-$100,000 = 8; Above $100,000 = 9.

Breast Feeding Practices

Parents were asked to answer either "yes" or "no" if their child was breast fed for greater than one month.

BMI

Parents were asked to provide their height and weight, from which their BMI (wt/kg^2) was calculated. Overweight/obesity status was calculated using the values ascribed by the NCHS (2002a), i.e., BMI < 25 = normal weight, BMI between 25 and 30 = overweight, and BMI > 30 = obese. Parental BMI was controlled in all parental level analyses.

Cultural Attitude Towards Appearance

Parental attitudes towards physical appearance were thought to possibly be associated with their level of body image dissatisfaction. To control for this, parents filled out the Sociocultural Attitudes Towards Appearance Questionnaire ([SATA]; Heinberg, Thompson, & Stormer, 1995). It was designed to assess an individual's recognition, acceptance, and internalization of societal standards of appearance. The SATA is comprised of 14 items, eight of which compromise the Internalization scale and six of which comprise the Awareness scale. The Awareness subscale measures an individual's recognition of society's standards of appearance. The Internalization subscale measures the extent to which an individual endorses society's standards of appearance. The SATA has demonstrated having good internal reliability, having Chronbach's α coefficients of .88 for the Internalization subscale and .71 for the Awareness subscale (Heinberg et al., 1995). The SATA has also demonstrated good convergent–validity with five other measures of body image and eating disturbance (the Rosenberg Self-Esteem Inventory, The Physical Appearance State Trait Anxiety Scale, the Multidimensional Body Self-Relations Questionnaire, the Body Image Avoidance Questionnaire, and the Eating Disorders Inventory), having correlation values in the range of r = .28-.61.

Body Image

It was hypothesized that parental dissatisfaction with their own body image as well as their dissatisfaction with their child's body would be associated with their child's weight status. In order to assess parental dissatisfaction with their body image, silhouette ratings using the CDRS were employed using the same methodology as described for children, except that adult silhouettes were used. Using

silhouettes to assess body image dissatisfaction has been demonstrated to be both a valid and reliable index in women and men (Fallon & Rozin, 1985; Phelps, Johnston, Jimenez, & Wiczenski 1993; Tiggermann & Pennington, 1990).

Additionally, parents were asked to assess their child's body using an actual-ideal discrepancy task. Looking at the same silhouettes as their children, parents were asked which illustration best described their child's body and which illustration described the body they would like their child to look like. Separate forms were created for mothers and fathers (see Appendix A & B). The illustrations were ordered from one being the thinnest to seven being the largest. The CDRS has been demonstrated to be a reliable measure, having a test-retest correlation of $r = .78$, as well as a valid measure, having a strong correlation with reported weight, $r = .71$ (Thompson & Gray, 1995).

Parental Nurturance

In order to control for a parent's level of nurturance in examining the relationship between parental feeding practices and child weight status, the degree to which parents care for their child was assessed using the Nurturance subscale of the Personal Resource Questionnaire-Part 2 ([PRQ-II-N] Weinert, 1987). The PRQ-II-N assesses a parent's level of responsibility for the well-being of a child (Weinert, 1987). The PRQ-II-N has demonstrated moderate internal consistency with Chronbach's α coefficients ranging from .62 to .68 (Weinert, 1987).

Parental Eating Behavior (Restraint)

Restrained, or rigid, parental eating behavior was hypothesized to be positively associated with child weight status and was measured using a subscale of the Three-Factor Eating Questionnaire (TFEQ), otherwise known as the Eating Inventory ([EI]; Stunkard & Messick, 1985; Westenhoefer, Stunkard, & Pudel, 1999). The TFEQ is a 51-item instrument designed to assesses adult eating behavior at three levels: restraint, disinhibition, and hunger (Stunkard & Messick, 1985) and has been demonstrated to be a highly reliable and valid instrument (Allison & Kalinsky, 1994). The restraint factor quantifies the cognitive restraint of eating, i.e., the tendency to restrict food intake in order to control body weight, at two levels Flexible and Rigid. Each of the two subscales consists of seven items and has demonstrated good reliability and validity (Westenhoefer et al., 1999). Parental restrictive eating behavior was assessed using the Rigid Control (RC7) subscale of the TFEQ.

Parent Concern Over Child's Weight

It was hypothesized that parental concern over their child's weight would be positively associated with their child's weight status. Parental concern over child's weight remains relatively unexplored in

ethnically diverse populations, with the previously described exception (Birch et al., 2001). The Child Feeding Questionnaire-Concern over child's weight subscale ([CFQ-C] Johnson & Birch, 1994) assessed parental concern about the child's risk of being overweight (Birch et al., 2001). Subjects answered three questions on a five-point scale ranging from one (unconcerned) to five (very concerned). The CFQ-C has been used widely for studying the parental feeding-child overweight relationship (Johnson & Birch, 1994; Birch & Fisher 1999a; Birch & Fisher, 1999b; Birch et al., 2001), and has a high internal consistency (average Chronbach's $\alpha = .74$; Birch & Fisher, 2000).

Parent Feeding Behavior (Restraint)

Restraint in feeding was hypothesized to be positively associated with child weight status (Davison & Birch, 2001; Zive et al., 1998; Fisher & Birch, 1999a). Parental feeding restraint was assessed using the Child Feeding Questionnaire-Restraint subscale ([CFQ-R]; Johnson & Birch, 1994). The CFQ-R contains eight items that measure parental attempts to control their child's eating via restricting access to foods (Birch & Fisher, 2000). Subjects rated their agreement with a statement on a five-point scale ranging from one (disagree) to five (agree). The CFQ-R has been used widely for studying the parental feeding-child overweight relationship (Johnson & Birch, 1994; Birch & Fisher 1999a; Birch & Fisher, 1999b; Birch et al., 2001), and has a high internal consistency (Chronbach's $\alpha = .78$; Birch & Fisher, 2000).

School Level Measures

School Lunch Comparison

The composition of five days worth of school lunches from each school was analyzed using ESHA's Food Processor Software, version 7.02 (Salem, Oregon) for both caloric content and percentage of calories from fat. Schools offer primary and secondary food choices each day and these two choices were averaged for each day. Five days were then averaged to provide an average daily measure of school lunch caloric content and fat percentage. Differences between the three school's lunch dietary composition were examined.

Physical Education Comparison

The physical education (PE) program content of all three schools was assessed and subsequently compared between schools. The variables collected were: the number of times PE was offered per week, the duration of time in physical education class, and the percent of children who attended physical education class. These variables were further refined to create two variables that were analyzed between

schools: “time spent in PE” and “PE participation rate”. The number of times per week PE was conducted was multiplied by the exact number of minutes of each PE class, which was directly timed and observed by the author of this manuscript. This allowed for the creation of one variable, “time spent in PE”. The number of children involved in exercising in PE class was measured by direct observation as well. The number of children who were sitting out of the exercise session within the PE room, i.e., the gym, or another location, e.g., the library, due to a medical excuse, unwillingness to participate, or any other reason was obtained. A weekly sum of “children missing PE classes” was calculated. The total number of children enrolled in each third grade PE class was multiplied by the number of times that class meets to create the number of “children enrolled in PE class”. The “children missing classes” was subtracted from the “children enrolled in PE class” and subsequently divided by the “children enrolled in PE” class to provide a “PE participation percentage” for each school.

Differences between schools in both “time spent in PE” and “PE participation rate” were calculated.

Community Level Measures

The primary community variable of interest, community weight dissatisfaction, was hypothesized to be associated with child weight status. This relationship was hypothesized to be moderated by child eating behavior. Community levels of emotional overeating, weight management behaviors and, psychological barriers to diet and exercise, were hypothesized to be associated with the eating behaviors of those children residing in the communities, e.g., child levels of emotional overeating, as well as the weight status of children living in those communities. Additionally, it was hypothesized that SES would be inversely related to child weight status, regardless of ethnicity.

The child’s neighborhood, i.e., their census tract, was geocoded via their physical address to assess characteristics of the child’s community thought to be related to overweight/obesity. Geocoding and geographic information systems (GIS) attempt to identify characteristics of neighborhoods by grouping street addresses into US census tracts that are readily available on the world-wide-web (U.S. Census Bureau, 2000). Using Arch GIS 8.1 software (ESRI, Redlands CA) to geocode the family’s addresses, neighborhood data from the 2000 U.S. census long form questionnaire were accessed. More specifically, the relationship between the average SES of the children’s census tracts and overweight/obesity status was evaluated.

Geocoded data from a community survey of Davidson County, conducted by the Nashville Metro Health Department and the CDC funded Project REACH 2010 (http://healthbehavior.psy.vanderbilt.edu/REACH/index.htm), also provided valuable information about the health behaviors of the child’s community. This survey was extensive and provided numerous health

related variables. The variable of chief importance to this study was a community's, i.e., census tract's, average level of dissatisfaction with their weight. Additionally, community levels of emotional overeating, BMI, weight management behaviors, and psychological barriers to healthy diet and exercise were collected. Combining census data with Health Department survey data allowed for a representation of the child's ecological community and the degree to which one aspect of community influences child eating behavior as well as child overweight/obesity status could be assessed.

Policy Level Measures

Variables at the policy level were not hypothesized to be predictors of weight status, as the design of the study involved only one community in one state, and did not allow for variability at the policy level. Therefore no pragmatic data could be measured at this level. In order to examine if these schools in the Nashville community "supported" the government's school lunch dietary guidelines and recommended amount of physical activity, a simple comparison between the school's levels and the government's recommendations was performed.

More specifically, each school's average weekly lunch content was compared with the USDA's guidelines for caloric content and fat percentage. The USDA's average weekly caloric content and fat percentage goal for children in grades K - 6 is 664 Calories and ≤ 30-31% total calories from fat (USDA School Lunch Guidelines, p. 17, 2002).

Each school's PE content was compared to the Surgeon General's suggestion (NCHS, 2002c) that children accumulate at least 60 minutes of moderate physical activity most days of the week. Disparities between "time spent in PE" for each school and the Surgeon General's exercise guidelines were calculated.

Statistical Analysis

Rationale

No one statistical strategy could be employed to examine the proposed ecological model in its entirety. Several analyses were performed to clarify the associations between a child's environment and his/her weight status.

Prior to analyses, data were screened for violations of statistical assumptions. When necessary, a transformation of the data was undertaken to ensure adherence to said assumptions. To ensure the reliability of the measures administered, the internal consistency of each measure was examined for each subgroup of interest.

Following these precautions, the data analytic strategy was to examine group differences using two-way Analysis of Variance (ANOVA). The purpose of the between group analyses was to establish that the source of ethnic disparities in overweight/obesity rate was not due solely to ethnicity per se. More specifically, by examining differences between, not only ethnic groups, but between genders, schools, and communities as well, the reasons for ethnic disparities in overweight/obesity could be clarified.

Our hypotheses addressed the relationship between the ecological model and a child's weight status. To assess the separate contribution of each child level independent variable, each parental level independent variable, and each community level independent variable upon child weight status, we employed multiple linear regression. Interactions were analyzed using Analysis of Covariance (ANCOVA) in order to test the main and interaction effects of gender and ethnicity on weight status while controlling for the effects of selected other continuous independent variables.. More specifically, in order to test for homogeneity of variance in regression slopes, a model was created which included not only the covariate, e.g., emotional overeating, and the independent variable, e.g., gender, but also the interaction between the covariate and independent variable, e.g., gender x emotional overeating. Mean centering of the covariate, i.e., subtracting the covariate's mean from the individual covariate scores, was not considered necessary and consequently not performed. Hypotheses related to the relationship between parental level independent variables and child level independent variables were examined using multiple linear regression. Two-tailed Pearson correlation, multiple linear regression, and two-way ANOVA were utilized to examine relationships between community level independent variables and child independent level variables as well as parent level independent variables. The relationship between community dissatisfaction with weight, child eating behaviors, and z-BMI, was examined via Hierarchical Linear Modeling (HLM). HLM, otherwise known as multilevel modeling or linear mixed modeling, allowed for the simultaneous examination of group-level and individual-level factors (Diez-Roux, 2000). The student version of HLM 5.04 software (Byrk, Radenbush, & Cogdon: Scientific Software International, Lincolnwood, IL, 2001) was used to explain the variance in weight status, as measured by z-BMI, at the individual child level and at the community, i.e., census tract, level. All other analyses were performed using SPSS version 11.5 software (Chicago, IL). Fixed level testing was performed with α set at. 05.

CHAPTER III

RESULTS

Data Collection Problems and Solutions

Missing Data

Body fat and waist circumference data were unable to be collected for one female student (N = 166 for body fat % & waist circumference).

