The Effect of Neighborhood and Family Influences on Body Image and Dietary Restraint in Pre-Adolescent Children

By

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Abstract

The purpose of this study was to investigate the effects of neighborhood and family influences on body image and dietary attitudes in a cohort of 10-and 11-year old children across the BMI spectrum. In this cross-sectional study, age-appropriate figure drawings, Dietary Restraint and Body Esteem Scales were administered to 554 boys and girls. Information on parent and neighborhood influences were gathered from participants' parents and tested for association with child variables through multiple linear regression. This study indicates that parent modeling variables have an association with child body esteem and dietary restraint when BMI is controlled. We found that socioeconomic status plays a role, with high socioeconomic neighborhoods resulting in higher body esteem and dietary restraint. Geographic location had no influence over child variables. Overall, important influences were found between parent and socioeconomic status variables and body esteem and restraint.

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Table of Contents

List of Tables

List of Figures

List of Copyright Material for which Permission was Obtained

List of Abbreviations

EAT- Eating Attitudes Test

BMI- Body Mass Index

SES- Socioeconomic Status

LICO- Low Income Cut Off

SAGE- Study of Asthma, Genes and the Environment

Although each individual's body image development may be different, some specific factors that may play a role in the development of body image are neighborhood socioeconomic status, family socioeconomic status and education; parental modeling of behavior; family comments and teasing; and pressure from peers (Adams et al., 2000; O'Dea & Caputi, 2001; Ricciardelli & McCabe, 2001; M. Story, French, Resnick, & Blum, 1995; Wang, Byrne, Kenardy, & Hills, 2005). However, few studies with adequate sample sizes have been conducted investigating the effects of parental and neighborhood influences and body esteem and dieting attitudes; even fewer of these studies contain Canadian data. Of the studies of adequate size that do exist around parental influences, few studies involve data from both the mother and the father.

This lack of appropriate data is a cause for concern. Body image can play an important role in the development of body dissatisfaction and the drive for a different appearance or body shape. Individuals may choose to diet or participate in frequent exercise, or a combination of the two. Dieting can develop into disordered eating. Disordered eating can include constant, or habitual dieting, irregular eating patterns and can involve ignoring hunger cues. It can also include behaviors involved in anorexia or bulimia, as well as compulsive eating (National Eating Disorders Information Centre, 2008). It is important to fully understand the factors surrounding the development of body image, its relationship with food and dieting, and the impact that this can have on a child in order to prevent poor body image, since some of the factors that play a role in the development of poor body image can play a direct role in the development of eating disorders (van den Berg, Wertheim, Thompson, & Paxton, 2002).

More research is needed around body image, and the subsequent relationship with food and dieting. The effect of family socioeconomic status on body image and dieting habits needs further study. Additional research on the contributions of parents' modeling behaviors on body image and dieting habits would be beneficial. Neighborhood socioeconomic status has been shown to play a role, but results in Canada are conflicting and warrant further study. Finally, the relationship between urban/rural location and body image is also under-investigated and conflicting. I am therefore hypothesizing that aspects of the family and neighborhood, such as socioeconomic status and location, play an important role in the development of body image and dieting habits.

The purpose of this study is to investigate the effects of neighborhood and family influences including socioeconomic status, geographic location and parental modeling on body image and dietary attitudes in a cohort of 10-and 11-year old children.

Literature Review

What is Body Image?

Defined broadly, body image "refers to an individual's thoughts and feelings about their body and physical appearance" (Hargreaves & Tiggemann, 2006). Body image therefore includes such constructs as body dissatisfaction, body esteem and desire for a different body size. Body dissatisfaction is defined as a negative evaluation of the appearance of one's body, or some aspect of it (G. D. M. Marchessault, 2001). This can include being dissatisfied with an overall aspect, such as with your weight, or being dissatisfied with a particular body part. Body esteem can be positive or negative and is often the concept referred to when measuring body dissatisfaction. Body esteem refers to self-evaluations of one's body or appearance (B. K. Mendelson & White, 1985; B. K. Mendelson, Mendelson, & White, 2001). This differs from self-esteem which refers "to the evaluation which the individual makes and customarily maintains with regard to himself: it expresses an attitude of approval or disproval, and indicates the extent to which the individual believes himself to be capable, significant, successful, and worthy" (Coopersmith, 1967). Finally, desire for a different body size reflects the desire of an individual to have a body shape that is smaller, or larger, than their current body size. Desire for a different body size may evolve as a byproduct of body dissatisfaction or poor body esteem.

Body Image in Pre-Adolescent Children

The self-perception that one is fat despite an adequate weight can happen prior to adolescence (Pinheiro & Giugliani, 2006). This self-perception has been found in

children who perceived that their parents wished they were thinner and children who had a low self esteem (Pinheiro & Giugliani, 2006). Poor body image has been found in both boys and girls, with boys frequently focusing on muscle building and weight gain, as well as weight loss, and girls focusing primarily on weight loss (Clark & Tiggemann, 2006; Clark & Tiggemann, 2007; Cohane & Pope, 2001; D. C. Jones & Crawford, 2005; McCabe & Ricciardelli, 2001). Poor body image is wide spread; in one study conducted in the San Francisco Bay Area, 50% (n=62, 31 girls) of children from grade 3 through grade 6 reported a desire to lose weight and 27.4% of the children had already attempted to alter their body weight (Schur, Sanders, & Steiner, 2000). A recent study conducted in Manitoba and using a cohort of 565 (56.8% boys) pre-adolescent children also reported that 34.6% of boys and 45% of girls desired a smaller body size, with girls desiring the greater change (Bernier, Kozyrskyj, Benoit, Becker, & Marchessault, 2010). Clark and Tiggemann (2006) reported similar results with 9 to 12 year old girls (n=100). In their study, conducted in Australia, 49% of the children reported desiring a smaller body size (Clark & Tiggemann, 2006). This idea, that roughly 50% of children desire to be thinner, has been supported in other literature (Clark & Tiggemann, 2007; Sands & Wardle, 2003).

Dieting Attitudes and Behaviors

According to Hill, Weaver and Blundell (1990), dieting, a self-enforced restriction of food intake, is a popular and socially acceptable method of maintaining or achieving one's desired body weight or body shape. The reasons for dieting vary, however frequently results from dissatisfaction with current body size or shape, a

component of poor body image. In children specifically, dieting behaviors have been linked to poor body image (Kelly, Ricciardelli, & Clarke, 1999; M. Story et al., 1991). Researchers have shown that the frequency and extent of dieting in children increases with age (Attie & Brooks-Gunn, 1989; M. Story et al., 1991). However, dieting is rarely successful. In one study of 2,921 university students who exhibited a high level of restraint/dieting, weight gain occurred over time (Provencher et al., 2009). This same effect has been shown in 14,972 (n= 8203 girls) American youth aged 9 to 14 years of age (Field et al., 2003). This is a problem which can further contribute to poor body image and overall self esteem.

Dieting has also been linked with the development of eating disorders, specifically binging practices (Field et al., 2003; Field et al., 2008; French, Story, Downes, Resnick, & Blum, 1995; Polivy & Herman, 1985; M. Story et al., 1991). Story and colleagues have found chronic dieters to be much more likely to use methods such as vomiting, laxatives and diuretics to maintain or lose weight (M. Story et al., 1991). This is concerning, since the annual mortality rate for anorexia nervosa in females between the ages of 15-25 is more than 12 times higher than the annual death rate for all other causes (Cavanaugh & Lemberg, 1999).

Weight and body image concerns are present in children as young as six years of age and some of these children have already experimented with dieting (O'Dea & Caputi, 2001; Tanofsky-Kraff et al., 2004). Dieting also occurs frequently in pre-adolescents. In one Canadian study conducted between 1993 and 2003, roughly 30% of girls between the ages of 10 to 14 (n=2,279) were currently dieting, while 11% had scores that were higher

than the clinical threshold for eating disorders (McVey, Tweed, & Blackmore, 2004). Similar findings were reported by Field and colleagues (2003) on surveys conducted from 1996 to 1999. In their sample of 14,972 (n= 8,203 girls) American girls aged 9-14 years, roughly 5% self-reported dieting 2-6 times per week or every day, while 25% reported dieting between once a week and once a month. The rates found in boys were 2% and 14%, respectively. Older studies have also shown large numbers of children dieting. In a study conducted by Maloney, McGuire, Daniels & Specker (1989) in two school in Cincinnati in the 1980's (n=318), 45% of children from grades 3-6 wanted to be thinner and 37% had experimented with dieting. A more recent study based in Manitoba and using a cohort of 565 pre-adolescent children reported that 12% reported dieting in the last year and girls had a more restrictive attitude towards food than boys (Bernier et al., 2010). Other investigators have reported similar findings, that pre and early adolescent children are dieting (Attie & Brooks-Gunn, 1989; Schur et al., 2000; Stevens et al., 1999; M. Story et al., 1991). In addition to participating in dieting, children are also well informed about what constitutes dieting, including altering eating and exercise habits and using diet pills, with their primary source of information cited as the family (Bernier et al., 2010; Schur et al., 2000). This places the family in an important position of influence in terms of body image and dieting practices.

Family Influences

The family may arguably be the most important influence in the development and maintenance of health. Recent research has indicated children who frequently eat meals with their family have been shown to be less likely to have disordered eating patterns,

and are less likely to be overweight, possibly because of the structured family meal environment and positive atmosphere at meal time (Neumark-Sztainer, Wall, Story, & Fulkerson, 2004; Veugelers & Fitzgerald, 2005).

By modeling physical activity and dietary practices, the family can play a role in developing healthy body habits. A parent's knowledge, behavior and beliefs about body image can be passed along to their children through parental modeling and instruction or verbal comments such as teasing that impact body dissatisfaction and a desire for thinness in the child (Keel, Heatherton, Harnden, & Hornig, 1997; Lowes & Tiggemann, 2003; Phares, Steinberg, & Thompson, 2004) . These influences have been shown to stem from both the mother (Hill & Franklin, 1998; Keel et al., 1997; Pike & Rodin, 1991), and the father (Field et al., 2001; Keel et al., 1997).

Mothers' influences. The relationship that a mother has with her daughter is important, since a mother's actions can influence her child's body image and dietary habits. At the most extreme, daughters of women with a history of an eating disorder have been shown to have more disturbed eating habits; with daughters under 14 years of age being 3 times more likely than other children their age to start purging weekly (Field et al., 2008). However, most women's eating habits would be categorized as restrained eating or dieting. The linkage between mothers' and daughters' motivation to diet has been previously supported (Hill et al., 1990; Wertheim, 2002).

The comments that a mother provides to her child may be one important source of influence. Previous studies have found that according to parents' and children's reports, mothers are more likely to comment on a daughter's weight, than a son's weight

(McCabe & Ricciardelli, 2001; Smolak, Levine, & Schermer, 1999). However, these studies merely looked at associations between factors and although one study controlled for BMI percentile, the other did not. Another study of 141 children (mean age 9.23 years) from the southeast United States, based on parents' reports, found that mothers' placed more importance on weight and dieting for both their daughters and sons, than fathers' did, however again did not control for BMI percentile (Phares et al., 2004). Girls, as well as boys, reported perceiving that their mothers provided more encouragement, or advice, to lose or control their weight than fathers, although mothers did not report providing more encouragement than fathers (Thelen & Cormier, 1995). This may be due to denial on the part of mothers, or a different phrasing of the advice provided. Alternatively, the amount of time spent with a particular parent may impact the amount of comments provided, or a child may expect to hear such comments from a mother figure, and recognize them more readily.

Parental comments, as reported by child and parent, have been shown to be associated with weight concern and body dissatisfaction (Haines, Neumark-Sztainer, Hannan, & Robinson-O'Brien, 2008). For mothers in particular, researchers have shown that comments a mother makes regarding her daughter's weight are associated with the daughter's tendency to diet and poor body esteem (Keel et al., 1997; Smolak et al., 1999; Thelen & Cormier, 1995). For sons, a mother's comments have been linked to weight loss attempts, and poor body esteem scores (Smolak et al., 1999). The failure to control for weight in these studies is problematic because mothers' comments encouraging weight loss have been shown to be greater for those children who are in a higher BMI group (McCabe & Ricciardelli, 2001).

In regards to parental modeling of weight concerns and dietary habits, one study conducted in the United States and utilizing a sample of 552 children, 131 mothers and 89 fathers found that maternal complaints about their own weight and dieting practices were associated with their daughters' body esteem scores, with complaints about weight also being related to fear of weight gain (BMI was not controlled) (Smolak et al., 1999). A second study conducted in the United States and utilizing a sample of 810 adolescents (n=429 girls) and their parents/guardians has shown that girls' perceptions of their mothers' dieting frequency predicts weight concerns in girls and increases the possibility of healthy or unhealthy dieting habits (adolescent BMI was controlled) (Keery, Eisenberg, Boutelle, Neumark-Sztainer, & Story, 2006). In another study of 135 (n=75 girls) Australian children between 5 and 8 years of age, children's perceptions of their mothers' body dissatisfaction was positively associated with their own (BMI not controlled) (Lowes & Tiggemann, 2003). A study conducted in the United States and utilizing a sample of 77 mothers and their daughters have also shown that the mothers of daughters who have disordered eating habits had disordered eating, a longer dieting history and were more critical of their daughters than they were of themselves (BMI was not controlled) (Pike & Rodin, 1991). However, the effect that a mother's modeling of dieting behaviors and body image has on children has been contradicted by other research results, although these studies had smaller sample sizes. One study utilizing 77 mother-daughter pairs (55 pairs assessed one year later) from middle to upper class families in New York City found that the behaviors a mother modeled in regards to dieting and body image did not predict their daughters' dieting and body satisfaction (BMI controlled) (Byely, Archibald, Graber, & Brooks-Gunn, 2000). Other studies, which utilized sample

sizes of 70 double parent families and 30 mother-daughter pairs, respectively, found that there was no association between the parents' concerns about their own weight, weight loss attempts, restrained eating or body dissatisfaction, and those of their children (BMI was not controlled) (Ogden & Steward, 2000; Thelen & Cormier, 1995).

Less research has been conducted with boys. Researchers have reported an association between maternal BMI and boys' body dissatisfaction (adolescent BMI controlled) (Keery et al., 2006). In addition, boys' perceptions of maternal dieting frequency predicted weight concerns and the use of weight control behaviors in the last year (Keery et al., 2006). However, it is possible that this association is due to boys with pre-existing concerns towards weight noticing similar behaviors in their mothers. In boys, the child's perceptions of their mothers' level of body dissatisfaction were positively associated with their own body dissatisfaction (BMI not controlled) (Lowes & Tiggemann, 2003). However, other researchers have found no link between maternal modeling of weight concerns and dieting and their sons' attempts to lose weight (BMI not controlled) (Smolak et al., 1999). This is an area that needs more research, since despite this, mothers have been viewed as having some form of influence on the boys' feelings about their body shape or size and eating patterns (Ricciardelli, McCabe, & Banfield, 2000).

Fathers' influences. Although not as well studied, fathers can also play an influential role in the development of healthy body image and dietary habits for boys as well as girls. Fathers can influence their sons' feelings about their bodies and the associated eating habits they undertake to alter or maintain their body shape (Ricciardelli

et al., 2000). In one study conducted between 1996 and 2004 in the United States, researchers showed that based on boys (n=5,618) reports, negative comments that a father makes about weight were predictive of starting to binge at least once a week (Field et al., 2008). In the same study, and based on girls (n=6,916) assessment of their fathers' concern, the importance of weight to fathers has also been associated with an increased risk of beginning to binge eat weekly (Field et al., 2008). BMI or weight of the children was not controlled for in this study, although weight status was considered, and investigated as a possible predictor of disordered eating. In a one year follow up of 5,287 boys and 6,770 girls who completed questionnaires in 1996 and 1997, children who believed that their body shape was important to their fathers were more likely to become dieters (Field et al., 2001). Another study conducted in the United States with 51 mother-father-daughter triads (n=153) has also found that a fathers' satisfaction with and description of their own weight was significantly associated with their daughters' weight satisfaction, although BMI percentile was not controlled in this study (Keel et al., 1997).

As with mothers, the comments that a father makes may influence children, however, unlike mothers, fathers are equally likely to make comments on weight to both daughters and sons (Smolak et al., 1999). One study, conducted in the United States and utilizing a sample of 51 mother-father-daughter triads reported that a daughter's perception of the comments her father made regarding her weight was significantly associated with her weight satisfaction. However, the body weight of the daughter was not controlled (Keel et al., 1997). Another study conducted in the United States and utilizing a sample of 552 children, 131 mothers and 89 fathers found that the investment that a father had in his own thinness was associated with a daughter's concern about

gaining weight, although BMI percentile was not controlled (Smolak et al., 1999). In regards to sons, it has been shown that the comments that a father makes are correlated with a son's concern about getting fat, and that the behaviors a father models are related to a son's weight loss attempts, although BMI percentile was again not controlled (Smolak et al., 1999).

Family socioeconomic status. In addition to the parents' comments and behaviors, there may be an association between families' socioeconomic status and body image and dietary habits. In the attempt to measure family socioeconomic status, there have been numerous methods used in the literature. These have included family income, occupation of the head of the household (Rogers, Resnick, Mitchell, & Blum, 1997), highest level of education or number of years of education (Robinson, Chang, Haydel, & Killen, 2001; Rogers et al., 1997; Stamatakis, Primatesta, Chinn, Rona, & Falascheti, 2005; Wang et al., 2005), or a combination measure (Martin, Ruiz, Nieto, Jimenez, & de Haro, 2004)**.**

Despite the differences in measurement tool, investigators have found that family socioeconomic status may influence body dissatisfaction. In one study of Australian children and adolescents (n=768), it was found that children whose parents worked in professional roles (viewed as higher socioeconomic status) were more likely to desire a thinner body figure than children whose parents worked in white or blue collar positions (viewed as lower socioeconomic status), representing dissatisfaction with their current body size (BMI was not controlled) (Wang et al., 2005). However, in California, it was found that Caucasian girls (n=969) from lower socioeconomic households reported more

body dissatisfaction that girls from higher socioeconomic households (BMI was not controlled) (Robinson et al., 2001).

In terms of dieting and disordered eating habits, researchers have found that there may be a link to socioeconomic status. In a study conducted by Story et al (1995) in Minnesota (n=17,545 girls, 16,852 boys), it has been shown that adolescent girls from higher socioeconomic status were more likely to be frequent dieters but were less likely to participate in unhealthy behaviors such as vomiting and binge eating than girls of lower socioeconomic status (BMI was controlled).

Family socioeconomic status may play a role on the rate of overweight in children, which may play a role in the prevalence of poor body image and dietary habits (Shrewsbury & Wardle, 2008; Sobal & Stunkard, 1989). This has been supported by one study conducted in Finland (n=60,252), where it was found that in adolescents there was an association between socioeconomic status and weight dissatisfaction as well as obesity (Mikkila, Lahti-Koski, Pietinen, Virtanen, & Rimpela, 2003). In Canada, one study using children aged 7 to 13 (n=6,060) and data from the 1981 Canada Fitness Survey and the 1996 National Longitudinal Survey of Children and Youth found that for every increase of $10,000 in family income a child's chance of being overweight decreased by approximately 3% (Willms, Tremblay, & Katzmarzyk, 2003).

In Manitoba, similar trends have been shown, with children from families with low income having a higher prevalence of overweight than children from families with more disposable income. However, while it was found that parental education, another measure of socioeconomic status, had an inverse relationship with overweight in girls, the

association for boys was J-shaped. Boys, whose parents had less than a high school education or had a university education, had the highest levels of overweight (Manitoba Health and Healthy Living, 2007). This did not follow previous findings in Canada; since it's been shown that for every extra year of father's education, the risk decreased by approximately 4%, and should be investigated further (Willms et al., 2003).

Similar studies have confirmed the linkage between low socioeconomic status and weight (Buddeberg-Fischer, Bernet, Sieber, Schmid, & Buddeberg, 1996; Celi et al., 2003; Gnavi et al., 2000; Kromeyer-Hauschild, Zellner, Jaeger, & Hoyer, 1999). In the U.K. a study of 14,587 boys and 14,014 girls aged 5-10 years found that children whose parents worked in the manual class were of higher odds to be overweight than children whose parents worked in the non-manual class (Stamatakis et al., 2005). Overall, it appears that family socioeconomic status appears to play an important role in body dissatisfaction, weight and dieting habits.

Neighborhood Influences

Neighborhood socioeconomic status. Different methods have been used to assess neighborhood socioeconomic status. These have included using Census data with average income level calculated by postal area (McLaren & Gauvin, 2002; Oliver & Hayes, 2005; Veugelers & Fitzgerald, 2005), using school socioeconomic status (as determined by average family income, government supplements, or other measures) (Adams et al., 2000; O'Dea & Caputi, 2001), number of children enrolled in low income food programs (Adams et al., 2000), or simply choosing low income neighborhoods (Merchant, Dehghan, Behnke-Cooke, & Anand, 2007). Therefore, the inconsistent

methods of measuring and determining neighborhood socioeconomic status should be recognized as a limitation of literature in this area.

Keeping in mind this limitation, it is still likely that the neighborhood lived in may play a role in body image, and dietary attitudes and behaviors. In women, living in a higher socioeconomic status neighborhood was associated with a higher degree of body dissatisfaction, even with a normal BMI (McLaren & Gauvin, 2002). In adolescents, it has been shown that those from higher socioeconomic status were more likely to be trying to lose weight than adolescents from lower socioeconomic status (Adams et al., 2000). Additionally, in one Australian study (n=1,131) boys and girls aged 6-19 years old from lower socioeconomic schools were more likely to skip breakfast, to perceive themselves as too thin, to be trying to gain weight and were less likely to receive positive comments about their eating habits than children from higher socioeconomic schools. Young middle/high socioeconomic status students were the least likely to receive advice about their eating habits compared to older and equivalently aged children of different socioeconomic status (O'Dea & Caputi, 2001).

The relationship between neighborhood socioeconomic status and body image may be influenced by the relationship between obesity and neighborhood socioeconomic status. Researchers have investigated the idea that the socioeconomic status of a neighborhood may play a role in the development of overweight or obesity. In a Canadian study of 11,455 children (aged 5 to 17) which utilized data from the National Longitudinal Survey of Children and Youth, findings indicated that the risks of being overweight increased with each quartile decrease in socioeconomic status of the

neighborhood (Oliver & Hayes, 2005). A second Canadian study conducted in Nova Scotia, utilizing data from the 2003 Children's Lifestyle and School-performance Study and using Grade 5 students (n=4,298) concluded that children from higher socioeconomic neighborhoods were half as likely to be obese as children living in lower socioeconomic neighborhoods (Veugelers & Fitzgerald, 2005). These findings conflict with another Canadian report of no difference between overweight prevalence in low and high socioeconomic neighborhood schools (Merchant et al., 2007). It is possible that this conflict results from a small sample size (n=160 children, n=156 parents) in just two schools. Studies from other countries have supported the finding that children from lower socioeconomic neighborhoods or schools were more likely to be overweight (O'Dea & Caputi, 2001).

Geographic location. It is possible that geographic location, specifically urban, rural, or First Nations community, may also play a role in body image. For individuals in rural areas, body image scores may be lower if, because of their remote location, they are protected from the media images that promote the thin ideal (L. R. Jones, Fries, & Danish, 2007). However, few studies have been conducted evaluating the differences between the body image of urban, rural and First Nations youth.

Of those few studies that have been conducted, it has been found that rural American youth (n=384) do experience body dissatisfaction, and have a desire to be thinner, with females desiring changes more than males (L. R. Jones et al., 2007). Findings appeared to be consistent with those reported in urban youth (Clark & Tiggemann, 2006; Clark & Tiggemann, 2007; McCabe & Ricciardelli, 2001). Another

study, based in Manitoba (n=5,150) found that adolescents and young adults in urban areas have a higher rate of concerns and negative attitudes towards eating, than youth in rural areas (Leichner, Arnett, Rallo, Srikameswaran, & Vulcano, 1986). This conflicts with reports that children (n=524) from American urban areas are more satisfied with their body size than children from suburban and rural areas (Welch, Gross, Bronner, Dewberry-Moore, & Paige, 2004), although this conflict may be related to the years the studies were conducted in. However, researchers have found that more children from rural schools desired a smaller figure than those children from urban schools (Welch et al., 2004). While there were no significant weight differences across different geographic locations in this study, it is possible that different cultures across locations may have played a role (Welch et al., 2004). Regardless, further study is needed.

In regards to First Nations, few studies were found which looked at the prevalence and influential factors regarding body image and dieting habits on reserves. However, in one study based in northern Ontario (n=729) First Nations females desired a smaller body size, although the desired body size was larger on average than those reported in other studies (Gittelsohn et al., 1996). In males, reported body shape was larger than those reported in other populations although the desired body shape was similar to those reported in other studies (Gittelsohn et al., 1996). In another study, conducted in Manitoba with 80 grade 8 girls (mean age 13.5 years) and their mothers, more aboriginal girls than non-aboriginal girls wanted to be thinner (65.8% and 36.1%, respectively), however there were no differences between those living on and off reserves (G. Marchessault, 2004). In addition, there were no significant differences in dieting between

aboriginal and non-aboriginal girls, or aboriginal girls living on and off reserves (G. Marchessault, 2004).

One possible difference between rural and urban youth is weight. Researchers have shown that in Canadian adolescents (n=4,851) from grades 6-10, rural adolescents are more likely to be overweight or obese when compared to adolescents growing up in an urban center (Bruner, Lawson, Pickett, Boyce, & Janssen, 2008). While the studies are few, these findings are consistent with previous Canadian research (Mitura & Bollman, 2004; Plotnikoff, Bercovitz, & Loucaides, 2004), but contrast with the findings of a recent Statistics Canada report (Shields & Tjepkema, 2006). Outside of Canada, similar reports of rural adolescents having a greater weight than urban adolescents have also been reported (Nelson, Gordon-Larsen, Song, & Popkin, 2006).

Further study of these groups, in comparison to each other, is needed. It is important to recognize differences between body weight and body image in urban, rural and First Nations youth in order to provide policies, programs and services that meet the needs of each group. Since family and neighborhood influences play a role in body image and the resultant dietary changes, if differences were found in urban, rural and First Nations youth, it may be important to examine how these influences differ in the various geographic locations.