Data Transformation

When a variable's distribution is not normally distributed it may violate the assumptions of various methods of analysis, i.e., correlation, regression, *t* tests, and ANOVAs (Altman & Bland, 1995). The five measures of weight status were all skewed to the right and were successfully transformed into a normal distribution via logarithmic transformation (Natural LN). Neither zero, nor negative values, were plausible values in any of the weight status measures, thus, implementing logarithmic transformations was an appropriate transformation choice (Lynch, 2003). Analyses were performed on the logarithmically transformed data. Means and standard deviations of untransformed data are typically more recognizable to the scientific community, however, and were reported in the tables and text for the entirety of this work.

Reliability of Measurements

Child Measure Reliability

Children's behaviors were measured using 13 psychosocial instruments. Two instruments were filled out by the child and 11 were filled out by the parent. The two instruments filled out by the child were the CDRS (perception of Body Image) and the Eating Habits Questionnaire-calorically dense foods. The internal reliability of each instrument was analyzed and the results of which can be seen in table two.

Table 2. *Reliability of Measures Filled Out by Children*

Instrument	Number of Items	Number of Complete Cases	α	Standardized A
CDRS (perception of Body Image)	2	148	.68	.68
Child Eating Habits Questionnaire-Calorically Dense Foods subscale	49	63	.93	.95

Parent Measure Reliability

Parents were instructed to complete 11 psychosocial measures about themselves and their child, as well as provide demographic information about his or her self. Of the 167 parents filling out this survey, 94% (n = 157) were females and 6% (n = 10) were males. 94% of the female persons answering the survey reported themselves to be the natural mother of the child and 80% of the male persons answering the survey reported being the natural father.

The 11 measures were: 1) the CFQ Concern subscale: 2) the CFQ Restraint subscale: 3) the CEBQ Satiety responsiveness subscale; 4) the CEBQ Desire for drinks subscale; 5) the CEBQ Emotional Overeating subscale; 6) the SATA Awareness subscale; 7) the SATA Internalization subscale; 8) the PRQ Nurturance subscale; 9) the CDRS Adult scale (perception of parent themselves); 10) the CDRS child scale (perception of child); and 11) the TFEQ Short Form Rigid Control subscale. The internal reliability of each of the 11 instruments was analyzed and the results of which can be seen in table three.

Table 3. *Reliability of Measures Filled Out by the Parent*

Instrument	Number of Items	Number of Complete Cases	α	Standardized α
CFQ Concern subscale	3	166	.89	.89
CFQ Restraint subscale	8	161	.84	.84
CEBQ Satiety Responsiveness subscale	8	164	.83	.83
CEBQ Desire for drinks subscale	3	166	.90	.90
CEBQ Emotional Overeating subscale	4	166	.85	.88
SATA Awareness subscale	6	159	.52	.52
SATA Internalization subscale	8	157	.87	.87
PRQ Nurturance subscale	5	160	.78	.79
CDRS-Adult scale	2	157	.69	.73
CDRS-Child scale	2	149	.76	.82
TFEQ Short Form Rigid Control scale	7	156	.74	.75

Measurement Error

The reliability of the child's CDRS, α = .68, was only slightly below acceptable (Nunnally, 1978) and was analyzed. The Child Eating Habits Questionnaire-Calorically Dense Foods subscale had a chronbach's Alpha (α) levels within an acceptable range, .70 – 1 (Nunnally, 1978) but a large proportion of child questionnaire data was missing, i.e., only 37 % of children completed the Calorically Dense subscale. Missing this amount of data invalidated the measure and the original hypothesis that children who preferred calorically dense foods would have a higher weight status could not be examined.

Alpha (α) levels were within acceptable range, 0.70 – 1, for the majority of parent administered measures (Nunnally, 1978). The SATA awareness subscale, α = .52, however, was below the acceptable range. Thus, the SATA awareness subscale was not considered to be a reliable measure and interpreted cautiously.

Descriptive Statistics

The final sample consisted of 167 students and one of their parents, i.e., the parent who identified themselves as the person primarily responsible for feeding the child.

Demographic Variables

Ethnicity

The final sample's ethnic distribution was 45% African American, 40% Caucasian, 7% Hispanic, 4% Asian, and 4% "Other". Due to the relatively lower percentages of Hispanic, Asian, and "Other" ethnicities in the study, these three groups were combined into one group which was labeled as the "Other" group and represented 16% of the total sample. There were significant differences in age and ethnicity between schools, Hattie Cotton being significantly older and African American. This can be seen in table four.

Table 4. *Demographic Description of Children by Gender and School*

	Total	Gender		School		
		Girls	Boys	West Meade	Stratton	Hattie Cotton
Sample Size *n*	167	93	74	56	56	55
Age (months)						
M	107.8	107.4	108.4	107.2	106.4	110.0*
SD	6.9	6.9	6.9	7.0	6.6	6.6
Ethnicity (%)						
Caucasian	39.5	37.6	41.9	57.1**	44.6	16.4
African American	44.9	48.4	40.5	23.2	32.1	80.0**
Other	15.6	14.0	17.6	19.6	23.2	3.6
Height (cm)						
M	133.8	133.6	133.9	133.1	132.9	135.3
SD	6.7	6.9	6.5	5.9	7.1	6.8

***** Indicates significance at the .05 level (2-tailed); ****** Indicates significance at the .01 level (2-tailed)

Schools

Between schools, a two-way ANOVA showed that the children at Hattie Cotton were significantly older (110 months for Hattie Cotton vs. 107 for West Meade and 106 for Stratton), $F(2, 164) = 4.34$, $p \leq .05$. Pearson's Chi-Square statistics were performed to compare ethnicity and gender

both between schools as wells as within schools. Children's ethnicity significantly differed between schools, $X^2(8, N = 167) = 5.19, p \leq .01$, but not by gender, $X^2(4, N = 167) = 1.38, p \geq .05$.

Within schools, the majority of students attending West Meade were Caucasian, (57% vs. 45% for Stratton and 16% for Hattie Cotton) $X^2(4, N = 167) = 1.44, p \leq .01$. At Stratton there were no significant differences in attendance between African American students, Caucasian students, and "Other" students, $X^2(4, N = 167) = 3.89, p \geq .05$. The large majority of children at Hattie Cotton were African-American (80 % vs. 23% for West Meade and 32% for Stratton), $X^2(4, N = 167) = 5.52, p \leq .01$.

Dependent Variables

Weight Status

There were no significant differences between schools for any of the five measures of weight status but there was a trend ($p = .055$) towards a difference in z-BMI between schools. The z-BMI levels of children at Stratton ($M = 1.4$, $SD = 1.9$) and Hattie Cotton ($M = 1.4$, $SD = 1.8$) were higher than the children at West Meade ($M = .8$, $SD = 1.3$).

Boys and girls significantly differed on only one measure of weight status, body fat % (12% vs. 15% respectively), $F(1, 164) = 6.83, p \leq .01$. When measures of weight status were compared between all three schools, there were no significant differences. Within ethnicities, boys and girls did not significantly differ between any of the main dependent variables.

Table 5. *Dependent Variables of Children by Gender and School*

	Total	Gender		School		
Variable		Girls	Boys	West Meade	Stratton	Hattie Cotton
Weight (kg)						
M	34.5	34.9	34.0	32.0	35.1	36.5
SD	10.4	11.0	9.5	6.8	10.9	12.2
BMI						
M	19.0	19.3	18.8	18.0	19.6	19.6
SD	4.2	4.4	4.0	2.9	4.7	4.7
z-BMI						
M	1.2	1.2	1.2	0.8	1.4	1.4
SD	1.7	1.7	1.7	1.3	1.9	1.8
Body Fat (%)						
M	13.6	14.9**	12.1	12.6	14.9	13.4
SD	8.6	8.9	8.1	6.6	8.7	10.2
Waist Circum. (cm)						
M	64.5	65.3	63.5	62.7	66.0	64.7
SD	11.5	11.8	11.0	8.6	12.5	12.8

** Indicates significance between genders at the .01 level (2-tailed

Parental Demographics

Only one parent per child was able to participate in the present work, i.e., the parent primarily responsible for feeding the child in the study, and parallel to their children, parents differed significantly in ethnicity between schools. Chi-square analyses significant at the .05 level are reported. As can be seen in table six, the majority (72%) of parents at Hattie Cotton were African American. The majority of parents at West Meade (47%) were Caucasian and the majority of parents at Stratton (42%) labeled their ethnicity as "other".

Table 6. *Demographic Variables of Parents by School*

Variable	Total	West Meade	Stratton	Hattie Cotton
Age (years) (*n* = 164)				
M	34.8	37.6**	32.8	34.2
SD	6.8	7.1	5.8	6.7
Ethnicity (%)(*n* = 167)				
African American	37.3	18.9	21.1	71.7**
Caucasian	30.4	47.2**	36.5	7.6
Other	32.3	34.0	42.3**	20.8
Hollingshead Coeff. (Part.) (*n* = 167)				
M	4.52	5.3**	4.0	4.3
SD	1.5	1.1	1.3	1.3
Family Income (*n* = 158)				
M	4.3	5.6**	3.7	3.5
SD	2.4	2.5	1.8	2.1
Height (in) (*n* =165)				
M	64.5	66.1	65.2	66.0
SD	3.8	3.4	3.7	3.9
Weight (lb.) (*n* = 163)				
M	167.6	166.6	166.5	188.7*
SD	42.8	32.2	37.1	49.4
BMI (wt/kg^2) (*n* = 162)				
M	28.4	26.6	27.9	30.8**
SD	7.4	4.8	6.1	7.9

* Indicates significance at the .05 level (2-tailed); ** Indicates significance at the .01 level (2-tailed)

As table six illustrates, parents significantly differed between schools on several descriptive variables. More specifically, parents at West Meade were significantly older, had a higher family income, and had a higher level of education. Parents at Hattie Cotton weighed significantly more and had a significantly higher BMI.

Parents differed by ethnicity on several variables. "Other" parents were significantly older. Caucasian parents had a significantly higher family income and African American parents weighed significantly more. This is illustrated in table seven.

Table 7. *Demographic Variables of Parents by Ethnicity*

Variable	African American	Caucasian	Other
Age (years) (*n* = 155)			
M	32.9	35.2	37.1**
SD	6.2	7.1	7.0
Parental Education (*n* = 158)			
M	4.6	4.6	4.4
SD	1.0	1.3	2.4
Family Income (*n* = 151)			
M	3.5	5.6**	4.2
SD	2.2	2.3	2.2
Height (in) (*n* =156)			
M	66.0	66.6	65.1
SD	3.6	2.2	4.7
Weight (lb.) (*n* = 155)			
M	185.6*	170.8	165.8
SD	43.1	34.9	44.4
BMI (*n* = 154)			
M	30.0	26.9	28.2
SD	6.5	5.1	7.8

* Indicates significance at the .05 level (2-tailed); ** Indicates significance at the .01 level (2-tailed)

Differences between all three ethnicities in BMI only approached significance $F(2, 151) = 2.96$, $p = .055$. Using adult weight status levels written by the NCHS (2002a), the relationship between parental ethnicity and weight status is illustrated graphically in figure three. There was also a trend towards an ethnicity by weight status interaction effect. As weight status increased above "normal", African Americans were more likely to be classified as obese, and Caucasians were more likely to be classified as overweight. This interaction was not significant, however.

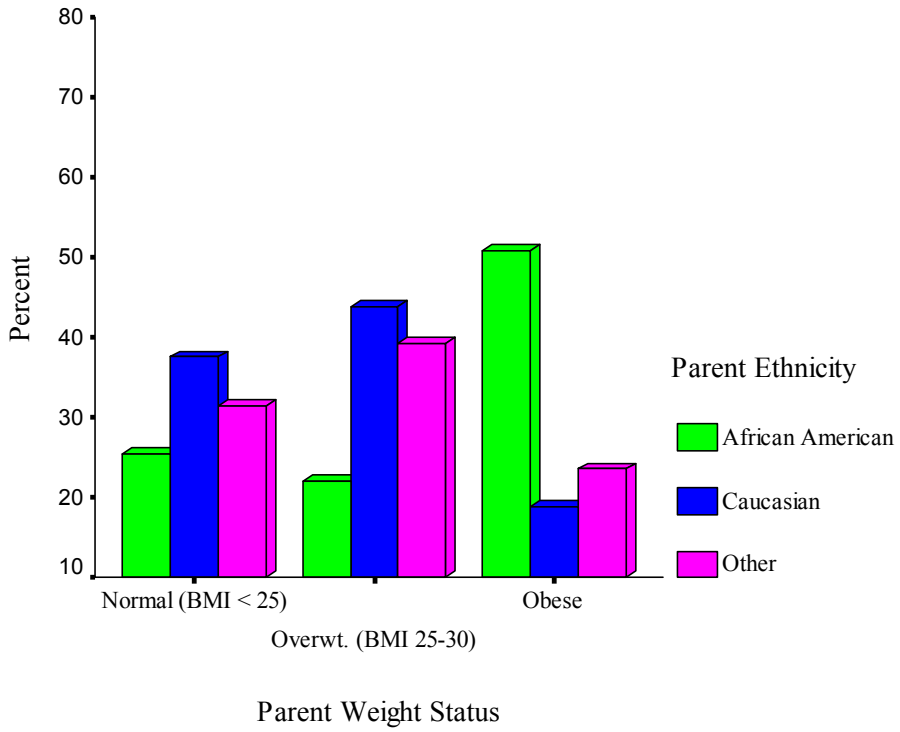


Figure 3. *Parental Weight Status by Ethnicity*

Analyses

Via multiple regression analyses, relationships between measures at the individual, interpersonal, and community levels and measures of child weight status were examined. For each child and parental analysis, parental SES, nurturance, age, educational level, marital status, employment status, cultural attitude towards appearance, and gender were entered in order to control for each. In the majority of child level or parental level analysis, these control variables did not reach significance. Child gender and ethnicity were controlled and reached significance in several analyses (hypotheses two and three). Parental BMI was controlled for in the parental level analyses and reached significance for two analyses (hypotheses five and six).