Statement of the Problem

Few studies with adequate sample sizes have been conducted investigating the effects of parental and neighborhood influences on body esteem and dieting attitudes; even fewer of these studies contain Canadian data. Of the studies of adequate size that do

exist around parental influences, few studies involve data from both the mother and the father and few control for child's body weight.

Purpose of the Study

The purpose of this study is to investigate the effects of neighborhood and family influences including socioeconomic status, geographic location and parental modeling on body image and dietary attitudes in a cohort of 10-and 11-year old children across the BMI spectrum.

Objectives and Hypothesis

Objective 1: To determine the effect family influences, such as socioeconomic status and parental behavior modeling, on a child's body esteem, desire for a different body size and dietary restraint when child's body weight is controlled.

Hypothesis 1: Children from high socioeconomic status families will have poorer body esteem, greater desire for a different body size and greater dietary restraint than children from low socioeconomic families.

Hypothesis 2: Parental modeling of poor body image and eating attitudes will be positively associated with body esteem, desire for a different body size and dietary restraint in children.

Objective 2: To determine the effect neighborhood factors have on body esteem, dietary restraint and desire for a different body size when child's body weight is controlled.

Hypothesis 1: Independent of family factors, body esteem will be lower and desire for a different body size and dietary restraint greater in children living in high socioeconomic status neighborhoods compared with children living in low socioeconomic status neighborhoods.

Hypothesis 2: Independent of family factors, body esteem is lower and desire for a different body size and dietary restraint greater in children living in urban neighborhoods compared with children living in rural neighborhoods.

Hypothesis 3: Independent of urban and rural location, body esteem, dietary restraint and desire for a different body size will have a greater association with family influences than neighborhood socioeconomic status.

Methods

Study Design

We have used a cross sectional analysis of data collected in a cohort of 565 10- and 11-year old children to test our research questions. The cohort was studied in 2005-2006 as part of a larger Study of Asthma, Genes and the Environment (SAGE) in Manitoba, Canada. This larger cohort consisted of 723 children and their families. Participants for SAGE were recruited from the 1995 Manitoba Birth Cohort (N=13,980), based on a linkage to maternal health data and response to a mailed out survey on child health. Thirty five hundred surveys were received, and those individuals who had parent-declared asthma were selected to participate. A pediatric allergist confirmed the diagnosis of asthma (cases: n= 246). A comparable sample of children without parent-diagnosed asthma (control: n=477) were also selected to participate (Kozyrskyj et al., 2008; Mai, Becker, Sellers, Liem, & Kozyrskyj, 2007). Two additional children were added to the study in the second wave, resulting in 725 children. Of the 725 children, 160 children either did not complete the body image survey or chose not to continue with the study, resulting in the 565 participants for this analysis (Figure 1).

Boys and girls and all ethnic groups were invited to participate in the cohort. Children completed surveys providing information on body image, body esteem, and dieting attitudes. Parents of the children completed surveys providing information on family income and education, their own body image and dieting habits, and their children's diet and physical appearance.

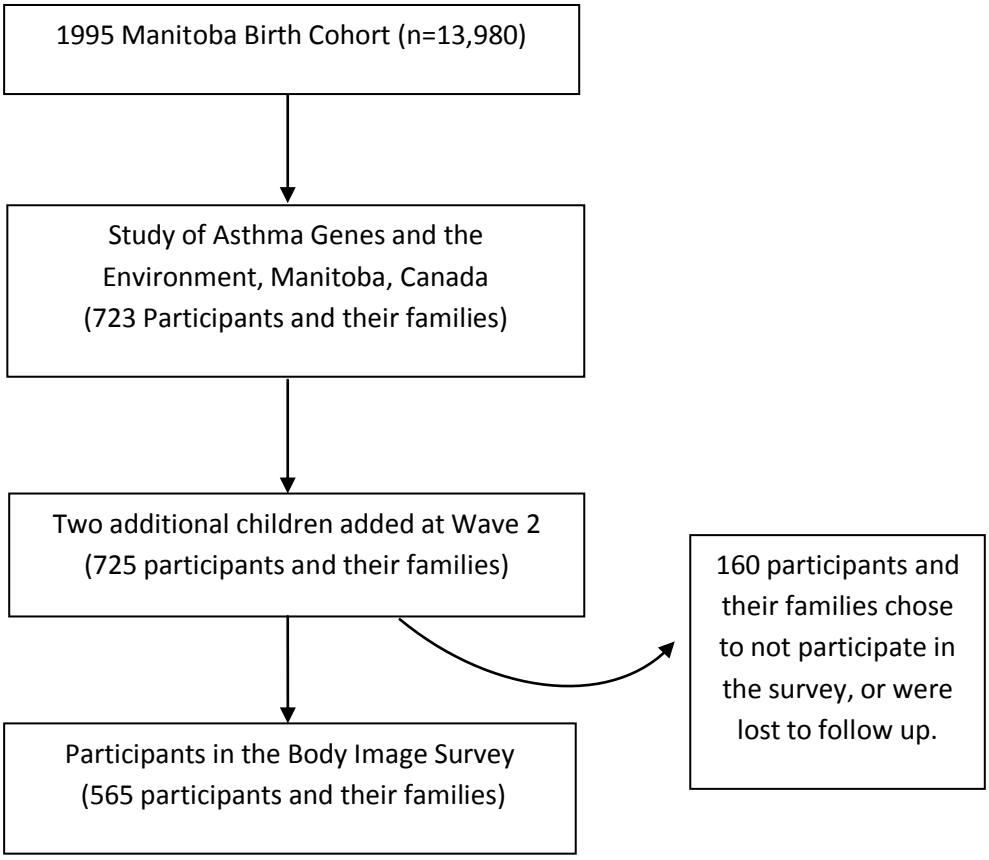

Figure 1: Development of the Body Image Survey cohort

Setting

Information was gathered in the participants' home during home visits. Additional information was gathered during participants' visits to the main research lab located in Winnipeg. Surveys may have been filled out at either of these locations.

Data Source

The data for this project was previously gathered through SAGE. The SAGE project gathered data on many different factors including the development of asthma in children, environmental factors, weight and physical activity. The data was collected by

trained research assistants. All participants involved in SAGE at the time of data collection and who had a parent or guardian also fill out a survey were included in this study.

Ethical Considerations

The Bannatyne campus Health Research Ethics Board at the University of Manitoba, Faculty of Medicine approved data collection. Additional approval from the Health Research Ethics Board had been received for the purposes of this Masters thesis. Prior to participating in this project, consent was received from the parents and assent was received from the child.

Measures: Neighborhood Variables

Neighborhood socioeconomic status/location. The independent variable neighborhood socioeconomic status was measured using income quintiles and was defined as the average household income within a given area. Income quintiles were available in two population groups: urban (Winnipeg and Brandon) and rural (all other areas). The income quintiles used in this study divide the population into five groups so that approximately 20% of the population is in each group (Manitoba Center for Health Policy, 2008). The income quintiles, developed by the Manitoba Center for Health Policy, are based on Statistics Canada enumeration or dissemination area average household income values taken from public use census files. Census files were linked to the Manitoba population through postal code conversion files (Manitoba Center for Health Policy, 2008). These income quintiles were then linked to our cohort through

postal codes available on the surveys gathered by SAGE and were used to identify the socioeconomic status of children's neighborhoods (Table 1).

Table 1

2006 Income Ranges for Urban and Rural Income Quintiles

Location	Rank	Minimum Income	Maximum Income	Mean Income
Rural	1	22,449.24	41,575.50	35,802.25
	2	41,615.00	47,928.64	44,803.14
	3	47,966.57	53,810.17	50,615.82
	4	53,829.00	65,235.00	60,020.49
	5	65,339.00	148,242.00	83,895.91
Urban	1	14,640.00	42,407.00	34,642.31
	2	42,463.00	54,663.00	48,525.29
	3	54,696.00	68,132.00	61,444.37
	4	68,140.00	87,201.00	77,264.21
	5	87,214.00	406,531.00	116,090.01

Note: As reported by the Manitoba Center for Health Policy (2008).

In addition, in order to determine participants' geographic location, the SAGE breakdown of 'urban start', 'rural start', or 'First Nations start' was used to distinguish between rural and urban families who have postal codes which may exist in both locations. Urban/rural start was defined as whether the child's home is located within an urban center (Winnipeg, Brandon), or in a rural community. First Nations start was defined as whether or not the child was living on a First Nations reserve. Participants identified as 'First Nations start' were categorized as part of the rural income quintiles.

Measures: Parents' Variables

Family socioeconomic status. The independent variable family socioeconomic status was defined as family income and family education as reported by the parent(s) participating in the study. Family income was defined as the last 12 months' average family income. Mothers' reports of the last 12 months of average family income were used as the family income variable, because a larger number of mothers participated in the survey and there was a high association between mothers' and fathers' reports of income ($R=0.802$, $p<0.001$). Parents were asked to select which of the following options represented their average family income: < $10,000, $10,000 to $19,999, $20,000 to $29,999, $30,000 to $39,999, $40,000 to $49,999, $50,000 to $59,999, $60,000 to $69,999, $70,000 to $79,999, $80,000 or more.

Income was re-categorized into low and high income levels, based on the low income cut offs (LICOs) for Manitoba for a family of four. LICOS are a measure set by Statistics Canada and used to reflect the level at which a family would spend more of their income on housing, food and clothing than an average family (Manitoba Center for Health Policy, 2006). LICOs were chosen since the size of the reference family used in the model was clear and they are easier to relate to broad categories of urban and rural which encompass many different communities and community sizes (Statistics Canada, 2009). As we did not have definitive information on our participants' family size, nor the family dynamics as they relate to family income (ie: how many individuals are supported by reported family income), it was not possible to match reference family size to actual family size. LICOs from 2006 were used in order to use a value that was compatible to the year the information was gathered. Since we had income ranges, and not specific

income amounts with our study, the category that the LICO fell into became the cut off category for low income. Since the LICOs recommended different cut off values for urban and rural locations, different values were used for rural and urban participants (First Nations reserve also fell under rural). For rural low income, the LICO value was $21,728 (low income cut off category in study was $29,999). For urban low income, the LICO value was $33,216 (low income cut off category in study was $39,999).

Education, reported as whether the family member had graduated from high school, was used. Mothers' reports of education was used in this study, since it was found that fathers' reports of education had no association with any of the children's dependant variables. Report of post secondary education by both parents was not used as it was found to have no association with the children's dependant variables in this study.

Parents' comments/advice. Parents' reports of their own comments and advice were used to investigate the association that advice/comments provided to children can have on children's dietary restraint and body image. Parents' reports of frequency and the type of comments/advice they provide were gathered through the Parents' Body Image/Diet Questionnaire. A high level of reliability (Chronbach's alpha coefficients ranging from 0.84 to 0.95) has been reported with the same questions and similar methods in a cohort of fourth grade children and their parents (Thelen & Cormier, 1995). Parents were asked a series of questions regarding whether they had provided advice on topics such as weight, diet or exercise to lose weight. To reflect the frequency with which they provided comments or advice, participants selected a score on the scale: Never, 1-2 times, 3-5 times, 6-10 times, 11 or more times. For the purpose of analysis, never and 1-2

times were considered low frequency, and 3 times or greater was considered high frequency.

Parents' Eating Attitudes Test. Parents' eating behaviors and attitudes were measured using the Eating Attitudes Test. In non-clinical groups, the Eating Attitudes Test assesses the presence of disturbed eating patterns, specifically the presence of symptoms common to anorexia nervosa (Garner, Olmsted, Bohr, & Garfinkel, 1982). The Eating Attitudes Test is comprised of 26 questions which measure oral control, dieting and bulimia and food preoccupation. A score of 20 or higher may indicate the presence of disturbed eating patterns or the presence of an eating disorder, although it is not a diagnostic tool (Garner et al., 1982). Questions are scored according to a six point Likert scale: Always, Very Often, Often, Sometimes, Hardly Ever, Never.

The most symptomatic response for each question was scored as 3 points, with the next symptomatic response being scored as 2 points, the next 1 point and any other answer as 0 points (Garner & Garfinkle, 1979).The reliability of the EAT has been reported to be high (alpha= 0.90), and the EAT-40, which is highly correlated with the EAT-26 has been shown to have good validity in the context of group membership (anorexia nervosa vs non-anorexia nervosa) (Garner & Garfinkle, 1979; Garner et al., 1982). In our sample, the EAT had high internal reliability with both mothers (alpha=0.786) and fathers (alpha=0.670).

Parents' perception of weight and desired weight change. The responding parents' reported desired weight change for their child and for themselves. Desired weight change variables were calculated by taking reported (perceived) weight in pounds

and subtracting it from desired weight in pounds so positive values reflect desired weight gain and negative values reflect desired weight loss.

Parents' Body Esteem Scale. Body esteem is defined as the self-evaluation of one's body or appearance (B. K. Mendelson et al., 2001). This tool is comprised of five questions from the Body Esteem Scale (B. Mendelson & White, 1993), and three questions ("I am not happy with the way I look", "most of the time I am happy with the way I look", "I frequently feel ugly and unattractive") from the Healthy Youth Survey used by Benoit, Galambos, & Jansson (2011) in Victoria, BC. Questions are answered on a yes/no basis. In our sample, good reliability was reported for both mothers (alpha=0.869) and fathers (alpha=0.836). All questions have obvious face validity (B. K. Mendelson et al., 2001). Scores can range from 8 -16 with a higher score indicating higher body esteem.