Individual Level Analyses

Hypothesis 1. Children who have an increased level of body image dissatisfaction, an increased desire to drink, increased emotional overeating, decreased satiety responsiveness, and an increased preference for calorically dense foods will be more likely to be overweight/obese. Support for this

hypothesis would be demonstrated by finding a significantly predictive relationship between a child eating behavior and child weight status.

Separate univariate models were created via the regression of each measure of weight status on each of the individual child level variables. The aim of this analysis was not to compare the predictive strength of child eating behavior but was to simply see if the eating behavior was a significant contributor. Table eight summarizes the significant child-level predictors of child weight status.

Table 8. *Significant Child Level Behavioral Predictors*

Dependent Variable	**Weight**		**BMI**		**z-BMI**		**Body Fat %**		**Waist Circumference**	
Statistic	R^2	B	R^2	β	R^2	β	R^2	β	R^2	β
Independent Variable										
Satiety Responsiveness	.07**	-.26	.07*	-.25	.07*	-.25	.10*	-.25	.10**	-.30
Emotional Overeating	.05*	.22	.06*	.23	.06*	.23	.08**	.21	.07**	.25
Body Image Dissatisfaction	.21***	.45	.22***	.46	.22***	.46	.25***	.46	.24***	.49

* Indicates significance at the .05 level; ** Indicates significance at the .01 level; *** Indicates significance at the .001 level

The CEBQ-Satiety Responsiveness subscale, the CEBQ-Emotional Overeating subscale, and the CDRS all significantly predicted weight, BMI, z-BMI, body fat %, and waist circumference. All subscale's Beta coefficients were statistically significant. These results confirmed the original hypotheses that children having lower satiety responsiveness would have a higher weight status, higher levels of emotional overeating would be associated with higher weight status, and that as the child's weight status increased body image dissatisfaction increased. The CEBQ-Desire for drinks subscale did not significantly predict weight, BMI, z-BMI, body fat %, or waist circumference.

Children having a higher weight status were more dissatisfied with their body image, than those children having a lower weight status. This increased level of body dissatisfaction is likely due to their having a larger body size rather than the dissatisfaction causing an increased body size. This is in concordance with previous studies by Collins (1991) in 5-7 year old girls, Hill et al.'s (1995) work with 9-11 year old girls, and Lawrence & Thelen's (1995) work with 3rd, 4th, and 5th grade girls. The vast majority of both boys and girls chose shapes that were equal to or smaller than their actual size. Only 13 boys and 13 girls chose ideal figures that were larger than their actual shape.

A multiple regression model was created using the significant predictors of child's z-BMI, i.e., child dissatisfaction with their body image, child emotional overeating, and child satiety responsiveness, which explained a significant proportion of the variance in z-BMI , $R^2 = .29$; $F(3, 143) = 19.05$, $p \leq .001$.

These data confirmed three of the five parts of hypothesis one: children having low levels of satiety responsiveness would have a higher weight status; children having higher levels of emotional overeating would have a higher weight status; and children having a higher level of dissatisfaction with their weight status would have a higher weight status. A multiple regression model utilizing these three significant predictors explained 29% of the variance in child weight status. These data did not support the hypothesis that children having a higher desire for drinks would have a higher weight status. Additionally, the hypothesis that children having an increased preference for calorically dense foods would have a higher weight status was not able to be examined, as this measure was incomplete.

Hypothesis 2. There will be an interaction between gender and child eating behavior in predicting children's weight status and, in particular, the positive relationship between emotional overeating and weight status will be stronger in girls than in boys. Support for this hypothesis would be demonstrated by finding a significant gender by emotional overeating interaction effect in predicting child weight status.

An Analysis of Covariance (ANCOVA) was utilized to test for first-order effects of the CEBQ-emotional overeating subscale while taking gender into account. Mean centering, i.e., subtracting the mean from a variable, leaving deviation scores, was not performed. There was a significant gender by emotional overeating interaction in predicting weight status, $F(1, 162) = 6.58$, $p \leq 0.01$. The total degrees of freedom utilized was four, however, the number of degrees of freedom shown only represents the interaction term. Figure four presents the regression lines predicting z-BMI from emotional overeating calculated separately for males and females. The slope for predicting weight status from emotional overeating was higher in girls than boys. This significant interaction confirmed the hypothesis that the positive relationship between emotional overeating and weight status would be stronger in girls than in boys.

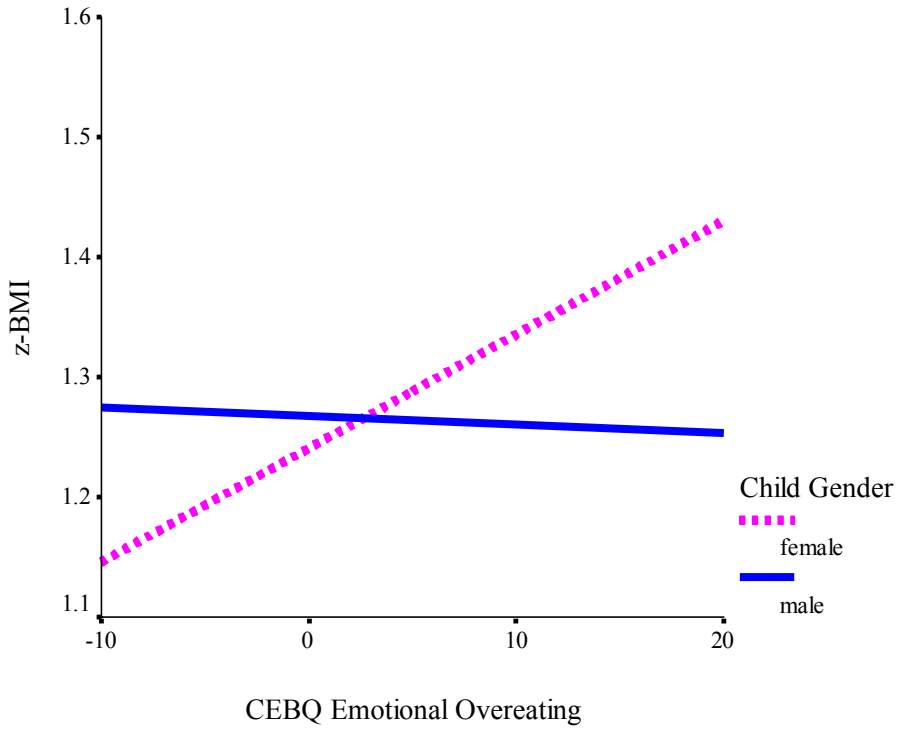


Figure 4. *Emotional Overeating by Gender*

Hypothesis 3. There will be an interaction between ethnicity and children's eating behaviors in predicting children's weight status. Support for this hypothesis would be demonstrated by finding a significant ethnicity by child eating behavior interaction effect in predicting child weight status.

An Analyses of Covariance (ANCOVA) was utilized to test for first-order effects of child eating behaviors predicting weight status while taking ethnicity into account. Analyses of Covariance were performed individually between each child eating behavior and ethnicity. There were no interactions between ethnicity and emotional overeating, dissatisfaction with body image, or desire for drinks in predicting weight status. Figure five presents the regression lines predicting z-BMI from satiety responsiveness calculated separately for ethnic group. There was a significant interaction between ethnicity and satiety responsiveness in predicting weight status, $F(2, 156) = 4.06$, $p \leq 0.05$. The total degrees of freedom used was five. The number of degrees of freedom shown only represents the interaction term. The slopes for predicting weight status via satiety responsiveness were significantly different between ethnicities. Satiety responsiveness negatively predicted the weight status of Caucasian children more than it did "Other" or African American children. These results confirmed the hypothesis

that there would be an interaction between ethnicity and children's eating behaviors, i.e., satiety responsiveness, in predicting children's weight status.

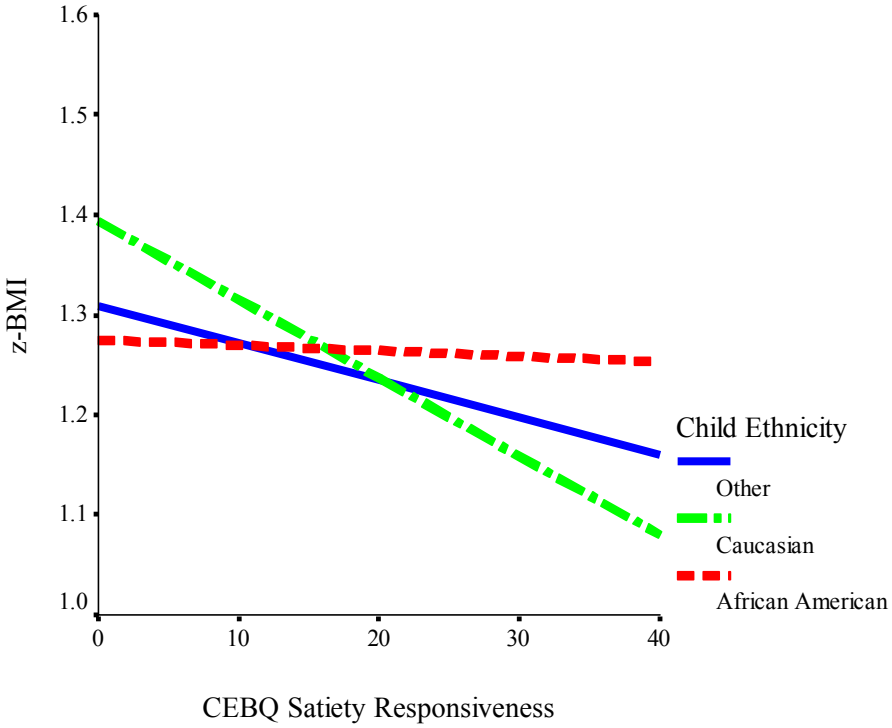


Figure 5. *Satiety Responsiveness by Ethnicity*

Caucasian children had a strong negative relationship between satiety responsiveness and weight status, whereas this relationship was approximately ½ the strength in "Other" children and almost non-existent in African American children. These results suggest that satiety responsiveness may play a more significant role in influencing the weight status of Caucasian children than African American or "Other" children in the multifarious path towards overweight/obesity.

Interpersonal Level Analyses

Hypothesis 4. Parent's level of restrictive feeding behavior, restrictive eating behavior, concern over child's weight, body image dissatisfaction, and dissatisfaction with their child's body will be positively associated with three child eating behaviors, i.e., emotional overeating, desire for drinks, dissatisfaction with body image, and negatively associated with one, i.e., satiety responsiveness. Support

for this hypothesis would be demonstrated by finding a significantly predictive relationship between a parent behavior and a child eating behavior.

Separate univariate models were created via the regression of child satiety responsiveness, emotional overeating, desire for drinks, and dissatisfaction with body image upon parent's level of restrictive *feeding* behavior, restrictive *eating* behavior, concern over child's weight, body image dissatisfaction, and dissatisfaction with their child's body. There were no significant relationships between parent level behaviors and children's eating behaviors, thus disconfirming hypothesis five.

Hypothesis 5. Parent's level of restrictive feeding behavior, restrictive eating behavior, concern over child's weight, body image dissatisfaction, and dissatisfaction with their child's body will be positively associated with child weight status. Support for this hypothesis would be demonstrated by finding a significantly predictive relationship between a parent behavior and child weight status.

Neither parental levels of restrictive feeding or eating were significant predictors of child weight status, as measured by z-BMI, when age and gender were controlled for. This disconfirmed the hypothesis that restrictive parental feeding and eating behavior would be positively associated with child weight status. In contrast, there was a significant positive relationship between parental concern over their child's weight and child weight status, (R^2 = .38; F(2, 155) = 13.05, p ≤ .001[β = .28]) as well as a significant positive relationship between dissatisfaction with child's body and child weight status (R^2 = .73; F(2, 144) = 81.6, p ≤ .001[β = .67]). Parental BMI was controlled in both of these analyses.

These results suggest that parents of children having a greater weight were more concerned about their children's weight, as well as, dissatisfied with their child's weight when parental BMI was controlled. Parental levels of restrictive feeding or restrictive eating were also not associated with child weight status.

Hypothesis 6. There will be an interaction between child ethnicity and parental dissatisfaction with their child's body in predicting child weight status. Support for this hypothesis would be demonstrated by finding a significant child ethnicity by parental dissatisfaction with their child's body interaction effect in predicting child weight status.

An Analysis of Covariance (ANCOVA) was utilized to test for first-order effects of parental dissatisfaction with their child's body in predicting child weight status while controlling for child ethnicity. A model which included the interaction effects of parental dissatisfaction on z-BMI, controlling for ethnicity was created. Figure six presents the regression lines predicting z-BMI from parental dissatisfaction with their child's body calculated separately by ethnicity. There was a significant interaction between ethnicity and parental dissatisfaction with their child's body in predicting weight

status, $F(2, 149) = 58.12$, $p \leq 0.001$. The total degrees of freedom used was five. The number of degrees of freedom shown only represents the interaction term.

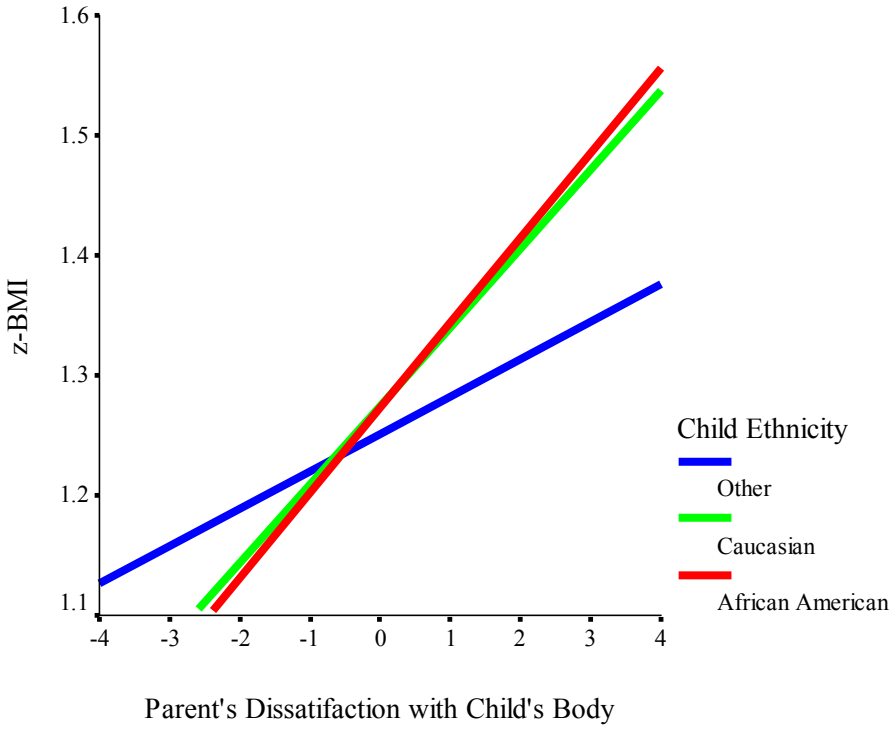


Figure 6. *Parental Dissatisfaction with Child's Body by Ethnicity*

The slopes for predicting weight status via parental dissatisfaction with their child's body were significantly different between ethnicities. Parental BMI was controlled. Parental dissatisfaction with their child's body positively predicted the weight status of African American children more than it did in Caucasian or "Other" children. Though the relationship between parental dissatisfaction and weight status appears to be relatively similar between Caucasian and African American children, a direct comparison of the two ethnicities showed that the relationship is significantly greater in African American children that in Caucasian children, $F(2, 129) = 78.75$, $p \leq 0.001$. These results confirmed the hypothesis that there would be an interaction between child ethnicity and parental dissatisfaction with their child's body in predicting child weight status.

Hypothesis 7: Breast Feeding will be negatively associated with child weight status. Support for this hypothesis would be demonstrated by finding a significantly predictive relationship between a breast feeding and a child weight status.

There was not a significant relationship between child weight status and having been breast feed greater than one month.

Organizational Level (School) Level Analyses

Physical Education (PE) and dietary data were collected at the school level and statistically provide no more, or perhaps even less, predictive capability than the categorical school which the child attended. In other words, exploring the relationship between PE and dietary composition with weight status is no different than exploring the relationship between the school each child attends and weight status. Nonetheless, it was a question of interest, for future studies perhaps, to examine if there was variability in dietary content of school lunch or PE between the schools

Question of Interest 1a. Are there differences between the three school's lunch program in either overall calories or percentage of calories from fat?

The nutrient composition of five school day's lunch menus was analyzed for each of the three schools, all of which had considerably different menus. Both macro and micro nutrient content were analyzed for each day and the average five day caloric and fat content of each school are summarized in the table nine.

Table 9. *Caloric and Fat Content of School Lunch by School*

	West Meade	Stratton	Hattie Cotton
School Lunch's Mean Fat content Percent	32.0%	30.0%	31.0%
School Lunch's Mean Calories	628	618	610

There were no significant differences between schools in the caloric level and fat % content of each school's lunch menu. The rate of all students at each school receiving either partial or fully subsidized school lunch differed between schools. No information specifically regarding the third grade students was available. Thirty-nine percent of the students at West Meade received subsidized lunch,

75% of the students at Stratton received subsidized lunch, and 87% of the students at Hattie Cotton received subsidized lunch. The school lunch menu thus reflects to a greater extent a portion of calories and fat for Hattie cotton and Stratton students more than West Meade students.

Question of Interest 1b. Do the Physical Education (PE) programs differ between schools? Two variables were collected in order to explore the relationship between physical education and child weight status. The first was time spent in PE. Hattie Cotton and Stratton implemented a 30 school-day PE schedule, where the children attended PE ten times every 30 school-days (six regular weeks). West Meade had a schedule where children attended PE three times a week, i.e., they met 18 times every thirty school-days. In order to reflect the average time per week each child attended PE, the 30 school-day number was converted to a five school-day average number. For Hattie Cotton and Stratton this was equal to 1.67 times per week and obviously for West Meade was three times per week.
Five PE classes were timed at each school and averaged. This "mean time" was then multiplied by the five school-day average number. Each school's time spent in PE can be seen in table ten. West Meade met more times weekly, three on average, versus Stratton or Hattie Cotton who met 1.67 times per week on average, which translated into the children at West Meade receiving greater PE time per week.

Table 10. *Time Spent in Physical Education*

	School		
	West Meade	Stratton	Hattie Cotton
Mean gym class time (minutes)	53.0 ± 5.1	49.0 ± 8.3	54.0 ± 6.6
Mean days per week of PE	3.0	1.7	1.7
Mean time spent in PE per week (minutes)	159.0 ± 15.3**	81.9 ± 13.8	90.2 ± 11.0
Mean time spent per day (minutes)	31.8	16.4	18.0

* Indicates significance at the .05 level; ** Indicates significance at the .01 level

The second variable collected was an average PE participation rate. There were no significant differences in PE participation rate between schools, $X2(2, N = 167) = 3.0$, $p \geq .05$. As was expected, the dietary content of school lunch did not differ between schools. Schools also did not differ in the degree to which children participated in PE. It was not anticipated that the children at West Meade would receive more physical education but this proved to be the case. This result reflects the trend towards a difference

in z-BMI between schools. It cannot be concluded that exposure to PE affects the children's weight status. Rather, these results simply suggest that amount of PE a school provides could be related to its' student's weight status.

Community Level Analyses

Hypothesis 8. Weight status and weight related behaviors of children, parents, and community members will differ between communities, i.e., census tracts. Support for this hypothesis would be demonstrated by finding significant differences in weight status or weight related behaviors between communities.

Children

Children were categorized into 20 distinct census tracts via Geocoding their address. On average, there were eight children in each census tract. Two-way ANOVAs were performed to compare the behaviors and physiological markers of child overweight/obesity between the children's census tracts. In table 11, individual child level behaviors and markers of the data collected in the present study were compared between census tracts.

Table 11. *Child Level Differences Between Census Tracts*

Child Level Measures	2-way ANOVA Significance Level
CEBQ Desire for drinks Subscale	0.26
CEBQ Emotional Overeating Subscale	0.12
CEBQ Satiety Responsiveness	0.74
Child Dissatisfaction with Body Image	0.051
Weight	0.051
BMI	0.21
z-BMI	0.21
Body fat %	0.06
Waist circumference	0.07
TC	0.79
HDL	0.08
LDL	0.61
Triglycerides	< 0.01**

* Indicates significance at the .05 level; ** Indicates significance at the .01 level; *** Indicates significance at the .001 level

Between census tracts, children differed on only one individual level variable, triglycerides, which need be interpreted cautiously due to its skewed distribution. Differences between census tracts in child weight and child body image dissatisfaction approached significance. There were no easily

observable patterns of the children's weight status, as measured by z-BMI, between census tracts. This can be seen in figure seven.

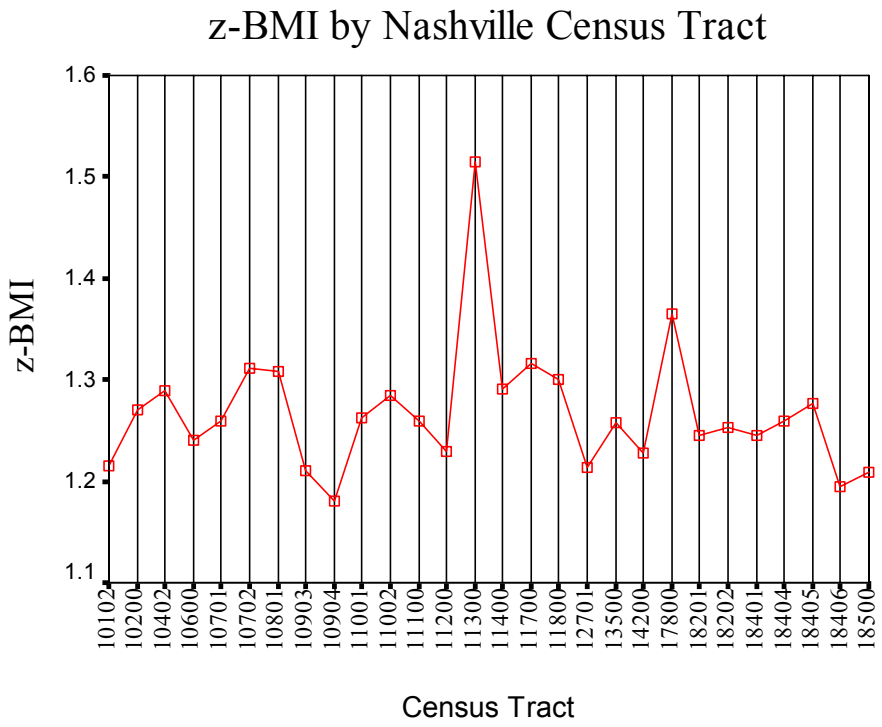


Figure 7. *z-BMI by Nashville Census Tract*

Parents

In contrast to their children, two-way ANOVAs showed several significant differences between census tracts in parent level variables. As can be seen in table 12, census tracts differed significantly between SATA Internalization Subscale scores, educational level, and income.

Table 12. *Parent Level Differences Between Census Tracts*

Parent Level Measures	2-way ANOVA Significance Level
CFQ-Restraint Subscale	0.78
CFQ-Concern Subscale	0.42
PRQ-II Nurturance Subscale	0.17
SATA Awareness Subscale	0.02*†
SATA Internalization Subscale	0.00**
TFEQ-Rigid Control 7	0.19
Parent breast feed > 1 month	0.74
Parent education	< 0.01**
Parent income	< 0.01**
Parental Body Image Dissatisfaction	0.72

* Indicates significance at the .05 level; ** Indicates significance at the .01 level;

*** Indicates significance at the .001 level; † Indicates that scale had very low reliability

Communities

At the community level, data from the Davidson County community survey (Nashville Metro Health Department) and the CDC funded Project REACH 2010 (http://healthbehavior.psy.vanderbilt.edu/REACH/index.htm) were extrapolated from the children's 20 census tracts. These data were then compared between census tracts via two-way ANOVA. As was expected, census tracts differed significantly differed between communities on all of the extrapolated measures and this can be seen in table 13.