Parent ate supper meal with child. Parents reported the number of times in the last week they ate the supper meal with their child. Possible responses ranged from 0 to 7 times per week.

Measures: Children's Variables

Children's age and gender. Children's age was calculated from date of birth. Children's gender, as reported by the child, was used to describe the sample and control for gender in the family modeling (both with and without socioeconomic status) analyses for children's dietary restraint and children's desire for a different body size. Preliminary correlations indicated a significant association between gender and children's dietary restraint (r=-0.127, p=0.003) and children's desire for a different body size (r=0.105,

p=0.014) providing justification for including the variable in the analyses. Children's dietary restraint and children's desire for a different body size have previously been found to be significantly associated with gender (Bernier et al., 2010). No association was found between gender and children's body esteem, and gender was not included in those models. Girls were entered as the reference variable of zero.

Children's Dietary Restraint Scale. Dietary restraint reflects the degree to which an individual eats less than they would actually like to eat (Van Strien, Frijters, Van Staveren, Defares, & Dohnt, 1986), essentially a form of dieting. The Dietary Restraint Scale measures an individual's attitude or tendency towards this form of dieting. The scale consists of questions taken from the Dutch Eating Behavior Questionnaire which focused on measuring dietary restraint (Van Strien, Frijters, Bergers, & Defares, 1986). With our sample, a high reliability was found (Cronbach's $\alpha = 0.847$) (Bernier et al., 2010). The questions used have been shown to have moderate to good predictive validity and adequate negative correlation between the scores on the scale and the estimated deviation in energy intake required for body size (Van Strien, Frijters, Van Staveren et al., 1986). An adequate negative correlation has also been reported between scores on the scale and intake of fat and sugars (foods perceived as being fattening) strengthening the predictive validity (Van Strien, Frijters, Van Staveren et al., 1986). The six point Likert scale was scored as follows: Always (5 points), Very Often (5 points), Often (4 points), Sometimes (3 points), Hardly Ever (2 points), Never (1 point).

Total score was calculated for each child and the average, based on number of questions answered, was calculated for each child. Possible range of scores was from 1-5. A higher score indicates an attitude or tendency towards using dietary restraint (limiting food intake) as a dieting technique.

Children's Body Esteem Scale. The scales for the adult and child versions contain the same questions and utilize the same methods. All questions have obvious face validity and the test has very good split-half reliability, $r(95) = 0.85$, $p<0.01$ when tested on children (B. K. Mendelson, White, & Mendelson, 1996). With the additional questions, the scale had a high level of reliability for our sample (Cronbach's $\alpha = 0.805$) (Bernier et al., 2010). Scores can range from 8-16, with a higher score indicating higher body esteem.

Children's weight. Weight was assessed by calculating BMI percentiles using measured height and weight. Using the US Centers for Disease Control and Prevention SAS formula for BMI, percentile z-scores were calculated (Centers for Disease Control and Prevention, 2007). Z-scores were converted to BMI percentiles using SPSS. In order to determine BMI percentile, height (in centimeters) and weight (in kilograms) were measured in triplicate and the mean recorded (Mai et al., 2007). During home visits, a portable scale was used to measure weight; during lab visits, the stationary lab scale was used. Trained research assistants measured participants' weight.

Children's desire for a different body size. Desire for a different body size indicates a child's desire to have a smaller or larger body shape than the one they currently perceive themselves as having. Children were given age appropriate body shape

figures (Stevens et al., 1999) and asked to choose the one that most looked like them and the one they most wished to look like (Figure 2).

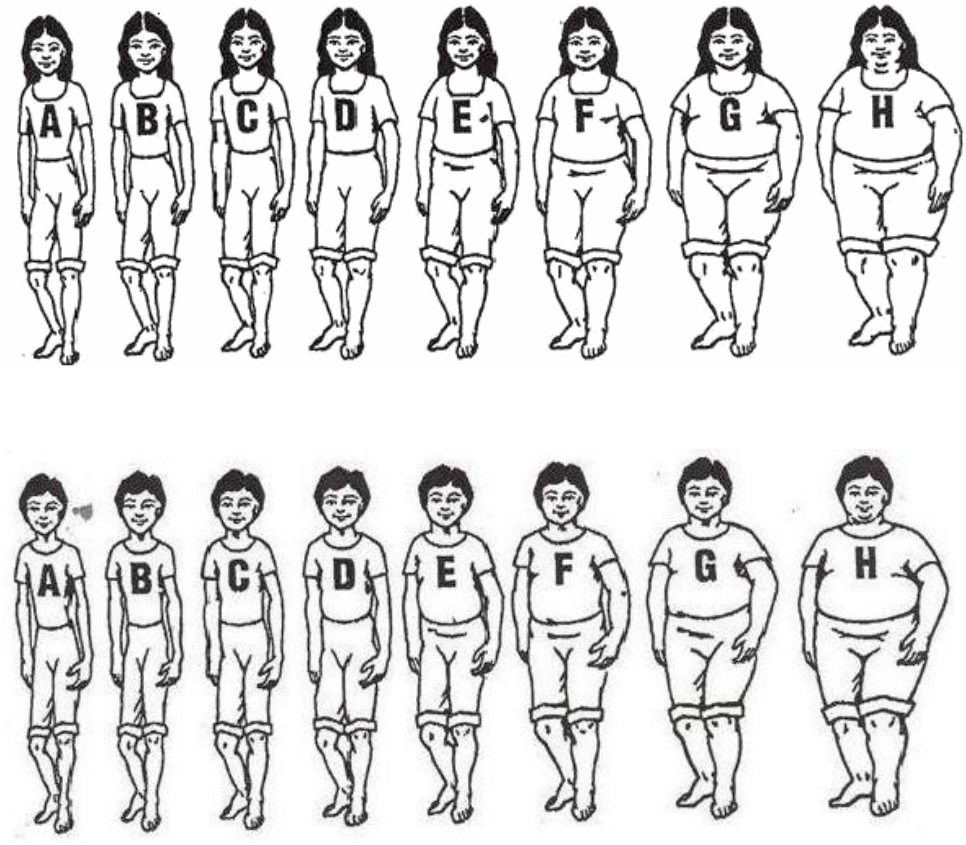

Figure 2: Age appropriate figure drawings, used to measure perception of own body size and desired body size.

Reprinted by permission from Macmillan Publishers Ltd: (Stevens et al.), copyright 1999.

Desire for a different body size was calculated by subtracting the perceived body shape from the desired body shape (Bernier et al., 2010). Negative numbers indicate a desire to be smaller, while zero indicates that no change is desired (Bernier et al., 2010).

Procedures

Trained research assistants met with children individually in order to facilitate the completion of the Children's Body Image/Diet Questionnaire and to measure the child's weight and height. Parents filled out the adult version of the Body Image/Diet Questionnaire at the same time. Information on socioeconomic status (family income, postal code) had been previously gathered from the parents through SAGE.

Data analysis

Analyses were conducted using Statistical Program for the Social Sciences (SPSS) version 17 (*SPSS for windows,* December 2008) and Hierarchical Linear Modeling (HLM) 6.06 Student version (Raudenbush, Bryk, & Congdon, 2004). Relationships between variables were assessed through correlations. Independent variables with no significant relationships with dependant variables were excluded from the analysis (Table 2). Relationships between the independent variables were assessed. In the situation where two independent variables were associated with each other ($p \geq 0.700$), one of the independent variables was removed from further analysis to avoid multi-colinearity. All other variables were utilized in the regression models (Table 3). In order to control for the important influence of weight, children's BMI percentile was included in all models. Child gender was included in models for dietary restraint and desire for a different body size. For analysis involving a combination of mothers' and fathers' variables, the fathers' desired weight change for child will be excluded as it was highly associated with the mothers' desired weight change for child.

Table 2

Variables that did not qualify for Analysis Based on Relationships with Dependant and Independent Variables

Mothers' Variables	Fathers' Variables
Mothers' BMI	Fathers' BMI
Spouses' frequency of criticism	Spouses' frequency of criticism
Mothers' compliments	Fathers' compliments
Does mother have post secondary education?	Number of times you've eaten dinner with family in last week
	Did father graduate from high school?
	Does father have post secondary education?

Objective 1: To determine the effect family influences such as socioeconomic status, and behavior modeling have on a child's body image, desire for a different body size and dietary restraint when child's body weight is controlled.

Hypothesis 1: Children from high socioeconomic status families have poorer body image, and greater desire for a different body size and dietary restraint than children from low socioeconomic families.

- Analyzed using Linear Regression. Family socioeconomic variables (income and mothers' education) were tested for entry into models based on their influence on children's dependant variables.

Hypothesis 2: Parental modeling of poor body image and eating attitudes will be positively associated with body image, desire for a different body size and dietary restraint in children.

- Analyzed using Linear Regression. Family modeling variables were tested for entry into models based on their influence on children's dependant variables.

Table 3

Parents' Variables, as Entered for each Children's Variable, based on Significant Correlations

	Children's Dietary Restraint	Children's Body Esteem Scale	Children's Desire for a Different Body Size
Mothers' EAT	X	X	X
Mothers' Body Esteem Scale	X	X	X
Mothers' desired weight change for self	X	X	X
Mothers' criticism	X	X	X
Mothers' desired weight change for their child	X	X	X
Number of times ate dinner with child during last week		X	
Fathers' desired weight change for their child	X	X	X
Fathers' EAT	X		
Fathers' BES	X	X	
Fathers' desired weight change for self	X	X	
Fathers' criticism	X	X	X
Family income	X	X	
Mothers' completion of high school	X	X	

Objective 2: To determine the effect neighborhood factors have on body image, dietary restraint and desire for a different body size when child's body weight is controlled.

Hypothesis 1: Independent of family factors, body image is lower and desire for a different body size and dietary restraint greater in children living in high socioeconomic status neighborhoods compared with children living in low socioeconomic status neighborhoods.

- Analyzed using Linear Regression. Neighborhood socioeconomic status was tested for entry into models based on their influence on the children's dependent variables. Family modeling variables and family socioeconomic status variables were tested for entry into models based on their influence on children's dependent variables.

Hypothesis 2: Independent of family factors, body image is lower and desire for a different body size and dietary restraint greater in children living in urban neighborhoods compared with children living in rural neighborhoods.

- Analyzed using Linear Regression. Geographic location (urban, rural or reserve) was tested for entry into models based on their influence on the children's dependent variables. Family variables were tested consecutively for entry into models based on their influence on children's dependent variables.

Hypothesis 3: Independent of urban and rural location, body esteem, dietary restraint and desire for a different body size will have a greater association with family influences than neighborhood socioeconomic status.

- Analyzed using Linear Regression. Neighborhood socioeconomic status and geographic location were tested for entry into models based on their influence on children's dependent variables. Family variables and neighborhood socioeconomic

status and geographic location were tested consecutively for entry into models based on their influence on children's dependent variables.

- Analyzed using Hierarchical Linear Modeling. Family variables (including family socioeconomic status) that entered into a significant model when analyzing family influences with SPSS were entered into the model as level 1 variables. Neighborhood socioeconomic status and geographic location were entered into the model as level 2 variables. Postal code was used as the linking variable between level 1 and level 2 variables. Individual analyses for parents', fathers' and mothers' variables were conducted for each of the following: children's dietary restraint, children's body esteem and children's desire for a different body size. Children's BMI percentile was included in each analysis.

Results

Five hundred and sixty-five children participated in the Child Diet Questionnaire. Eleven children were disqualified as neither of their parents participated in the Adult Diet Questionnaire resulting in a final sample size of 554 children. For these children, at least one of their parents or guardians completed the Adult Diet Questionnaire. In total, 544 mothers and 445 fathers participated in the survey. Fifty six point seven percent were boys, 15% of children were overweight and 15.7% were obese. Description of the children, by ethnicity, location, and family and neighborhood income is provided (Tables 4 & 5).

Table 4

Parents' Reported Ethnicity

Ethnicity	Mothers' (%) (n=538)	Fathers' (%) (n=447)
White	80.9	83.2
Black	0.6	0.7
First Nations	8.9	6.5
Métis	5.4	4.5
Oriental	2.0	2.7
South Asian	0.6	0.9
Other	1.7	1.6

Table 5

Means and Standard Deviations of Children's Variables and Family and Neighborhood Socioeconomic Status

	n (%)	Children's BMI Percentile	Children's Dietary Restraint	Children's Body Esteem	Children's Desire for a Different Body Size
Urban	301 (54%)	60.76 ± 27.49	4.57 ± 0.55	14.68 ± 1.79	-0.39 ± 0.82
Rural	209 (38%)	64.40 ± 28.72	4.56 ± 0.62	14.43 ± 2.11	-0.41 ± 0.89
Reserve	44 (8%)	78.45 ± 26.99	4.15 ± 0.73	13.63 ± 2.39	-0.61 ± 1.72
Low Family Income	83 (15%)	68.91 ± 29.15	4.34 ± 0.70	14.07 ± 2.18	-0.48 ± 0.89
High Family Income	418 (75%)	63.05 ± 27.83	4.58 ± 0.56	14.59 ± 1.96	-0.42 ± 0.89
Quintile 1 (Lowest)	58 (10%)	72.13 ± 23.97	4.31 ± 0.70	14.04 ± 2.11	-0.60 ± 1.21
Quintile 2	89 (16%)	66.54 ± 31.49	4.46 ± 0.60	14.19 ± 2.14	-0.44 ± 1.07
Quintile 3	112 (20%)	64.79 ± 27.98	4.51 ± 0.63	14.40 ± 2.07	-0.40 ± 0.79
Quintile 4	105 (19%)	62.13 ± 25.27	4.66 ± 0.57	15.04 ± 1.51	-0.33 ± 0.74
Quintile 5 (Highest)	162 (29%)	57.96 ± 29.10	4.78 ± 0.53	14.58 ± 1.98	-0.40 ± 0.87

Note: Higher value of dietary restraint indicates greater attitude towards restraint with diet. Negative numbers under desire for a different body size indicate a desire for a smaller body size. Higher value for body esteem indicates greater body esteem. Ten percent of participants did not provide information on family income.