Table 13. *Community Level Differences Between Census Tracts*

Community Level Measures	2-way ANOVA Significance Level
Community Average Dissatisfaction with Weight	< 0.01**
Community Average BMI	< 0.01**
Community Average Emotional eating	< 0.01**
Community Average Weight Management Behaviors	< 0.01**
Community Average Psychological Barriers to Healthy Diet & Exercise	< 0.01**

* Indicates significance at the .05 level; ** Indicates significance at the .01 level

Hypothesis 9. The health behaviors of communities, specifically community weight dissatisfaction, will positively predict childhood weight status and this will be moderated by child eating behavior. Support for this hypothesis would be demonstrated by: 1) finding a significant main effect at the census tract level (weight dissatisfaction) or; 2) a significant main effect at the individual level (child eating behavior) or; 3) a cross-level predictor interaction in predicting a significant amount of variance in z-BMI.

HLM

The first step of the HLM analysis was to run an unconditional model, i.e., an intercept model only. This was done in order to examine how much variation in z-BMI (logged) was between and within each census tract in addition to the reliability of each census tract's sample mean as an estimate of its true population mean. The intercept was randomly modeled but no explanatory variables were included at level 1 or level 2.

The within census tract model was:

Level 1: z-BMI $_{ij} = \beta_{oj} + r_{ij}$

The between class model was:

Level 2: $\beta_{oj} = \gamma_{00} + U_{0j}$

β_{oj} = mean z-BMI (logged) for census tract *j*

γ_{00} = grand mean z-BMI (logged)

$r_{ij} = \sigma^2$ (the within group variance in z-BMI (logged))

U_{0j} = the between group variance in z-BMI (logged).

The respective dependent variable, z-BMI, was regressed onto a constant (i.e., census tract mean for level-1 and grand-mean for level-2) and thus any within census tract variance in z-BMI (logged) was forced onto the Level-1 residual and any between census tract variance in z-BMI (logged) was forced onto the level 2 residual.

Results showed that the maximum likelihood point estimate for the grand mean of z-BMI (logged) was 1.2699 with a standard error of 0.0076 (indicating a 95% confidence interval of 1.2623 to 1.2775). The maximum likelihood estimate of the individual (level-1) variance was Var (r_{ij}) = 0.0073. The estimated variability in the census tract means (level-2) was $\tau_{00} = 0.0002$. These estimates indicate that most of the variation in z-BMI (logged) was at the individual (level-1) level. The intraclass correlation represents the portion of variance in z-BMI (logged) between census tracts was estimated using the following equation:

$\rho = \tau_{00} / (\tau_{00} + \text{Var}(r_{ij}))$

Intraclass Correlation Coefficient (ICC) = .00022 / (.00022 + .00732) = .0292

Thus, there was 2.92% variation in the intercept at level 2. This indicates that about 2.9% of the variance in z-BMI logged was between census tracts. Additionally, census tracts did not significantly differ in mean z-BMI (logged), $X^2(26) = 33.2$, $p > .05$.

The next step was to test the initial hypothesis that community and child eating behavior explain variance in the children's weight status. When combined with community weight dissatisfaction, models including emotional overeating, dissatisfaction with body image, or a desire for drinks at the individual child were insignificant. Significant effects were found, however, in a model combining satiety responsiveness with community weight dissatisfaction. In order to explain differences in satiety responsiveness across census tracts using the level-2 predictor, community weight dissatisfaction, an intercepts-as-outcomes and slopes-as-outcomes full maximum likelihood estimation model was run.

There were no significant main effects, either at the census tract level (weight dissatisfaction) or at the individual level (satiety responsiveness), disconfirming parts one and two of hypothesis ten. However, these cross-level predictors interacted to significantly predict z-BMI. Figure eight demonstrates this interaction. The model explained significant variance in z-BMI (logged), $X^2(7, N = 167) = 14.72$, $p < .05$. That is, the step 2 model, with the predictors in it, explained a significant amount of variance in z-BMI.

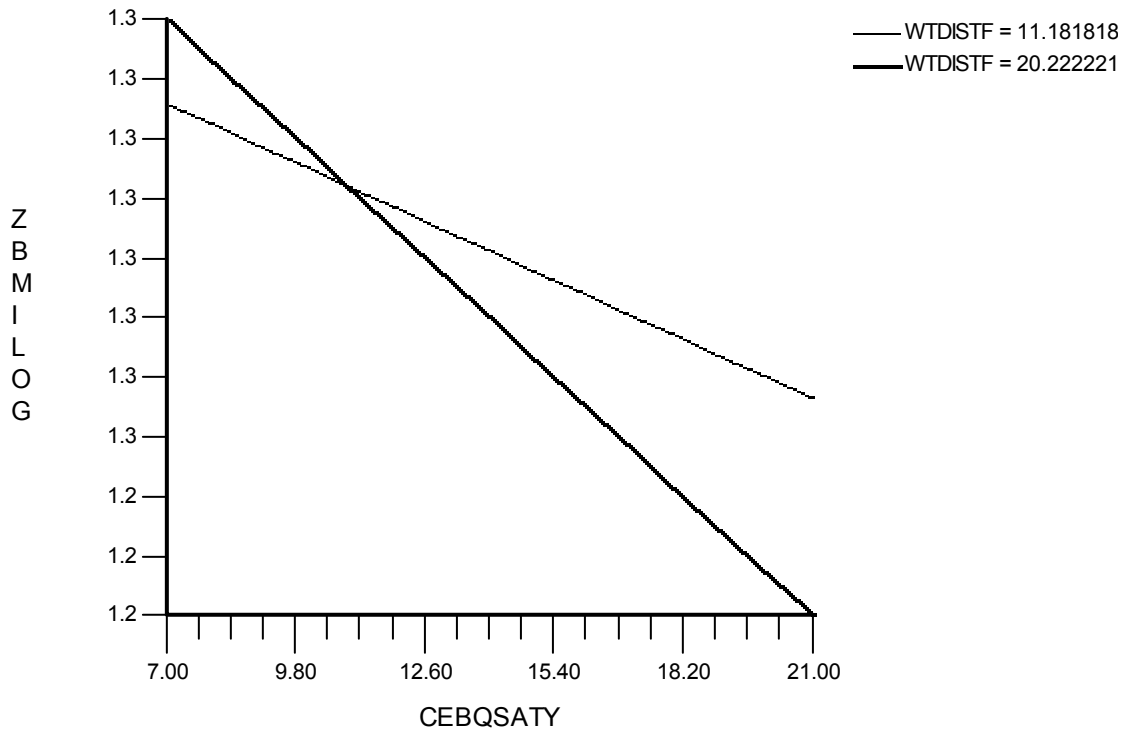


Figure 8. *Cross Level Interaction between Satiety Responsiveness and Community Weight Dissatisfaction*

Despite having little variance to work with, there was a cross-level interaction between satiety responsiveness and community weight dissatisfaction in predicting z-BMI. More specifically, there was a stronger negative relation between satiety responsiveness and BMI for individuals living in census tracts with high weight dissatisfaction than those living in census tracts with low weight dissatisfaction. That is, greater personal satiety responsiveness predicted significantly lower body mass if living in a community with greater (aggregate) weight dissatisfaction than if living in a community with lower (aggregate) weight dissatisfaction. The data suggest that weight dissatisfaction may be an aspect of social climate that moderates individual satiety responsiveness to predict body mass, supporting part three of hypothesis ten.

Hypothesis 10. Children's weight status will be inversely related to community SES. Support for this hypothesis would be demonstrated if a child's community SES significantly and inversely predicted child weight status.

Community SES did not significantly or inversely predict child z-BMI. As such, hypothesis 11 was not supported.

Hypothesis 11. Community levels of emotional overeating, weight management behaviors, and psychological barriers to diet and exercise were hypothesized to be associated with the eating behaviors of those children and/or parents residing in the communities. Support for this hypothesis would be demonstrated by finding a significant two-tailed Pearson correlation between community level behaviors and child or parent behaviors.

The mean census tract value of individual weight status behaviors and markers were compared with the mean value of community weigh status behaviors and markers via two-tailed Pearson correlation. There were no significant relationships between children's satiety responsiveness, emotional overeating, parental concern over child weight, parental dissatisfaction with child's body, or child's body image dissatisfaction with community levels of emotional overeating, dissatisfaction with weight, weight management behaviors, or psychological barriers to diet and exercise. There were, however, three significant parental correlations between the behaviors related to child overweight/obesity and the community level overweight/obesity behaviors, which can be seen in table 14.

Table 14. *Significant Correlations Between Parent Measures & Community Measures*

	CFQ-Restraint Subscale	**SATA Awareness Subscale**	**SATA Internalization Subscale**
Community Emotional Overeating	NS	NS	-.16*
Community Dissatisfaction with Weight	NS	NS	NS
Community Weight Management Behaviors	NS	.17*	NS
Community Psychological Barriers to Healthy Diet and Exercise	.16*	-.16*	-.20*

* Indicates significance at the .05 level

The SATA internalization score was significantly and negatively correlated with community levels of emotional overeating. It was also negatively correlated with community barriers to healthy diet and exercise. These findings suggest that those communities who internalize the typical appearance values of persons in the United States to a greater extent are less likely to emotionally overeat and less likely to have a larger number of barriers to exercise and healthy eating in their community.

The SATA Awareness subscale was an unreliable measure. It was significantly and positively correlated with community weight management behaviors and significantly and negatively correlated with community psychological barriers to diet and exercise. Obviously, the SATA Awareness analyses should be interpreted cautiously due to its unreliability.

Parental feeding restraint was positively correlated with community barriers to healthy diet and exercise, suggesting that the more barriers there were in a community, the more likely the parent was to be restrictive in their child's feeding.

Policy Level Analyses

Question of Interest 2. Will schools follow the government's guidelines for both physical activity and school lunch dietary composition?

The USDA's average weekly caloric content and fat percentage goal for children in grades K - 6 is 664 Calories and ≤ 30-31% total calories from fat (USDA School Lunch Guidelines, p. 17, 2002). Disparities between schools and guidelines in caloric content and fat percentage were calculated as seen in table 15.

Table 15. *School Adherence to UDSA Guidelines*

USDA School Lunch Goal		West Meade	Stratton	Hattie Cotton
≤ 30 – 31% total calories from fat	*School Lunch's Mean Fat content*	32.0%	30.0%†	31.0%†
	School Lunch's Fat Disparity From USDA Goal	+ 1.0%	0.0%	0.0%
664 total calories	*School Lunch's Mean Calories*	628	618	610
	School's Caloric Disparity from USDA Goal	- 36	- 46	- 54

† = met USDA goal

Differences in caloric and fat content between each school's lunch menu and the USDA's goals were minimal. The schools were not expected to meet the USDA's goals perfectly (USDA School Lunch Guidelines, 2002) and fell within the range expected.

The Surgeon General has made a list of "suggestions" for the prevention, identification, and treatment of pediatric obesity, whereby it is suggested that children exercise 60 minutes each day (NCHS, 2002c). Via physical education class, none of the schools fulfilled the Surgeon General's criterion.

CHAPTER IV

DISCUSSION

The main goal of this study was to begin to explore the variables that significantly predicted a child's weight status. The ecological model allowed for both macro and micro analyses, which is quite valuable given that information regarding macro level variables is limited in the pediatric obesity literature. Via this ecological perspective, macro, micro, and macro-micro level relationships were found. The ecological model also graphically illustrated how complex a problem it is to decipher those factors which accurately predict a child's weight. An attempt was made to draw a consummate model of the nature of these relationships yielded promising results.

The most noteworthy finding was that children's levels of satiety responsiveness negatively predicted weight status. This was an expected finding in that children's satiety responsiveness has been linked to overweight/obesity (Birch & Deysher, 1985; Satter, 1996) but never via a parental questionnaire, i.e., the CEBQ-satiety responsiveness subscale. This relationship was not as strong in African-American or "Other" as in Caucasian children, suggesting that the mechanism by which Caucasian children are becoming overweight/obese is to a greater degree via the overriding of their satiety cues than it is in African American or "Other" children.

Another major finding was that girls' level of emotional overeating positively predicted their weight status significantly more so than it did in boys, indicating that emotional overeating, a behavior seen more frequently in overweight women than men (Blair et al., 1990; Lowe & Fisher, 1983), may begin as early as age six. Another novel finding was via statistical methodology allowing for the simultaneous examination of community and individual based behaviors upon weight status, community levels of weight dissatisfaction interact with individual levels of satiety responsiveness to predict child weight status. Those children living in communities with higher levels of weight dissatisfaction responded less to their satiety cues and had a significantly greater z-BMI. This implies that community level thoughts and feelings are interacting with the individual children's behaviors and ultimately affecting their weight status.

The value of the ecological model is its ability to systematically organize, not only these cross level interactions, but direct relationships in close proximity to each other. Children's weight was predicted very well by the children's eating behaviors, a very close relationship in the ecological model. Children's satiety responsiveness, emotional overeating, and dissatisfaction with their body image explained 29% of the variance in child weight status. Individual level eating behaviors did indeed predict a child's weight status but 71% of the variance still remained unexplained.