One hundred and sixty children did not complete the Child Diet Questionnaire. Chi-square analysis indicates that there was no significant difference between the ethnicity of participants and non-participants fathers', although there was a significant difference between mothers' ethnicity ($p=0.012$). In addition, there was no significant difference between the family income or weight of participants and non-participants, although there was a significant difference in geographic location of residence ($p<0.001$). Tables on non-participants and their comparison to the participants can be found in Appendix A.

Objective 1: Influence of Family Socioeconomic Status and Parental Modelling

Family socioeconomic status.

Children's dietary restraint. In a model including family socioeconomic status variables, two variables in addition to the control variable children's BMI percentile met the entry requirements (mothers' education, family income). The model explained 8.8% (Adjusted $R^2 = 0.088$) of the variation in children's dietary restraint. Beta values indicate that children with lower BMI percentiles (Beta=-0.247), came from families with higher income (Beta=0.112), and whose mother finished high school had greater dietary restraint scores (Beta=0.092) (Table B1).

Children's body esteem. In a model including family socioeconomic status variables and children's BMI percentile, one variable met the entry requirement for the model (mothers' education). The model explained 12.6% (Adjusted $R^2 = 0.126$) of the variation in children's body esteem. Beta values indicate that children with lower BMI

percentiles (Beta=-0.343), and whose mother's finished high school had greater body esteem (Beta=0.087) (Table B1).

Children's desire for a different body size. Children's BMI percentile was the only variable that entered into a model with children's desire for a different body size. This variable explained 24.8% of the variation in children's desire for a different body size (Adjusted R^2=0.248). Beta values indicate that children with higher BMI percentiles had greater desires for smaller body shapes (Beta=-0.500). These findings also indicate that family socioeconomic status had no association with children's desire for a different body size (Table B1).

Parental modeling.

Children's dietary restraint. In a model including both mothers' and fathers' body image and dieting behaviors, as well as children's BMI percentile, fathers' criticism, fathers' body esteem score, mothers' desired weight change for their child, and mothers' EAT met the entry requirements. Eighteen point seven percent of the variation in children's dietary restraint was explained by the four predictor variables and children's BMI percentile. Beta values indicate that children who received less criticism from their father (Beta=-0.172), had fathers' with high body esteem scores (Beta=0.156), whose mothers' desired an increase in weight for their child (Beta=0.145), who were of a smaller BMI percentile (Beta= -0.126), and had mothers' with lower EAT scores (Beta=-0.114), had higher dietary restraint scores (Table B2). When gender was added to the analyses, mother's EAT lost its significance and was dropped from the model (Table B3).

When just fathers' variables were entered, only fathers' body esteem scale score, fathers' desired weight change for their child and fathers' criticism frequency, in addition to children's BMI percentile and children's gender, met the entry requirements for the model. Eighteen percent of the variation in children's dietary restraint was explained (Adjusted R^2= 0.180). Beta values indicate that dietary restraint scores were highest when fathers' desired an increase in weight for their child (Beta= 0.234), children were girls (Beta=-0.156), fathers offered less criticism (Beta=-0.144), had higher body esteem scale scores (Beta=0.117) and children had lower BMI percentiles (Beta=-0.082) (Table B4).

When mothers' variables, as well as children's BMI percentile were entered, mothers' criticism, mothers' desired weight change for their child and mothers' desired weight change, in addition to children's BMI percentile met the entry requirements for the model. The model explained 16.9% of the variation in children's dietary restraint. Beta values indicate that higher dietary restraint scores occurred when mothers' offered little criticism (Beta=-0.191), mothers' desired an increase in body weight for their children (Beta=0.165), mothers' desired an increase in body weight for themselves (Beta=0.121), children were female (Beta=-0.104) and had lower BMI percentiles (Beta=-0.095) (Table B4).

Children's body esteem. In a model including both mothers' and fathers' body image and dieting behaviors, as well as children's BMI percentile, mothers' desired weight change for their child, mothers' criticism frequency, and fathers' criticism frequency met the entry requirements. Thirty one point eight percent (Adjusted R^2=0.318) of the variation in children's body esteem was explained by the model. Beta

values indicate that in this model, children who had higher body esteem scores had mothers who desired an increase in weight for their child (Beta= 0.237), had fathers (Beta=-0.216) and mothers (Beta=-0.172) who offered less criticism, and had lower BMI percentiles (Beta=-0.114) (Table B5).

When only fathers' variables were entered, children's BMI percentile, fathers' body esteem scale score, fathers' desired weight change for their child, and fathers' criticism met the entry requirements. Twenty four point seven percent of the variation in children's body esteem was explained (Adjusted R^2=0.247). Beta values indicate that for this model, children with greater body esteem scale scores had fathers' who offer less criticism (Beta=-0.321), and desired an increase in weight for their child (Beta=0.172), but had higher body esteem scale scores (Beta=0.116) and had lower BMI percentiles (Beta=-0.088) (Table B5).

When only mothers' variables were entered, two variables in addition to children's BMI percentile met the entry requirements (mothers' desired weight change for their child, and mothers' criticism frequency). Thirty three percent (Adjusted R^2=0.330) of the variation in children's body esteem was explained. Beta values indicate that for this model, children with higher body esteem scale scores had mothers' who desired an increase in weight for their child (Beta=0.319), offered less criticism (Beta=-0.252), and had lower BMI percentiles (Beta= -0.124) (Table B5).

Children's desire for a different body size. In a model including both mothers' and fathers' body image and dieting behaviors, as well as children's BMI percentile and gender as controls, two additional variables met the entry requirements (fathers' criticism

and mothers' desired weight change for their child). Twenty seven point three percent (Adjusted R^2=0.273) of the variation in children's desire for a different body size was explained by the four predictor variables. Beta values indicate that for this model, children who desired a smaller body shape came from a higher BMI percentile (Beta=-0.286), have mothers' who desired a decrease in body weight for their child (Beta=0.221), received more criticism from their fathers (Beta=-0.142), and were female (Beta=0.134) (Table B6).

When only fathers' variables, as well as children's BMI percentile and gender were added in, two variables met the entry requirements for the model (fathers' criticism frequency, fathers' desired weight change for their child). Thirty three point eight percent (Adjusted R^2 =0.338) of the variation in children's desire for a different body size is explained by the four predictor variables. These values indicate that for this model, children who desired a smaller body shape came from a higher BMI percentile (Beta=-0.411), were girls (Beta=0.181), had fathers' who provided more criticism (Beta=-0.171), and desired a decrease in body weight for their child (Beta=0.136) (Table B6).

When only mothers' variables, as well as children's BMI percentile and gender were added in, two variables (mothers' criticism frequency, and mothers' desired weight change for their child) met the entry requirements for the model. Twenty three point five percent (Adjusted R^2 = 0.235) of the variation in children's desire for a different body size was explained. Beta values indicate that for this model, children who desired a smaller body shape had mothers who desired a decrease in body weight for their child

(Beta=0.205), came from higher BMI percentiles (Beta=-0.240), had mothers who provided more criticism (Beta=-0.177), and were girls (Beta=0.113) (Table B6).

Influence of family socioeconomic status and family modeling.

Children's dietary restraint. When family factors, including family socioeconomic status were tested, four variables in addition to children's BMI percentile and gender met the entry requirements for the model (mothers' desired weight change for their child, fathers' criticism, fathers' body esteem score and family income). The model explained approximately 21.7 % of the variation in children's dietary restraint (Adjusted R^2= 0.217). Beta values indicate that for this model, children with higher dietary restraint scores had fathers' that provided less criticism (Beta=-0.183), came from a family with higher income (Beta=0.157), had mothers' who desired an increase in weight for their child (Beta=0.151), had fathers' with higher body esteem scale scores (Beta=0.143), were from a lower BMI percentile (Beta=-0.142) and were girls (Beta=-0.135) (Table 6).

When only fathers' variables were included in the model, four variables met the entry requirements (fathers' desired weight change for their child, fathers' criticism frequency, family income, and fathers' body esteem scale score) in addition to children's BMI percentile and gender. The model explained 24.3% of the variation in children's dietary restraint (Adjusted R^2= 0.243). Beta values indicate that for this model, higher dietary restraint scores occurred when fathers' desired an increase in weight for their child (Beta=0.223) and provided less criticism (Beta=-0.185), children were girls (Beta=-0.181), had families with a higher income (Beta= 0.165), had fathers' with higher body

esteem scale scores (Beta=0.140) and came from a lower BMI percentile (Beta=-0.090) (Table 7).

Table 6

Association between Children's Dietary Restraint and Parents' Variables, including Socioeconomic Status, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	261	-0.003	0.001	-0.142	0.033	0.217
	Mothers' Desired Weight Change for their Child		0.006	0.003	0.151	0.032	
	Fathers' Criticism (High Frequency)		-0.237	0.080	-0.183	0.004	
	Fathers' Body Esteem Score		0.032	0,013	0.143	0.012	
	High Family Income		0.308	0.108	0.157	0.005	
	Male Gender		-0.148	0.061	-0.135	0.017	

When only mothers' variables, in addition to the control variables children's BMI percentile and children's gender, were tested for entry into the model, four variables were found to meet the entry requirements (mothers' criticism frequency, mothers' desired weight change, family income, and mothers' desired weight change for their child). The model explained 21.7% of the variation in children's dietary restraint (R^2=0.217). Beta values indicate that for this model, greater dietary restraint scores occurred when mothers' provided less criticism (Beta=-0.221), desired an increase in weight for both

Table 7

Association between Children's Dietary Restraint and Fathers' (Model 1) and Mothers' (Model 2) Variables, including Socioeconomic Status, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint (Model 1)	Children's BMI Percentile	254	-0.002	0.001	-0.090	0.154	0.243
	Fathers' Criticism (High Frequency)		-0.239	0.081	-0.185	0.003	
	Fathers' Desired Weight Change for their Child		0.009	0.003	0.223	0.001	
	High Family Income		0.303	0.101	0.165	0.003	
	Fathers' Body Esteem Scale		0.032	0.013	0.140	0.014	
	Male Gender		-0.204	0.063	-0.181	0.001	
Children's Dietary Restraint (Model 2)	Children's BMI Percentile	304	-0.002	0.001	-0.111	0.015	0.217
	Mothers' Criticism (High Frequency)		-0.280	0.078	-0.221	0.000	
	Mothers' Desired Weight Change for themselves		0.003	0.001	0.134	0.012	
	High Family Income		0.199	0.092	0.111	0.031	
	Mothers' Desired Weight Change for their Child		0.006	0.003	0.152	0.021	
	Male Gender		-0.147	0.060	-0.127	0.015	

their child (Beta=0.152) and themselves (Beta=0.134), children were girls (Beta=-0.127), had families with greater income (Beta=0.111), and came from a lower BMI percentile (Beta= -0.111) (Table 7).

Children's body esteem. When parents' variables including family socioeconomic status were tested with children's body esteem, three variables met the entry requirements for the model in addition to children's BMI percentile (mothers' desired weight change for their child, mothers' criticism frequency, and fathers' criticism). The model predicted 31% of the variation in children's body esteem (Adjusted R^2= 0.310). Beta values indicate that for this model, children with higher body esteem scale scores had mothers' who desired an increase in body weight for their children (Beta=0.247), had mothers (Beta=-0.193) and fathers (Beta=-0.169) who provided less criticism and came from a lower BMI percentile (Beta=-0.114) (Table 8) .

When mothers' variables were removed from the model and only fathers' variables were tested for inclusion, it was found that three variables met the entry requirements for the model, in addition to children's BMI percentile (fathers' criticism frequency, fathers' desired weight change for their child, and fathers' body esteem score). The model predicted approximately 23.9% of the variation in children's body esteem (Adjusted R^2= 0.239). Beta values indicate that for this model, children with higher body esteem had fathers' who provided less criticism (Beta=-0.306), desired an increase in body weight for their child (Beta=0.177) and had higher body esteem scale scores (Beta=0.135), and children came from lower BMI percentiles (Beta=-0.083) (Table 8).

Table 8

Associations between Children's Body Esteem, Parents' (Model 1), Fathers' (Model 2) and Mothers' (Model 3) Variables and Family Socioeconomic Status, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Body Esteem (Model 1)	Children's BMI Percentile	297	-0.008	0.004	-0.114	0.078	0.310
	Mothers' Desired Weight Change for their Child		0.034	0.010	0.247	<0.001	
	Mothers' Criticism (High Frequency)		-0.844	0.296	-0.193	0.005	
	Fathers' Criticism (High Frequency)		-0.755	0.288	-0.169	0.009	
Children's Body Esteem (Model 2)	Children's BMI Percentile	285	-0.006	0.004	-0.083	0.192	0.239
	Fathers' Criticism (High Frequency)		-1.389	0.288	-0.306	<0.001	
	Fathers' Desired Weight Change for their Child		0.024	0.009	0.177	0.008	
	Fathers' Body Esteem Scale		0.108	0.046	0.135	0.019	
Children's Body Esteem (Model 3)	Children's BMI Percentile	350	-0.009	0.004	-0.122	0.037	0.334
	Mothers' Desired Weight Change for their Child		0.045	0.008	0.321	<0.001	
	Mothers' Criticism (High Frequency)		-1.141	0.252	-0.258	<0.001	

When mothers' variables were tested along with children's BMI percentile, it was found that two variables met the entry requirements for the model (mothers' desired weight change for their child, mothers' criticism). The model predicted 33.4% of the variation in children's body esteem. Beta values indicate that for this model, children with higher body esteem had mothers' who desired an increase in weight for their child (Beta=0.321) and provided less criticism (Beta=-0.258) and the child came from lower BMI percentiles (Beta=-0.122) (Table 8).

Children's desire for a different body size. Family socioeconomic status was previously shown to have no association with children's desire for a different body size.

Objective 2: Influence of Neighborhood Socioeconomic Status

Neighborhood Socioeconomic Status.

Children's dietary restraint. When neighborhood income was tested, along with children's BMI percentile, it met the entry requirements for the model. The adjusted R^2 value indicates that 7.1% of the variation in children's dietary restraint is explained by the model. Beta values indicate that for this model, children with higher dietary restraint scores came from a lower BMI percentile (Beta= -0.226), but higher neighborhood socioeconomic status, specifically neighborhood quintile 4 (Beta=0.209) and 5 (Beta=0.164) (Table C1).

When only mothers' variables were entered into the model to control for family factors, as well as children's BMI percentile and neighborhood socioeconomic status, it was found that neighborhood socioeconomic status met the entry requirements of the

model. The model predicted 20.5% of the variation in children's dietary restraint. Beta values indicate that for this model, children with higher dietary restraint scores had mothers' who offered less criticism (Beta=-0.246), came from lower BMI percentiles (Beta=-0.190), came from higher socioeconomic status neighborhoods (although not the highest) (Beta=0.177), had mothers' who desired an increase in weight for themselves (Beta=0.148) and came from families with higher socioeconomic status (Beta=0.108) (Table 9). When gender was added to the analyses, family income lost its significance and was dropped from the model (Table C2).

Table 9

Association between Neighborhood Socioeconomic Status and Children's Dietary Restraint, while Children's BMI Percentile and Mothers' Variables are Controlled

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	290	-0.004	0.001	-0.190	0.002	0.205
	Mothers' Criticism (High Frequency)		-0.314	0.078	-0.246	<0.001	
	Mothers' Desired Weight Change for Self		0.003	0.001	0.148	0.007	
	High Family Income		0.195	0.097	0.108	0.046	
	Quintile 1 (Lowest)		-	-	-	-	
	Quintile 2		0.126	0.129	0.080	0.331	
	Quintile 3		0.099	0.121	0.073	0.413	
	Quintile 4		0.248	0.123	0.177	0.045	
	Quintile 5 (Highest)		0.063	0.121	0.049	0.603	

When fathers' and parents' variables, were entered into separate models, along with children's BMI percentile and neighborhood socioeconomic status, it was found that neighborhood socioeconomic status was not significant.

Children's body esteem. When neighborhood income was tested for entry into the model, along with children's BMI percentile to control for child's weight, neighborhood income met the entry requirements into the model. The adjusted R^2 value indicated that 13.5% of the variation in children's body esteem was explained by the model (Adjusted R^2= 0.135). Beta values indicate that for this model, children with higher body esteem scores came from lower BMI percentiles (Beta= -0.348) and higher (although not the highest) socioeconomic status neighborhoods (Beta=0.153) (Table C3).

When only mothers' variables were put into the model to control for family influences, in addition to children's BMI percentile and neighborhood socioeconomic status, neighborhood socioeconomic status met the entry requirements for the model. The model predicted 32.5% of the variation in children's body esteem. Beta values indicate that for this model, children with higher body esteem scores had mothers' who desired their child to gain weight (Beta=0.289) and offered less criticism (Beta =-0.262), came from higher (although not the highest) socioeconomic status neighborhoods (Beta= 0.174), and had lower BMI percentiles (Beta= -0.111) (Table 10).

When neighborhood socioeconomic status was tested in separate models along with fathers' and parents' variables, neighborhood socioeconomic status did not meet the entry requirements for the model, and therefore did not have a significant association with children's body esteem.

Table 10

Association between Children's Body Esteem and Neighborhood Socioeconomic Status, when Children's BMI Percentile and Mothers' Variables are Controlled

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Body Esteem	Children's BMI Percentile	333	-0.008	0.004	-0.111	0.049	0.325
	Mothers' Desired Weight Change for their Child		0.042	0.008	0.289	<0.001	
	Mothers' Criticism (High Frequency)		-1.139	0.242	-0.262	<0.001	
	Quintile 1 (Lowest)		-	-	-	-	
	Quintile 2		0.387	0.368	0.074	0.295	
	Quintile 3		0.170	0.351	0.036	0.629	
	Quintile 4		0.850	0.357	0.174	0.018	
	Quintile 5 (Highest)		0.397	0.340	0.092	0.244	

Children's desire for a different body size. Neighborhood income was found to have no significant association with children's desire for a different body size.

Geographic Location.

Children's dietary restraint. When urban, rural and reserve were tested in association with children's dietary restraint, it was found that geographic location, particularly reserve location, when compared to urban location, had a significant influence over children's dietary restraint (Table 11). The values shown indicate that for

this model, children with lower BMI percentiles, and who came from a reserve environment, as compared to an urban location, had lower dietary restraint scores. However, when urban, rural and reserve location was included with children's BMI percentile and family variables, it was found that geographic location of residence did not have a significant influence in any model.

Table 11

Association between Children's Dietary Restraint, Children's Body Esteem and Geographic Location, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	549	-0.004	0.001	-0.211	<0.001	0.075
	Reserve Location		-0.356	0.096	-0.158	<0.001	
	Rural Location		0.012	0.052	0.010	0.822	
	Urban Location		-	-	-	-	
Children's Body Esteem	Children's BMI Percentile	549	-0.024	0.003	-0.340	<0.001	0.127
	Reserve Location		-0.638	0.313	-0.084	0.042	
	Rural Location		-0.170	0.168	-0.042	0.312	
	Urban Location		-	-	-	-	

Children's body esteem. When urban, rural and reserve environment were tested in association with children's body esteem, it was found that geographic location, particularly reserve location, when compared to urban location, had a significant influence over children's body esteem (Table 11). The values shown indicate that

children who have a lower BMI percentile, and come from reserve environments, as compared to urban environments, had lower body esteem score. However, when urban, rural and reserve location was included in models with family variables and children's BMI percentile, they were not found to have a significant influence over children's body esteem.

Children's desire for a different body size. When urban, rural, and reserve environment were tested in association with children's desire for a different body size, they did not have a significant association with children's desire for a different body size and did not enter into the model.

Influence of family variables, neighborhood socioeconomic status and geographic location.

SPSS Analysis. When family variables, neighborhood socioeconomic quintiles and geographic location were tested together in models as influencing factors for children's dietary restraint, children's body esteem and children's desire for a different body size, no models were found where family, neighborhood income quintiles and geographic location were all found to have significant influence. Models that were created involved only family and neighborhood income quintiles and have been previously noted in the section on 'Influence of neighborhood socioeconomic status'.

HLM Analysis: Children's Dietary Restraint. When family variables, neighborhood socioeconomic status and geographic location of residence were tested with HLM, additional results were found. Level 1 family variables were found to have

significant associations with children's dietary restraint (Table 12). β values indicated the same direction of influence as those found by SPSS analysis, although fathers' criticism had a stronger influence (-0.818 vs. -0.237 in SPSS). The main effects of the level 2 variables, neighborhood socioeconomic status and geographic location, were found to be insignificant in separate models using mothers' and parent variables. With the model using mothers' variables, this was supported by the fact that level 1 family variables explained 97.68% of the variation in children's dietary restraint. Therefore, the main effects of neighborhood socioeconomic status and geographic location would only be able to explain 2.32% of the variation. With models utilizing both parents' variables, the level 1 variables accounted for 99.1% of the variation.

Table 12

Significant Effects of Family Variables (Level 1) on Children's Dietary Restraint in Parents' (Model 1) and Mothers' (Model 2) Models using HLM Analysis

Dependent Variable	Independent Variables	n	β value	Standard Error	P-value
Children's Dietary Restraint (Model 1)	Intercept	218	4.579	0.033	<0.001
	Children's BMI Percentile	238	-0.006	0.001	<0.001
	Fathers' Criticism (High Frequency)	238	-0.818	0.223	0.001
Children's Dietary Restraint (Model 2)	Intercept	246	4.535	0.032	<0.001
	Children's BMI Percentile	278	-0.007	0.001	<0.001
	High Family Income	278	0.485	0.170	0.005

Interactions were also analyzed for these models. In the mothers' model, after controlling for geographic location and neighborhood income quintiles in level 2, children's BMI percentile had a significant effect on children's dietary restraint ($p<0.001$), however the effect of children's BMI percentile on children's dietary restraint did not differ among geographic location or neighborhood socioeconomic status. Family income also had a significant effect on children's dietary restraint ($p=0.005$), however, the effect of family income on children's dietary restraint did not differ among geographic locations or neighborhood income quintiles. This indicates that there were no significant interactions for this model.

When HLM software was used to assess the influence of neighborhood socioeconomic status, geographic location and fathers' variables on children's dietary restraint, it was found that this analysis could not be run by HLM software due to an inadequate number of cases[1]. Therefore, for this model, linear regression is an appropriate tool. As noted earlier, no significant model utilizing father's variables,

[1] Received a message that robust standard errors could not be computed for this model. Scientific Software International states that "The robust standard errors should be trusted only when the number of higher-level units is moderately large relative to the number of explanatory variables at a higher level. At some point, the number of higher-level units can become so small that these standard errors are not computable as the information matrix is uninvertible or not positive-definite. In such cases, a message that robust standard errors could not be computed for a model may be printed to the HLM output file(Scientific Software International, 2010)."

neighborhood income quintiles and geographic location was created for children's dietary restraint. In addition, interactions were not able to be calculated for the parents' model.

HLM Analysis: Children's Body Esteem. When separate analyses for mothers', fathers' and parents' variables were conducted using HLM software, level 1 family variables were found to have significant associations with children's body esteem (Table 13). β values found with HLM supported the direction of influence of the β values found with SPSS, and variables' strength were similar. Further analysis of the level 2 main effects of geographic location and neighborhood socioeconomic status were insignificant in all three models. With the model using fathers' variables, this was supported by the fact that the level 1 variables (family influence variables) explained 99.48% of the variation in children's body esteem. This was also supported in the mothers' model where it was found that the level 1 variables explained 98% of the variation in children's body esteem. In the parent's model, 99.5% of the variation was explained by the level 1 variables.

Interactions were also explored, however were not able to be calculated for the parents' model. In the mothers' model, after controlling for geographic location and neighborhood income quintiles in level 2, the children's BMI percentile had a significant effect on children's body esteem ($p=0.001$), however this effect did not differ among geographic locations or neighborhood income quintiles. Mothers' desired weight change for their child also had a significant effect on children's body esteem ($p<0.001$), however did not differ among geographic locations or neighborhood income quintiles. Therefore, no significant interactions were found for this model.

Table 13

Significant Effects of Family Variables (Level 1) on Children's Body Esteem in Parents' (Model 1), Fathers' (Model 2) and Mothers' (Model 3) Models using HLM Analysis

Dependent Variable	Independent Variables	n	β value	Standard Error	P-value
Children's Body Esteem (Model 1)	Intercept	249	14.568	0.099	<0.001
	Fathers' Criticism (High Frequency)	272	-1.397	0.431	0.002
	Children's BMI Percentile	272	-0.0129	0.004	0.002
	Mothers' Desired Weight Change for their Child	272	0.058	0.058	<0.001
Children's Body Esteem (Model 2)	Intercept	239	14.638	0.107	<0.001
	Children's BMI Percentile	260	-0.009	0.004	0.040
	Fathers' Desired Weight Change for their Child	260	0.055	0.012	<0.001
Children's Body Esteem (Model 3)	Intercept	282	14.483	0.092	<0.001
	Children's BMI Percentile	320	-0.013	0.004	0.001
	Mothers' Desired Weight Change for their Child	320	0.063	0.011	<0.001

In the fathers' model, after controlling for geographic location and neighborhood income quintiles in level 2, children's BMI percentile had a significant effect on children's body esteem (p=0.037), however this effect did not differ among geographic

locations or neighborhood income quintiles. Fathers' desired weight change for their child also had a significant effect on children's body esteem ($p<0.001$), however also did not differ among geographic locations or neighborhood income quintiles. Therefore, no significant interactions were found for this model.