In contrast to the individual child level, parental level variables did not hold much value in predicting child weight status. Via the interpersonal level of the ecological model, it was anticipated that the interpersonal-parental level variables chosen would be highly associated with child weight status. This had been previously demonstrated in the obesity literature but, in essence, this aspect of the ecological model was not supported. The relationship between parental restraint in feeding and child weight status was insignificant and the originally hypothesized association between parental restraint in feeding and child weight status was unsupported.

Perhaps the relationship between parental restrictive eating/feeding and child weight status is moderated by the amount of time families eat together. If families are not eating together, then it would not be anticipated that a parent's eating or feeding behaviors would have much of an impact upon the child. The frequency of family meals was unmeasured and utilizing such a measure could prove efficacious in future studies.

Parents of children who were more overweight/obese were, at the very least, aware that their children were heavier and justifiably concerned about their weight status, given the negative health implications of overweight/obesity. This relationship was significant even when parental BMI was controlled.

At the school level of analysis, there was minimal variance between school lunch menus caloric levels or percentage of calories from fat. This was expected as Metro-Nashville's school lunch program is centrally located and operated. Menus were created individually for each school but there was wide overlap between menu items. The children at West Meade received nearly double the physical education time than those children attending Hattie Cotton or Stratton but there were no significant differences in PE participation rate between schools. Although a myriad of factors could contribute to this difference, the increased time for physical activity in West Meade is worthy of further investigation.

The most noteworthy community-level finding was the interaction between community weight dissatisfaction and child satiety responsiveness in predicting child weight status. Preventing or treating obesity can be addressed at multiple levels, e.g., by public health professionals, parents, or teachers (Horgen & Brownell, 2002). This study provided a community level variable for public health professionals to target, i.e., community weight dissatisfaction. Addressing weight dissatisfaction at the community level could increase the effectiveness of targeting obesity/overweight behaviors at the child level, i.e, satiety responsiveness and, in turn, have a significant impact upon the growing rate of childhood obesity.

At the policy level, the caloric and fat content differences of each school's lunch menu from the USDA's goals were minimal. The schools were not expected to meet the USDA's goals perfectly (USDA School Lunch Guidelines, 2002) and fell within the range expected. None of the schools provided enough

time to fulfill the Surgeon General's recommendation that children receive approximately 60 minutes of exercise each day. The Surgeon General has made a list of "suggestions" for the prevention, identification, and treatment of pediatric obesity (NCHS, 2002c) but no program has been established to convey this message on a large scale.

Problems and Limitations

Only 37 % of children completed the preference for calorically dense foods subscale and hypotheses regarding children's preference for these foods were unable to be tested. The reason for this low rate of completion is likely multifarious. The amount of adult supervision-assistance delivered when the children filled out the questionnaires varied considerably. For instance, children who were away from their classroom and missed the initial offering of the measures, filled out the measures at a later date and were typically left unsupervised. The research protocol of the investigators left little time for supervision of the measures after the initial offering. Another plausible reason for the poor response on these measures is that each measure was fairly long and perhaps beyond the typical attention span of a third-grade child. Each measure has been previously validated with children age six to ten years in previous studies (Harrell, 2000) yet their supervision may have been more extensive in filling out these questionnaires.

There is a possible limiting factor in the accuracy of the finding that the relationship between emotional overeating and weight status is stronger in girls. Namely, boys may be less likely to verbalize their emotions (Brody & Hall, 1993). As parents filled out the CEBQ-E, it may be that parents are unable to link their son's emotional state with overeating.

There are confounds in collecting data from a convenience-school sample in the South-eastern U.S. First, this sample was not representative of the United States population as the participants are from the Southeast, though the majority of African-Americans (53%) reside in the Southeast (Kumanyika, 2002). Thus, the generalizability of this analysis was limited. Community data was derived solely from Nashville, TN and whether this translates to other cities, states, or regions within the United States remains to be seen. A larger community based study implementing the same measures to a larger population would likely be informative. Second, the study was a convenience sample and was not been randomly selected from the population, weakening the generalizability of the study.

A variety of explanations may exist for the lack of findings at the community level. A child's census tract may be an inaccurate estimation of the child's neighborhood. A census tract is typically a very small geographic area, i.e., a few blocks, and an analysis at this level may be breaking the area of interest into too many parts. It is also possible that neighborhood "culture" was not a level of the child's environment that had a significant influence on the child's weight status. The number of children in each

census tract, i.e., an average of eight children per tract, may have been too few to find a difference, i.e., the study was underpowered at this level. However, analyzing differences at the individual level and the community level at a single common level is very problematic.

Community level analyses are particularly vulnerable to aggregation bias (Bryk & Radenbush, 1992). Aggregation bias occurs when information is lost when many subunits are aggregated into values for fewer super-units, decreasing the ability to detect an effect if it is present (Bryk & Radenbush, 1992). In the above mentioned analyses, community level variables were aggregated into values which matched the child level, i.e., an *N* of ~2500 was aggregated into an *N* of 167, thereby losing statistical power. Perhaps the parental-community level relationships were particularly strong and overcame aggregation bias. The more than likely case, however, was that the parental-community level analyses violated the assumption that there was independence of observations, i.e., parents living in the same community were exposed to the same community level characteristics.

There are also limitations to the hierarchical linear model that was created. The most obvious of which is that only a small amount of the variance in z-BMI, 2.9%, was explained by satiety responsiveness and community weight dissatisfaction.

Theory

This study failed to support any relationship between parental eating behavior or feeding behavior and child weight status. The population examined in the present study was ethnically diverse and the results of which parallel Robinson et al.'s (2001) findings. Using a much larger, ethnically diverse sample, the authors found no relationship between parental feeding practices and pediatric overweight/obesity status. Perhaps the relationship between restrictive parental feeding practices and weight status is only applicable in specific ethnic populations, e.g. Caucasians. SES was controlled for in this project and does not explain the lack of findings either. The lack of effect could also be a product of time. When the model was created in 1985, the food environment was not nearly as "toxic" (Horgen & Brownell, 2002). Effects of parental restrictiveness upon weight status could be slight and masked by the prominent environment behemoths (Horgan & Brownell, 2002), e.g., the fast-food industry, or, as mentioned earlier, the amount of exposure a child has to their parent's eating and/or feeding practices.

Implementing the ecological model required novel lines of research to be addressed, and serendipitously lead to novel lines of theory, e.g., satiety responsiveness and community weight dissatisfaction, which would have gone unexplored if multiple levels of the child's environment had not been examined.

Future Research

This project has laid the groundwork for future lines of research in pediatric obesity. Although a relationship with parental feeding and eating behaviors and children weight status was not found, it would be foolhardy to ignore the powerful impact a parent does have on their child's weight status. Perhaps the "key" to this relationship is not in the manner in which a parent feeds their child but how the parent interacts with the child on a larger level. Perhaps administering a system of "parent training", i.e., teaching basic behavioral principles of parenting to the parents of overweight/obese children could be an effective form of treatment for overweight/obesity (Zucker, 2004). If the overall effectiveness of a parent upon their child's behavior is increased, perhaps they would be more likely to direct their child away from the food toxic environment and towards an increased level of physical activity.

Implications for Clinical Practice

The results of this study have several implications for the clinical prevention and treatment of pediatric overweight/obesity. The major finding of this study is that, in Caucasian children, overweight/obese children are less likely to respond to their feelings of fullness. Teaching satiety responsiveness is one component of a novel line of Appetite Awareness training (AAT) for weight management in adults (Craighead, 2004). The initial focus of this program is instructing participants to focus on and decipher signals of hunger and satiety. Such training occurs via *in vivo* exercises, psychoeducation, and active daily monitoring. The focus of such instruction is the initiation of eating at a moderate level of hunger and the termination of eating at a moderate level of satiety. Furthermore, participants are taught problem-solving skills to determine the function of overeating at those eating episodes when they eat past fullness. The tenets of this program rest on principles of learning theory and are influenced by eastern meditative mindfulness practices. Modifying such a program for overweight children has been performed very recently by Zucker (2004) and is being currently pilot-tested in Australia.

Negative emotion has long been recognized as an antecedent for overeating (Greeno et al., 2000). Creating an emotional regulation coping skills program for children that teaches children alternate ways to deal with their emotions rather than overeating could also prove to be effective.

Finally, body image dissatisfaction was strongly associated with the children's weight status and treating body image dissatisfaction is a very rich area of psychological treatment for overweight/obesity (Davison et al., 2000). Developing a line of therapeutic intervention research, which combines all satiety responsiveness training, alternate coping skills for dealing with emotions than overeating, and addressing body image issues, would very likely prove fruitful for the treatment of pediatric overweight/obesity.

Implications for Families

The primary implication for families put forward by this work is that listening to one's satiety cues could be a very good way of preventing overweight/obesity. If overweight/obesity prevention is one family goal, a rule such as "Clean up your Plate" has little foundation. Listening to one's satiety cues is not an easy task but the AAT described above could likely help entire families to re-conceptualize their feelings of "fullness" and decrease their chances of becoming overweight/obese.

Another implication for families is that boys may be emotionally overeating and parents are failing to recognize the connection between their son's emotional arousal and his eating because he is not otherwise expressing his emotion. It could also be the case that boys are just less likely to cope with emotional arousal via overeating. In either case, this work suggests that girls begin to emotionally overeat as young as age six, which is strongly associated with a higher weight status. A parent's modeling of alternate coping skills to overeating when they are emotionally aroused could prove to be very effective. Additionally, teaching children to recognize their emotional state and methods to deal with these emotions could also prove to be efficacious.

Implications for Schools & Policy

As this project was cross-sectional, it was limited in its examination of school and policy level variables relevant to child weight status. One pertinent finding was that the z-BMI of the children in the school receiving the most PE was lower. On a grander level, the rate of PE offered to school age children has dropped considerably over the past 30 years while the rate of overweight/obesity has risen. Decreasing levels of PE in schools may have contributed to the pediatric overweight/obesity epidemic but no firm relationship has been established. Physical activity was not addressed by this project but unquestionably plays a role in determining a child's weight status. Given that PE is a prime opportunity for children to increase their level of physical activity, it can only be suggested that school and government policy be directed towards increasing the amount of PE offered, as increased levels of physical activity can only aid in lowering rates of pediatric obesity/overweight.

Implications for Communities

Higher levels of community dissatisfaction with weight are associated with the children in those communities having a higher weight status. This suggests that community level interventions, e.g., newspaper ads, billboards, programs, etc., which specifically address weight related topics could prove to be efficacious. Certainly only a project on a much larger scale than the present work could answer these questions. This study has provided researchers, public health officials, and/or community based

organizations with possible directions where they might put their intervention efforts to decrease the rate of pediatric overweight/obesity.

Conclusion

This project attempted to decipher the role of a child's environment in determining their weight status. Via an exploration of factors at the individual, family, organizational, community, and policy levels, valuable pieces of information were uncovered and, optimistically, productive lines of future research were suggested.

Appendix A - Female Feeding Questionnaire (Scales with Labels)

The following is to be filled out by ONE person in the family only. This person is the parent, guardian, grandparent, etc. who is primarily in charge of FEEDING the child (the person who does most of the shopping and cooking in the house). If you are a woman filling out this questionnaire, please fill out the questionnaire with 'WOMAN' written below and throw away the questionnaire that says 'MAN' written below. If you are a man filling out this questionnaire, please fill out the questionnaire with 'MAN' written below and throw away the questionnaire that says 'WOMAN' below.

WOMAN

It should take approximately 15 minutes to fill out this questionnaire

Please answer the following questions to the best of your ability. If, at any time, you do not feel comfortable answering a question, you may choose to not answer the question. You may also stop at any time if you no longer wish to participate. Thank you for your time.

PLEASE DO NOT CIRCLE MORE THAN ONE CHOICE FOR ANY GIVEN ANSWER

1) What is your third-grade child's age (**only** the child participating in the study) ? _

2) How do you describe **your child's** ethnicity?

Black-African American Asian Hispanic White-American Other

3) What are the names of two people who will always know where you are living?

1._____ 2._____.

4) Did your child breast-feed for more than one month?