HLM Analysis: Children's Desire for a Different Body Size. When analysis was conducted using HLM, level 1 family variables were found to have significant associations with children's desire for a different body size in parents', fathers' and mothers' models (Table 14). β values reported with HLM supported the direction of the β values reported with SPSS, and variable strength were similar. With further analysis of level 2 variables, it was found that the main effects of neighborhood socioeconomic status and geographic location were insignificant in models containing fathers', mothers' and parents' variables. This was supported by findings that level 1 of the model containing parents' variables explained 77.77% of the variation in children's desire for a different body size. In fathers' and mothers' models, level 1 was found to explain 99.72 and 95% of the variation in children's desire for a different body size, respectively.

However, interactions were also explored. In the fathers' model, after controlling for geographic location and neighborhood income quintile in level-2, children's BMI percentile had a significant negative effect on children's desire for a different body size ($p<0.001$), and the effect of children's BMI percentile on children's desire for a different body size significantly differed among urban, rural and reserve locations ($p=0.044$). Fathers' desired weight change for child was also found to have a significant effect on

children's desire for a different body size (p=0.002), however did not differ among different income quintile groups (p=0.140) (Table 15).

Table 14

Significant Effects of Family Variables (Level 1) on Children's Desire for a Different Body Size in Parents' (Model 1), Fathers' (Model 2) and Mothers' (Model 3) Models using HLM Analysis

Dependent Variable	Independent Variables	n	B value	Standard Error	P-value
Children's Desire for a Different Body Size (Model 1)	Intercept	249	-0.449	0.044	<0.001
	Children's BMI Percentile	273	-0.007	0.002	0.001
	Mothers' Desired Weight Change for Child	273	0.021	0.006	0.001
Children's Desire for a Different Body Size (Model 2)	Intercept	244	-0.401	0.044	<0.001
	Children's BMI Percentile	264	-0.012	0.002	<0.001
	Fathers' Desired Weight Change for Child	264	0.021	0.005	<0.001
Children's Desire for a Different Body Size (Model 3)[2]	Intercept	282	-0.483	0.042	<0.001
	Children's BMI Percentile	321	-0.008	0.002	<0.001
	Mothers' Desired Weight Change for Child	321	0.022	0.006	<0.001

[2] Although variables in the parents' and mothers' models are the same, values are not. Construction of the MDM files in HLM used the 'delete missing values when creating MDM file' option. Therefore, all possible variables tested for the model impacted the n in the model, not only the final significant variables.

Table 15

Interactions between Family (Level 1) and Neighborhood (Level 2) Variables and Children's Desire for a Different Body Size, using HLM Analysis (Fathers' Model)

Fixed Effect	Coefficient (β value)	Standard Error	n	P-value
Intercept1, B0				
Intercept 2	-0.349	0.148	242	0.020
Geographic Location	-0.002	0.089	242	0.979
Neighborhood Income Quintile	-0.012	0.038	242	0.754
Children's BMI Percentile, B1				
Intercept2	-0.008	0.002	260	<0.001
Geographic Location	-0.006	0.003	260	0.044
Fathers' desired weight change for child, B2				
Intercept2	0.043	0.013	260	0.002
Neighborhood Income Quintiles	-0.006	0.004	260	0.140

In the mothers' model, after controlling for geographic location and neighborhood income quintiles in level 2, children's BMI percentile had a significant negative effect on children's desire for a different body size (p=0.22), and the effect on children's BMI percentile on children's desire for a different body size significantly differed among urban, rural and reserve locations (p=0.021). Mothers' desired weight change for child also has a significant effect on children's desire for a different body size (p=0.014), however did not differ among neighborhood income quintile groups (p=0.390) (Table 16).

In the parents' model, after controlling for geographic location and neighborhood quintiles in level 2, children's BMI percentile had a significant effect on children's desire for a different body size ($p<0.001$) and mothers' desired weight change for child had a significant effect on children's desire for a different body size ($p=0.001$). There were no significant interaction effects.

Table 16

Interactions between Family (Level 1) and Neighborhood (Level 2) Variables and Children's Desire for a Different Body Size, using HLM Analysis (Mothers' Model)

Fixed Effect	Coefficient (β value)	Standard Error	n	P-value
Intercept1, B0				
Intercept2	-0.454	0.147	280	0.003
Geographic Location	-0.004	0.087	280	0.959
Neighborhood Income Quintile	-0.002	0.037	280	0.958
Children's BMI Percentile, B1				
Intercept2	-0.006	0.002	317	0.022
Geographic Location	-0.007	0.003	317	0.021
Mothers' desired weight change for child, B2				
Intercept2	0.033	0.013	317	0.014
Neighborhood Income Quintile	-0.004	0.005	317	0.390

In summary, although the main effects of geographic location and neighborhood income did not have significant influence over any model for children's dietary restraint, children's body esteem or children's desire for a different body size, children's BMI

percentile did have a significant interaction with children's desire for a different body size in both fathers' and mothers' model, with the interaction differing among geographic locations.

Discussion

This study indicates that pre-adolescent children from high socioeconomic status families have higher body esteem and dietary restraint than pre-adolescent children from low socioeconomic families. Socioeconomic status did not have an association with children's desire for a different body size (Objective 1, Hypothesis 1). We found that, when children's BMI percentile was controlled, there was a positive association between family socioeconomic factors and children's dietary restraint and body esteem (Table B1) however, only the association between child dietary restraint and family socioeconomic status was maintained when other family variables were included (Table 6 & 7). Although dieting and dietary restraint are not the same variable, similar findings related to dieting in children have been reported, and indicate that girls from higher socioeconomic status were more likely to be frequent dieters (M. Story et al., 1995).

Our findings are in contrast to other studies which frequently report an association between socioeconomic status and a desire for a different body size, and do not often report an association between body esteem or dietary restraint and family socioeconomic status (Robinson et al., 2001; Wang et al., 2005). This discrepancy may be explained by the numerous ways to measure socioeconomic status. Our study utilized measures of both education and family income to measure family socioeconomic status, while the study by Robinson et al. (2001) utilized only the highest level of education, and the study by Wang et al. (2005) used parents' occupations as a measure (white collar, blue collar or

professional). This could lead to different results, as education and type of profession might not equal income.

In our study, we have also shown that different measures of parental body image and eating attitudes are positively and negatively associated with body image, desire for a different body size and dietary restraint in pre-adolescent children (Objective 1, Hypothesis 2). We found that measures of parental body image, such as the body esteem scale or desire for a different body size (in self and child) were consistently positively associated with our children's variables; however measures of parental attitudes towards weight and food, such as criticism or the Eating Attitudes Test, were negatively associated. Similar variables have previously been shown to have a significant impact on body image and attitudes towards food in youth (Meesters, Muris, Hoefnagels, & van Gemert, 2007).

Of all the influencing variables in our study, criticism and parents' desire for a change in body weight for their child appear most influential, consistently occurring in models for all three children's measures. When looking at parents' desired weight change for child, we found that a higher dietary restraint and body esteem score was consistently associated with parents' desire for their child to gain weight. For example, in the mothers' analyses, for every 1 pound increase in mother's desired weight change for child, children's body esteem increased by 0.045 (Table B5). Similarly, in the parents' model, for every 1 pound increase in the mother's desired weight change for child, children's dietary restraint increased by 0.006 (0.007 when gender was included in the model) (Tables B2 & B3). Children's desire for a smaller body size was also consistently

associated with parents' desire for their child to lose weight. In the parents' analyses, for every 1 pound increase in the mothers' desired weight change for their child, children's desire for a different body size increased by 0.013 (Table B6). When considering BMI percentile, these findings indicate that although parents appear to be dissatisfied with their child's lower weight, the children appear to be satisfied with their body (high body esteem) and are maintaining it with dietary restraint (high dietary restraint). In terms of children's desire for a different body size, and when also considering BMI percentile, our study indicates that children from higher BMI percentiles desire a smaller body weight for themselves and have parents who share the same opinion.

When looking at our criticism variables, we found that children who received more criticism from their parents had lower body esteem, lower dietary restraint, and desired a smaller body size after controlling for the children's body weight. These findings indicate that parental comments can influence a child's acceptance of their body and may negatively impact a child's body esteem. Previous studies support our findings that parental comments can have an influence in a child's attitude towards their body (Field et al., 2008; Haines et al., 2008; Phares et al., 2004; Smolak et al., 1999).

An unexpected finding and one that is not supported by previous literature is our finding that more criticism from parents has an association with lower dietary restraint. Previous studies have indicated that criticism is linked to activities that would be associated with a higher dietary restraint score, specifically the beginning of binge eating, and eating less to lose weight (Field et al., 2008; Ricciardelli et al., 2000; Thelen & Cormier, 1995). It is possible that a different dynamic is occurring in our cohort from

previous studies. One explanation is that children have not yet reacted to the criticism that is being provided by their parents. Alternatively, children are hearing the comments from their parents and are choosing to do the opposite. Another explanation is that children are receiving support about their body size and lifestyle choices from another source, such as peers, and hold this source of support in higher esteem than that of their parents. However, it is possible that the opposite finding, the fact that low amounts of criticism were associated with higher dietary restraint is the more interesting finding. A final explanation, and one that takes into account the consistent associations of BMI percentile and parents' desired weight change for their child, is that parents may be reacting out of concern for their child's weight. In our models, we consistently see that children with high dietary restraint have a low BMI (possibly representative of dieting behavior), have parents who provide fewer critical comments (possibly to avoid further dieting behavior or because weight is not perceived to be an issue) and desire them to gain weight.

Another surprising finding in our study was that fathers' body esteem appears to be positively associated with children's dietary restraint and children's body esteem in pre-adolescent children. Fathers' body esteem score, in all models in which it was significant, maintained a positive association with children's dietary restraint and children's body esteem, indicating that those children with higher dietary restraint scores, or higher body esteem scores have fathers who have higher body esteem. For example, in the parents' analysis, for every 1 unit increase in the Fathers' Body Esteem Scale, children's dietary restraint increased by 0.035 (0.029 when gender was included in the model) (Tables B2 & B3). In the fathers' analyses of children's body esteem, for every 1

unit increase in Fathers' Body Esteem Scale, children's body esteem increased by 0.092 (Table B5). This is a finding that this writer is not aware of in previous research. Although previous research has found an association between fathers' satisfaction with their own weight and their daughters' weight satisfaction (Keel et al., 1997), no association has been reported with a broader measure such as body esteem, or with dietary restraint.

One explanation for this finding is that a father who models high body esteem may influence their children to also have high body esteem. In terms of dietary restraint, a father who has higher body esteem may maintain a lean, muscular build, and might expect their children to maintain a similar body shape, thus resulting in children who have a higher dietary restraint score. Another explanation could be that there is an association between child and fathers' weight, maintained by dietary restraint, which contributes to high body esteem. This is an interesting consideration as it conflicts with the current popular belief that dieting is not beneficial, is ineffective and can be harmful by leading to poor body esteem. Additional research in this area would be beneficial.

Our results indicate that independent of family factors, body esteem is higher and dietary restraint greater in children living in high socioeconomic status neighborhoods compared with children living in low socioeconomic status neighborhoods. No association was found between children's desire for a different body size and neighborhood socioeconomic status (Objective 2, Hypothesis 1). Our evidence for this finding is that when neighborhood income quintiles were tested for significance, it was found that the second highest income quintile was positively associated with both

children's dietary restraint and children's body esteem, with this significance remaining even after mothers' variables were included (Tables 9 & 10). Previous research has shown that children from high socioeconomic statuses are less likely to be obese (Veugelers & Fitzgerald, 2005), and are more likely to be trying to lose weight than children from lower socioeconomic statuses (Adams et al., 2000).

There is a discrepancy between this finding and our own. We found no indication in our study that children from higher socioeconomic status neighborhoods were more likely to be dieting; in fact we found no difference in desire for a different body size across the neighborhood socioeconomic status spectrum. Logic would indicate that a desire for a different body size would be a stimulus to dieting. What we did find was an increased attitude towards dietary restriction, while still maintaining a positive body image. Therefore, our finding may indicate that children from higher socioeconomic status have higher body esteem related to body satisfaction and do not desire a change in body size, however maintain a high level of dietary restraint in order to maintain their current perceived body size.

We found that independent of family factors, body image, desire for a different body size and dietary restraint were found to have no association with living in an urban or rural neighborhood (Objective 2, Hypothesis 2). Despite the fact that children's body esteem and dietary restraint were lower in children from a reserve environment, once family factors were included, geographic location was found to have no significant association with our children's variables. We can therefore say that family influences have a greater association with our children's variables than geographic location.

Our results indicate that body image, dietary restraint and children's desire for a different body size have a greater association with family influences than neighborhood influences (Objective 2, Hypothesis 3). We see this through both our SPSS and our HLM findings for the analyses including neighborhood income. Our HLM findings found that geographic location and neighborhood income did not significantly enter into any model, indicating that all three children's variables had a greater association with family influences than neighborhood influences. SPSS findings support this by presenting a beta coefficient for neighborhood income and children's body esteem which is lower than the beta coefficients associated with family variables. Despite the fact that the beta coefficient for neighborhood income and children's dietary restraint is of a similar strength as some of the family variables, it is strongly surpassed by the criticism variable, again indicating that family influences are stronger. In addition, in none of the SPSS models, did our second neighborhood measure, geographic location, enter into a model. Despite the fact that children's BMI percentile was found to have a significant interaction with children's desire for a different body size which differed over geographic locations in the HLM analyses, the fact that geographic location was not associated with children's desire for a different body size in SPSS appears to indicate that this finding is less related to geographic location and more to another influence we did not measure. One possible influence may be related to physical activity, as this would be an influence which would impact children's BMI percentile and consequently their desire for a different body size and may differ between urban and rural locations.

This research has a few strengths worthy to mention. Firstly, to the authors' knowledge, few previous studies have utilized a method such as Hierarchical Linear

Modeling to assess various levels of neighborhood and family environments on dieting and body esteem in children. This is an important method of analysis as it allows us to look at multiple levels, instead of simply in a linear or single level and provides us with greater insight into our findings. The study utilized information from both mothers and fathers which allows us to look at both sources of parental influence. In addition, since the fairly large sample size included children from across Manitoba, we were able to compare geographical locations and neighborhood socioeconomic status. Measured height and weight allowed for accurate control

This study does have limitations. Although all children who were included in the analysis did have at least one parent participate in the survey, there was a large difference between the number of mothers and fathers who participated. In addition, although children independently answered the questions in their survey, a parent was present in room at the same time, which could have influenced their responses. As a large number of children and their parents dropped out of the study prior to the administration of the child and parent dieting questionnaire, it is possible that the cohort of children that remained in the study was somehow motivationally different from the participants who chose not to remain as part of the study group.

Although this study does use children's figure drawings, the images in our scale do not match to specific BMI ranges, and therefore it is possible that the figures used to determine a child's desire for a different body size do not accurately represent the child's BMI. Recent research has shown that children underestimate their weight (Saxton, Hill, Chadwick, & Wardle, 2009). It is therefore possible that our method of calculating a

child's desire for a different body size might over- or under- estimate the body change needed to meet the child's desired body size.

The SAGE study was originally designed to measure differences between children with asthma and children without asthma; therefore this cohort had a strong representation of children with asthma. This over-representation of children with asthma may have impacted our results if having asthma somehow impacts a child's body esteem or dieting habits. In addition, although this study included measures on family and neighborhood influences, it did not account for any peer influences, which have been documented to play an influence in dieting and body esteem in children. Also, this study was only able to retain a small sample of 44 participants and their families who resided on a First Nations reserve. A greater difference may have been found between urban, rural and First Nations reserve categories if a larger sample size had been retained.

In addition, as the student version of HLM was used for this analysis, certain restrictions were placed on the analysis. Due to these restrictions, only a small number of the possible variables could be entered into the model for testing. Therefore, had all of the possible variables been tested, it is possible that different results would have been found.

Conclusions

In summary, we have found that high family socioeconomic status was associated with a higher body esteem and greater dietary restraint in children. Similar findings were found with neighborhood socioeconomic status, with body esteem being higher and dietary restraint greater in children living in high socioeconomic status neighborhoods compared with children living in low socioeconomic status neighborhoods. Although there were no associations between our children's variables and geographic location, we did find that our children's variables are more strongly associated with family influences than neighborhood factors. Finally, we found that BMI percentile and parents' criticism had a negative association while parents' desired weight change for child and fathers' body esteem had a positive association with our children's variables.

Overall, family influences overwhelmingly provided the majority of the influence over our children's variables. We found some results which, to our knowledge, have not previously been reported, particularly regarding the effect of fathers' body esteem on children's dietary restraint and body esteem and additional research in this area would be beneficial to fully understand the influence. Additional research is also needed to further understand the interaction that was found between children's desire for a different body size and children's BMI percentile across geographic locations. It is possible that this interaction is actually measuring the impact of a variable that we did not account for.

We have seen in our study that parents may possibly already be reacting to dieting practices in their children by limiting their comments related to weight and body image and desiring weight gain for their children. This information may be useful for health

professionals as it may signal a larger problem related to dieting habit and body image issues in our youth. Health professionals can utilize this information by encouraging parents to focus on positive comments (ie: you look beautiful today) instead of negative comments, to encourage the belief that you can be healthy and beautiful at any size and to start doing so from a young age. A belief system such as this may go beyond helping children accept themselves by also allowing parents to improve their own body esteem, acceptance of their bodies, and appreciation for self.

Appendix A

Table A1

Fathers' Ethnic Differences between Participants and Non-Participants

Ethnicity	Participants (%) (n=447)	Non-Participants (%) (n=136)	Pearson Chi-Square
First Nations/Métis	11.0	5.9	0.191
White	83.2	86.8	
Other	5.8	7.4	

Note: First Nations and Métis were combined to form First Nations/Metis, and Other, Oriental, South Asian and Black were combined to form the Other category. Categories were combined in order to have counts greater than 5 in each category.

Table A2

Mothers' Ethnic Differences between Participants and Non-Participants

Ethnicity	Participants (%) (n=538)	Non-Participants (%) (n=160)	Pearson Chi-Square
First Nations/Métis	14.3	5.6	0.012
White	80.9	88.1	
Other	4.8	6.3	

Note: First Nations and Métis were combined to form First Nations/Metis, and Other, Oriental, South Asian and Black were combined to form the Other category. Categories were combined in order to have counts greater than 5 in each category.

Table A3

Means and Standard Deviations of Children's BMI Percentile grouped by Family SES and Geographic Location in Children who did not participate

	Children's BMI Percentile
Low Family Income	63.77 ± 27.12
High Family Income	67.64 ± 28.40
Urban Location	64.00 ± 28.09
Rural Location	68.79 ± 27.29
Reserve Location	72.10 ± 29.70

Note: Income information was not available for 15 non-participants

Table A4

Weight, Geographic Location and Family Income Differences between Participants and Non-Participants

	Participants (%)	Non-participants (%)	Pearson Chi- Square
Normal Weight	69.2	64.4	0.467
Overweight	15.0	16.3	
Obese	15.8	19.4	
Urban Location	54.3	45.0	<0.001
Rural Location	37.7	35.0	
Reserve Location	7.9	20.0	
Low Income	16.6	11.7	0.156
High Income	83.4	88.3	

Note: Income information was not available for 15 non-participants and 53 participants

Table A5

T-test of Child BMI Percentile in Participants and Non-Participants

	N	Mean	Standard Deviation	P-Value
Participants	552	63.48	28.25	0.930
Non-participants	160	66.42	28.95	

Appendix B

Table B1

Associations between Children's Dietary Restraint, Children's Body Esteem and Children's Desire for a Different Body Size and Family Socioeconomic Status Variables, while Controlling for Children's BMI Percentile

Dependant Variables	Independent Variables	n	β values	St. Error	Beta Values	P-Value	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	498	-0.005	0.001	-0.247	<0.001	0.088
	Mothers' completion of high school		0.183	0.088	0.092	0.037	
	High Family Income[3]		0.177	0.069	0.112	0.011	
Children's Body Esteem	Children's BMI Percentile	498	-0.024	0.003	-0.343	<0.001	0.126
	Mothers' completion of High School		0.590	0.285	0.087	0.039	
Children's Desire for a Different Body Size	Children's BMI Percentile	497	-0.016	0.001	-0.500	<0.001	0.248

[3] Interaction between High Family Income (mothers' report) and mothers' completion of high school was tested, but was not significant.

Table B2

Associations between Children's Dietary Restraint and Parents' Variables, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	287	-0.002	0.001	-0.126	0.057	0.187
	Fathers' Criticism (High Frequency)		-0.211	0.079	-0.172	0.008	
	Fathers' Body Esteem Score		0.035	0.013	0.156	0.008	
	Mothers' Desired Weight Change for their Child		0.006	0.003	0.145	0.040	
	Mothers' Eating Attitudes Test		-0.009	0.004	-0.114	0.050	

Table B3

Associations between Children's Dietary Restraint and Parents' Variables, while Controlling for Children's BMI Percentile (Children's Gender Included)

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	287	-0.002	0.001	-0.104	0.112	0.160
	Fathers' Criticism (High Frequency)		-0.187	0.077	-0.150	0.016	
	Fathers' Body Esteem Score		0.029	0.013	0.128	0.022	
	Mothers' Desired Weight Change for their Child		0.007	0.003	0.179	0.009	
	Male Gender		-0.126	0.060	-0.115	0.038	

Table B4

Associations between Children's Dietary Restraint and Fathers' (Model 1) and Mothers'(Model 2) Variables, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint (Model 1)	Children's BMI Percentile	284	-0.002	0.001	-0.082	0.183	0.180
	Fathers' Criticism (High Frequency)		-0.186	0.080	-0.144	0.020	
	Fathers' desired weight change for child		0.009	0.003	0.234	<0.001	
	Fathers' Body Esteem Score		0.027	0.013	0.117	0.038	
	Male Gender		-0.177	0.062	-0.156	0.005	
Children's Dietary Restraint (Model 2)	Children's BMI Percentile	331	-0.002	0.001	-0.095	0.136	0.169
	Mothers' Criticism (High Frequency)		-0.239	0.077	-0.191	0.002	
	Mothers' Desired Weight Change		0.003	0.001	0.121	0.021	
	Mothers' Desired Weight Change for their Child		0.007	0.003	0.165	0.011	
	Male Gender		-0.121	0.059	-0.104	0.042	

Table B5

Associations between Children's Body Esteem and Parents' (Model 1), Fathers' (Model 2) and Mothers' (Model 3) Variables, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Body Esteem (Model 1)	Children's BMI Percentile	297	-0.008	0.004	-0.114	0.068	0.318
	Mothers' Desired Weight Change for their Child		0.033	0.009	0.237	<0.001	
	Fathers' Criticism (High Frequency)		-0.957	0.268	-0.216	<0.001	
	Mothers' Criticism (High Frequency)		-0.743	0.279	-0.172	0.008	
Children's Body Esteem (Model 2)	Children's BMI Percentile	285	-0.006	0.004	-0.088	0.140	0.247
	Fathers' Criticism (High Frequency)		-1.428	0.269	-0.321	<0.001	
	Fathers' Desired Weight Change for their Child		0.024	0.009	0.172	0.007	
	Fathers' Body Esteem Score		0.092	0.043	0.116	0.034	
Children's Body Esteem (Model 3)	Children's BMI Percentile	350	-0.009	0.004	-0.124	0.028	0.330
	Mothers' Desired Weight Change for their Child		0.045	0.008	0.319	<0.001	
	Mothers' Criticism (High Frequency)		-1.103	0.242	-0.252	<0.001	

Table B6

Associations between Children's Desire for a Different Body Size and Parents' (Model 1), Fathers' (Model 2) and Mothers' (Model 3) Variables, while Controlling for Children's BMI Percentile

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Desire for a Different Body Size (Model 1)	Children's BMI Percentile	296	-0.008	0.002	-0.286	<0.001	0.273
	Fathers' Criticism (High Frequency)		-0.268	0.108	-0.142	0.013	
	Mothers' Desired Weight Change for their Child		0.013	0.004	0.221	<0.001	
	Male Gender		0.224	0.084	0.134	0.008	
Children's Desire for a Different Body Size (Model 2)	Children's BMI Percentile	288	-0.013	0.002	-0.411	<0.001	0.338
	Fathers' Criticism (High Frequency)		-0.343	0.108	-0.171	0.002	
	Fathers' Desired Weight Change for their Child		0.008	0.004	0.136	0.020	
	Male Gender		0.318	0.086	0.181	<0.001	
Children's Desire for a Different Body Size (Model 3)	Children's BMI Percentile	350	-0.007	0.002	-0.204	0.001	0.235
	Mothers' Criticism (High Frequency)		-0.366	0.117	-0.177	0.002	
	Mothers' Desired Weight Change for their Child		0.014	0.004	0.205	<0.001	
	Male Gender		0.215	0.090	0.113	0.018	

Appendix C

Table C1

Association between Neighborhood Income and Children's Dietary Restraint

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	523	-0.005	0.001	-0.226	<0.001	0.71
	Quintile 1 (Lowest)		-	-	-	-	
	Quintile 2		0.135	0.099	0.085	0.171	
	Quintile 3		0.176	0.095	0.121	0.064	
	Quintile 4		0.312	0.096	0.209	0.001	
	Quintile 5 (Highest)		0.213	0.090	0.164	0.019	

Table C2

Association between Neighborhood Socioeconomic Status and Children's Dietary Restraint, while Children's BMI Percentile and Mothers' Variables are Controlled (Gender Included)

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Dietary Restraint	Children's BMI Percentile	426	-0.003	0.001	-0.143	0.005	0.166
	Mothers' Criticism (High Frequency)		-0.328	0.064	-0.258	<0.001	
	Mothers' Desired Weight Change for Self		0.003	0.001	0.127	0.006	
	Quintile 1 (Lowest)		-	-	-	-	
	Quintile 2		0.082	0.103	0.053	0.423	
	Quintile 3		0.124	0.096	0.093	0.196	
	Quintile 4		0.215	0.097	0.156	0.028	
	Quintile 5 (Highest)		0.090	0.094	0.073	0.335	
	Male Gender		-0.109	0.051	-0.095	0.035	

Table C3

Associations between Children's Body Esteem and Neighborhood Variables

Dependant Variable	Independent Variables	n	β values	St. Error	Beta Values	P-Values	Adjusted R^2
Children's Body Esteem	Children's BMI Percentile	521	-0.024	0.003	-0.348	<0.001	0.135
	Quintile 1 (Lowest)		-	-	-	-	
	Quintile 2		0.013	0.318	0.002	0.968	
	Quintile 3		0.181	0.305	0.038	0.554	
	Quintile 4		0.753	0.309	0.153	0.015	
	Quintile 5 (Highest)		0.193	0.292	0.045	0.509	

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