Yes No

Child Feeding Questionnaire-Concern about Child's Weight					
3) How concerned are you about your child eating too much when you are not around him/her?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
4) How concerned are you about your child becoming over weight?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
5) How concerned are you about your child having to diet to maintain a desirable weight?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
Child Feeding Questionnaire-Restraint in Feeding					
6) I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries)	disagree	slightly disagree	neutral	slightly agree	agree
7) If I do not guide or regulate my child's eating, he/she would eat too much of her favorite foods	disagree	slightly disagree	neutral	slightly agree	agree
8) I have to be sure that my child does not eat too many high-fat foods	disagree	slightly disagree	neutral	slightly agree	agree
9) I offer sweets (candy ice cream, cake pastries) to my child as a reward for good behavior	disagree	slightly disagree	neutral	slightly agree	agree

10) I have to be sure that my child does not eat too much of her favorite foods	disagree	slightly disagree	neutral	slightly agree	agree
11) I offer my child her favorite foods in exchange for good behavior	disagree	slightly disagree	neutral	slightly agree	agree
12) If I do not guide or regulate my child's eating, he/she would eat too many junk foods	disagree	slightly disagree	neutral	slightly agree	agree
13) I intentionally keep some foods out of my child's reach	disagree	slightly disagree	neutral	slightly agree	agree
CFQ-Monitoring					
14) How much do you keep track of the high-fat foods that your child eats?	never	rarely	sometimes	often	always
Child Eating Behavior Questionnaire-Satiety Responsiveness					
15) My child gets filled up easily	never	rarely	sometimes	often	always
16) My child has a big appetite	never	rarely	sometimes	often	always
17) My child leaves food on her plate at the end of a meal	never	rarely	sometimes	often	always
18) My child gets full before her meal is finished	never	rarely	sometimes	often	always
19) My child cannot eat a meal if he/she has had a snack just before	never	rarely	sometimes	often	always
20) My child takes more than 30 minutes to finish a meal	never	rarely	sometimes	often	always
21) My child finishes his/her meal very quickly	never	rarely	sometimes	often	always
22) My child eats more and more slowly during the course of a meal	never	rarely	sometimes	often	always
Child Eating Behavior Questionnaire-Desire for drinks					
23) If given the chance, my child would always be having a drink	never	rarely	sometimes	often	always
24) If given the chance, my child would drink continuously throughout the day	never	rarely	sometimes	often	always
25) My child is always asking for a drink	never	rarely	sometimes	often	always
Child Eating Behavior Questionnaire-Emotional Overeating					

26) My child eats more when anxious	never	rarely	sometimes	often	always
27) My child eats more when annoyed	never	rarely	sometimes	often	always
28) My child eats more when worried	never	rarely	sometimes	often	always
29) My child eats more when he/she has nothing else to do	never	rarely	sometimes	often	always

Please read each of the following items and circle the answer that best reflects your agreement with the statement.

Three Factor Eating Questionnaire-Flexible Control				
30) When I have eaten my quota of calories, I am usually good about not eating any more	True	False		
31) I deliberately take small helpings as a means of controlling my weight	True	False		
32) While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it	True	False		
33) I consciously hold back at meals in order not to gain weight	True	False		
34) I pay a great deal of attention to changes in my figure	True	False		
35) How conscious are you of what you are eating?	not at all	slightly	moderately	extremely
36) How likely are you to consciously eat less than you want?	unlikely	slightly likely	moderately likely	very likely
Three Factor Eating Questionnaire-Rigid Control				
37) I have a pretty good idea of the number of calories in common food	True	False		
38) I count calories as a conscious means of controlling weight	True	False		
39) How often are you dieting in a conscious effort to control your weight?	rarely	sometimes	usually	always

40) Would a weight fluctuation of 5lbs (2kgs) affect the way you live your life?	not at all	slightly	moderately	very much
41) Do your feelings of guilt about overeating help you control your food intake?	never	rarely	often	always
42) How frequently do you avoid "stocking up" on tempting foods?	almost never	seldom	usually	always
43) How likely are to shop for low calorie foods?	unlikely	slightly likely	moderately likely	very likely

Please read each of the following items and circle the number that best reflects your agreement with the statement.

Sociocultural Attitude Towards Appearance

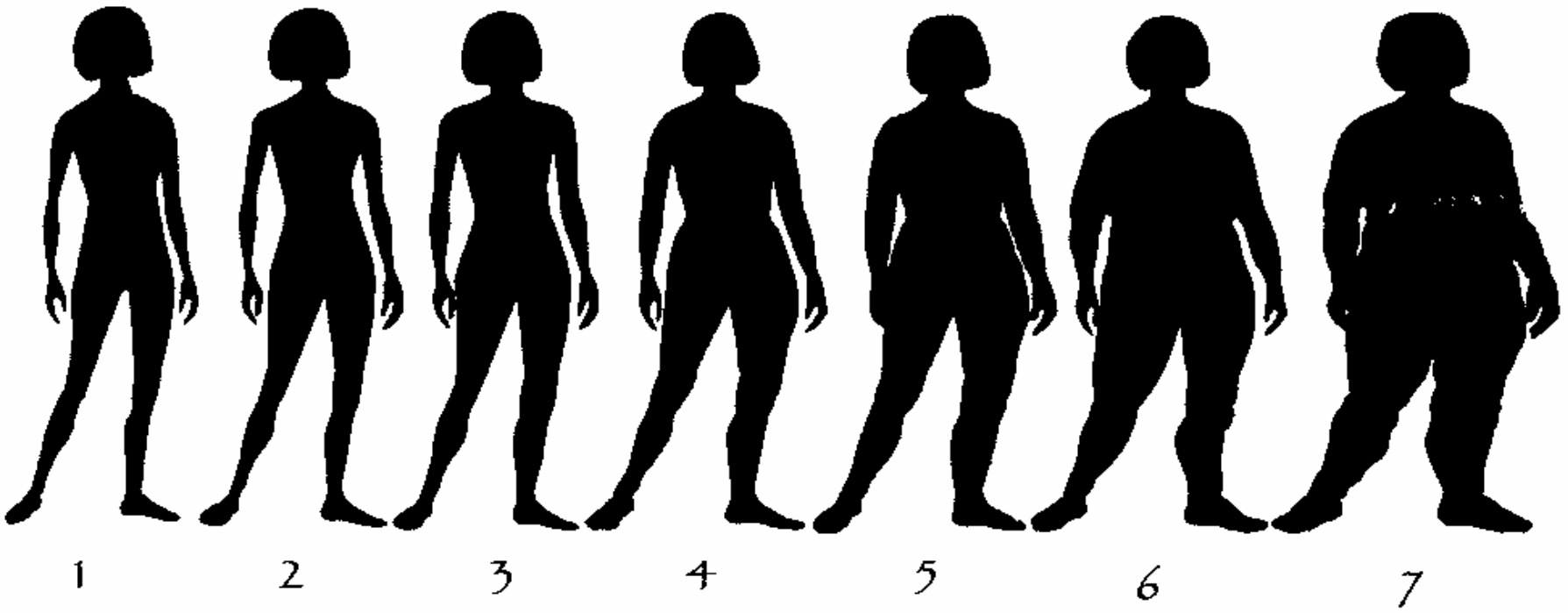
**** = Awareness Scale***

44) Women who appear in TV shows and movies project the type of appearance that I see as my goal.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
45) I believe that clothes look better on thin models.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
46) Music videos that show thin women make me wish that I were thin.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
47) I do not wish to look like the models in the magazines	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
48) I tend to compare my body to people in magazines and on TV.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
49) In our society, fat people are not regarded as unattractive*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree

50) Photographs of thin women make me wish I were thin	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
51) Attractiveness is very important if you want to get ahead in our culture*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
52) It's important for people to work hard on their figures/physiques if they want to succeed in today's culture*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
53) Most people do not believe that the thinner you are, the better you look in clothes*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
54) People think that the thinner you are, the better you look in clothes*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
55) In today's society, it's not important to always look attractive*	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
56) I wish I looked like a swimsuit model	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
57) I often read magazines like Cosmopolitan, Vogue, and Glamour and compare my appearance to the models	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
Personal Resource Questionnaire-Nurturance					
58) There is little opportunity in my life to be giving and caring to another person	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree

59) I have the opportunity to encourage others to develop their interests and skills	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
60) I enjoy doing little "extra" things that make another person's life more pleasant	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
61) I am responsible for helping provide for another person's needs.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
62) I have a sense of being needed by another person	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree

Contour Drawing Rating Scale-Mother



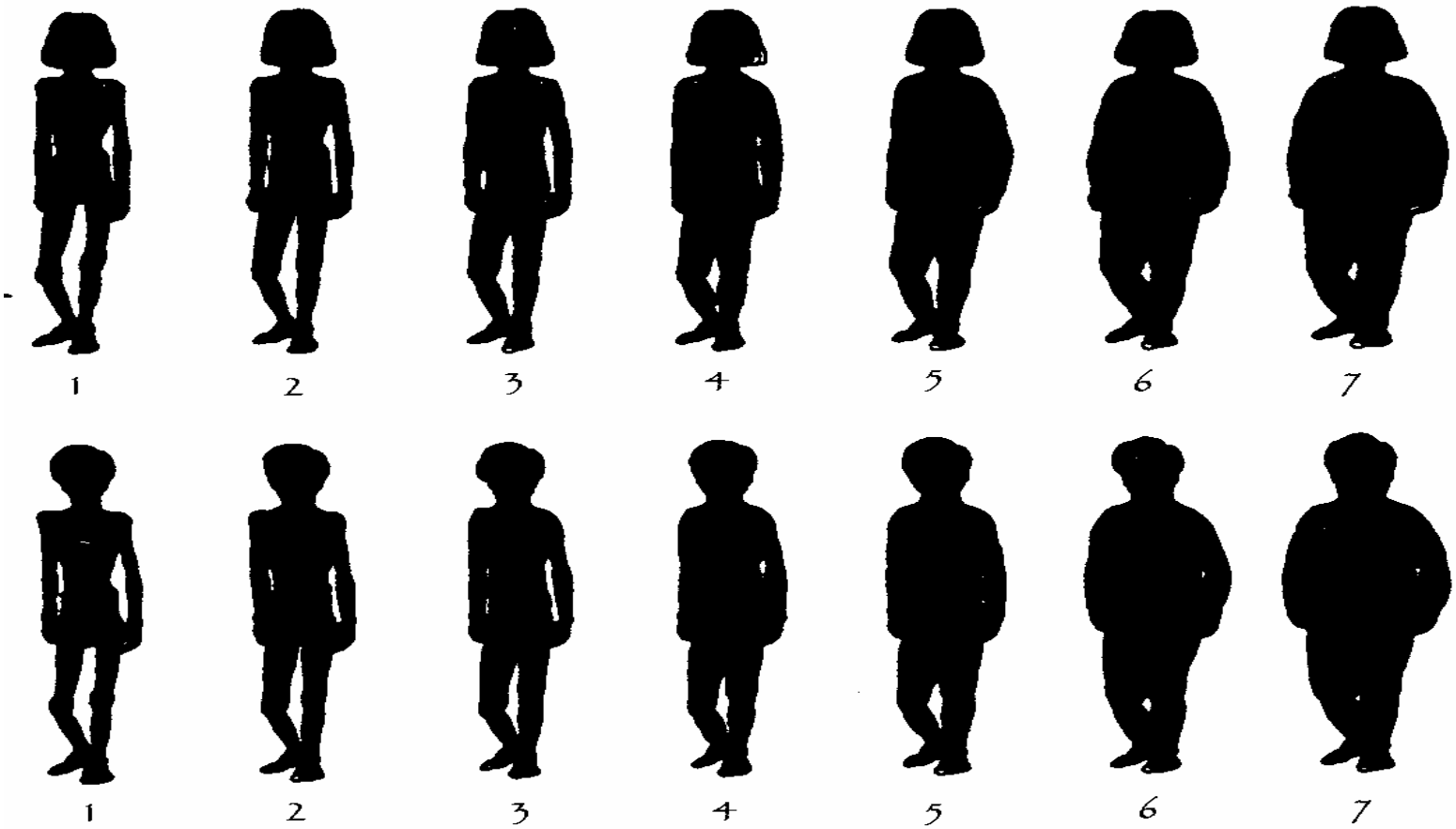
Use the numbers from the above images to answer the following 2 questions <u>about yourself, mom.</u>

63) Which figure do you feel looks like **your** body right now? ___(choose a number from 1-7)

64) Which figure do you feel **you** would like your body to look like? ____(choose a number from 1-7)

Contour Drawing Rating Scale-Mother's View of Child

Girls



Use the numbers from the above images to answer the following 2 questions are <u>about your child</u>.

65) Which figure do you feel looks like **your child's** body right now? ___(choose a number from 1-7)

66) Which figure do you feel you would like **your child's body** to look like? ___(choose a number from 1-7)

Appendix B - Male Feeding Questionnaire (Scales without labels)

The following is to be filled out by ONE person in the family only. This person is the parent, guardian, grandparent, etc. who is primarily in charge of FEEDING the child (the person who does most of the shopping and cooking in the house). If you are a woman filling out this questionnaire, please fill out the questionnaire with 'WOMAN' written below and throw away the questionnaire that says 'MAN' written below. If you are a man filling out this questionnaire, please fill out the questionnaire with 'MAN' written below and throw away the questionnaire that says 'WOMAN' below.

MAN

It should take approximately 15 minutes to fill out this questionnaire

Please answer the following questions to the best of your ability. If, at any time, you do not feel comfortable answering a question, you may choose to not answer the question. You may also stop at any time if you no longer wish to participate. Thank you for your time.

PLEASE DO NOT CIRCLE MORE THAN ONE CHOICE FOR ANY GIVEN ANSWER

1) What is your third-grade child's age (**only** the child participating in the study) ? _

2) How do you describe **your child's** ethnicity?

Black-African American Asian Hispanic White-American Other

3) What are the names of two people who will always know where you are living?

1._____ 2._____.

4) Did your child breast-feed for more than one month?

Yes No

3) How concerned are you about your child eating too much when you are not around him/her?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
4) How concerned are you about your child becoming over weight?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
5) How concerned are you about your child having to diet to maintain a desirable weight?	unconcerned	a little concerned	concerned	fairly concerned	very concerned
6) I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries)	disagree	slightly disagree	neutral	slightly agree	agree
7) If I do not guide or regulate my child's eating, he/she would eat too much of her favorite foods	disagree	slightly disagree	neutral	slightly agree	agree
8) I have to be sure that my child does not eat too many high-fat foods	disagree	slightly disagree	neutral	slightly agree	agree
9) I offer sweets (candy ice cream, cake pastries) to my child as a reward for good behavior	disagree	slightly disagree	neutral	slightly agree	agree
10) I have to be sure that my child does not eat	disagree	slightly disagree	neutral	slightly agree	agree

too much of her favorite foods					
11) I offer my child her favorite foods in exchange for good behavior	disagree	slightly disagree	neutral	slightly agree	agree
12) If I do not guide or regulate my child's eating, he/she would eat too many junk foods	disagree	slightly disagree	neutral	slightly agree	agree
13) I intentionally keep some foods out of my child's reach	disagree	slightly disagree	neutral	slightly agree	agree
14) How much do you keep track of the high-fat foods that your child eats?	never	rarely	sometimes	often	always
15) My child gets filled up easily	never	rarely	sometimes	often	always
16) My child has a big appetite	never	rarely	sometimes	often	always
17) My child leaves food on her plate at the end of a meal	never	rarely	sometimes	often	always
18) My child gets full before her meal is finished	never	rarely	sometimes	often	always
19) My child cannot eat a meal if he/she has had a snack just before	never	rarely	sometimes	often	always
20) My child takes more than 30 minutes to finish a meal	never	rarely	sometimes	often	always
21) My child finishes his/her meal very quickly	never	rarely	sometimes	often	always
22) My child eats more and more slowly during the course of a meal	never	rarely	sometimes	often	always
23) If given the chance, my child would always be having a drink	never	rarely	sometimes	often	always
24) If given the chance, my child would drink continuously throughout the day	never	rarely	sometimes	often	always
25) My child is always asking for a drink	never	rarely	sometimes	often	always
26) My child eats more when anxious	never	rarely	sometimes	often	always
27) My child eats more when annoyed	never	rarely	sometimes	often	always
28) My child eats more when worried	never	rarely	sometimes	often	always
29) My child eats more when he/she has nothing else to do	never	rarely	sometimes	often	always

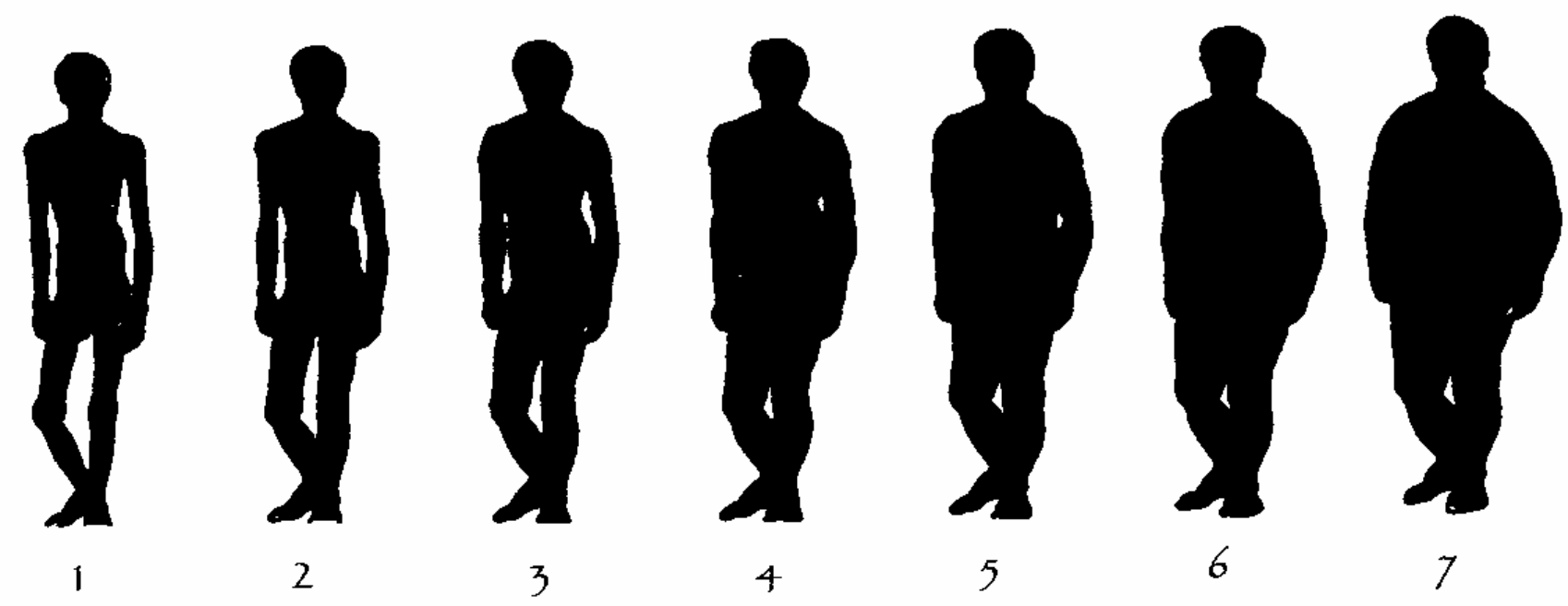
Please read each of the following items and circle the answer that best reflects your agreement with the statement.

30) When I have eaten my quota of calories, I am usually good about not eating any more	True	False		
31) I deliberately take small helpings as a means of controlling my weight	True	False		
32) While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it	True	False		
33) I consciously hold back at meals in order not to gain weight	True	False		
34) I pay a great deal of attention to changes in my figure	True	False		
35) How conscious are you of what you are eating?	not at all	slightly	moderately	extremely
36) How likely are you to consciously eat less than you want?	unlikely	slightly likely	moderately likely	very likely
37) I have a pretty good idea of the number of calories in common food	True	False		
38) I count calories as a conscious means of controlling weight	True	False		
39) How often are you dieting in a conscious effort to control your weight?	rarely	sometimes	usually	always
40) Would a weight fluctuation of 5lbs (2kgs) affect the way you live your life?	not at all	slightly	moderately	very much
41) Do your feelings of guilt about overeating help you control your food intake?	never	rarely	often	always
42) How frequently do you avoid "stocking up" on tempting foods?	almost never	seldom	usually	always
43) How likely are to shop for low calorie foods?	unlikely	slightly likely	moderately likely	very likely

Please read each of the following items and circle the number that best reflects your agreement with the statement.

	(1)	(2)	(3)	(4)	(5)
44) Men who appear in TV shows and movies project the type of appearance that I see as my goal.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
45) I believe that clothes look better on thin models.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
46) Music videos that show thin men make me wish that I were thin.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
47) I do not wish to look like the models in the magazines	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
48) I tend to compare my body to people in magazines and on TV.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
49) In our society, fat people are not regarded as unattractive	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
50) Photographs of thin men make me wish I were thin.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
51) Attractiveness is very important if you want to get ahead in our culture	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
52) It's important for people to work hard on their figures/physiques if they want to succeed in today's culture	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree

53) Most people do not believe that the thinner you are, the better you look in clothes	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
54) People think that the thinner you are, the better you look in clothes	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
55) In today's society, it's not important to always look attractive	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
56) I wish I looked like a swimsuit model	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
57) I often read magazines and compare my appearance to the models	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
58) There is little opportunity in my life to be giving and caring to another person	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
59) I have the opportunity to encourage others to develop their interests and skills	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
60) I enjoy doing little "extra" things that make another person's life more pleasant	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
61) I am responsible for helping provide for another person's needs.	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree
62) I have a sense of being needed by another person	1 completely disagree	2	3 neither agree nor disagree	4	5 completely agree

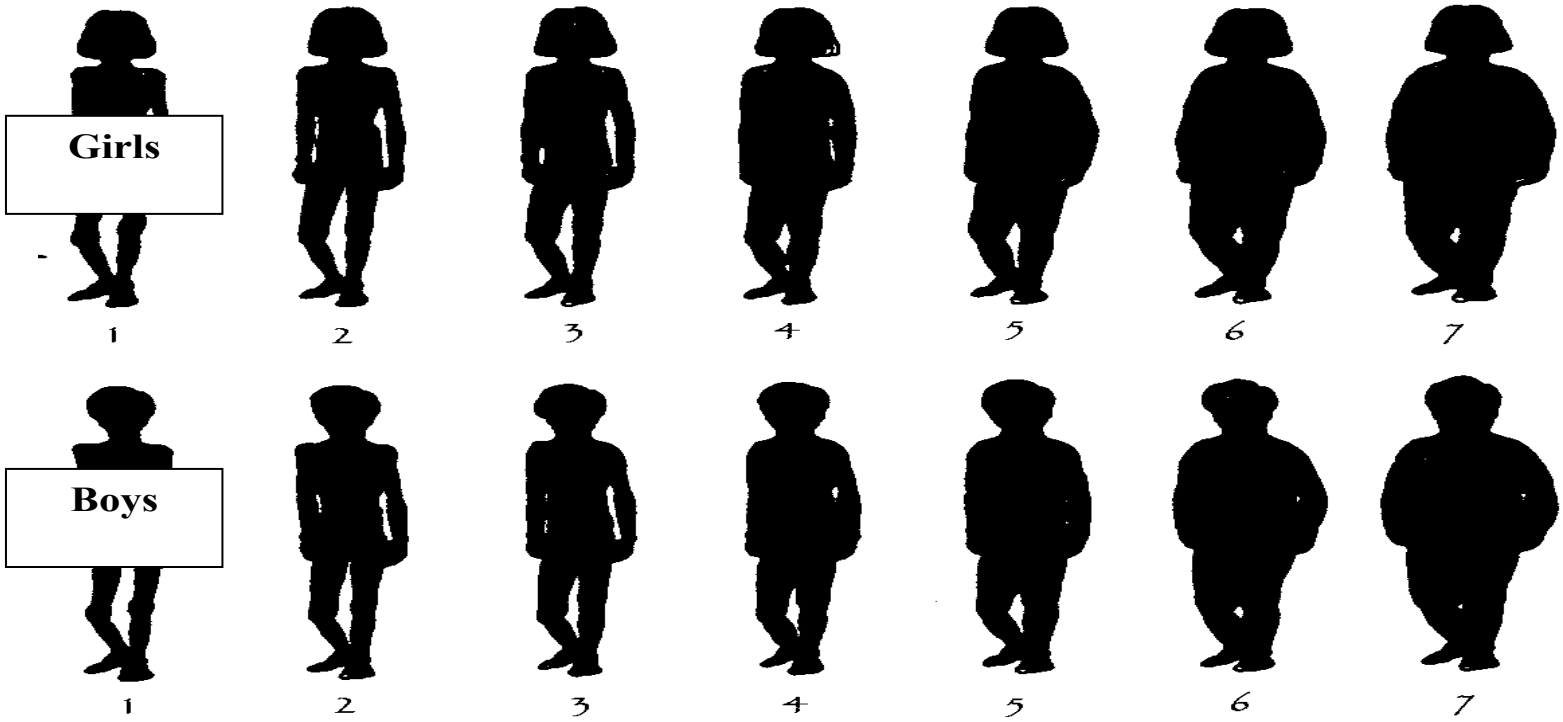


Use the numbers from the above images to answer the following 2 questions <u>about yourself, dad.</u>

63) Which figure do you feel looks like **your** body right now? ___(choose a number from 1-7)

64) Which figure do you feel **you** would like your body to look like? ____(choose a number from 1-7)

Appendix C - Child Body Image Dissatisfaction Scale



Use the numbers from the above images to answer the following 2 questions about <u>yourself</u>.

65) Which figure do you feel looks like **your** body right now? _____(choose a number from 1-7)

66) Which figure do you feel you would like **your body** to look like? _____(choose a number from 1-7)

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