The family environment and adolescent girls’ weight and weight-related behaviors:
Implications for obesity prevention programs

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Dedication

For my Sasha, may this work prove to you that with passion and determination you can achieve anything you desire.
Abstract

Introduction: Over one-third of adolescent girls in the United States are overweight or obese, and most are not regularly physically activity (PA), watch excessive television (TV), frequently consume soft drinks, and consume an insufficient amount of fruits and vegetables (FV). Although studies have observed associations between factors in the family environment and youths’ participation in these behaviors, questions remain as to how families can best help their adolescent daughters achieve and maintain a healthy weight. Additionally, while school-based obesity prevention interventions offer great potential to help youth modify their behavior and weight, it is unknown whether adolescents can make meaningful improvements without support and resources from their families. Utilizing data from New Moves, a school-based physical activity and nutrition intervention, this dissertation aims to 1) explore sociodemographic differences in girls’ weight-related family environments, 2) test cross-sectional associations between family environment factors and girls’ total PA, moderate-to-vigorous PA, TV use, soft drink intake, FV intake, body mass index (BMI), and body composition, and 3) determine whether factors in girls’ family environments are associated with girls’ improvements in behavior, BMI, and body composition over the course of New Moves, as well as whether factors in the family environment modify the effect of New Moves.

Method: Subjects included 253 adolescent girls from 12 schools who participated in New Moves (mean age = 15.7) and one of their parents. At baseline, parents completed surveys assessing the family environment. At baseline and post-intervention 9-12 months later, girls’ PA and TV use were measured by a 3-Day Physical Activity Recall (3DPAR) and dietary intake by survey measures. Height and weight were measured by study staff and body fat was measured using dual-energy X-ray absorptiometry (DXA). Hierarchical linear and logistic regression models were used to address study aims.

Results: Girls’ family environments differed in many ways by girls’ race/ethnicity, foreign-born status, and parental education. These differences frequently reflected the disparities in weight and weight-related behavior observed among adolescent girls in other study populations. Several cross-sectional associations were observed between
family environment factors and girls’ behavior and weight. Parental modeling of eating and physical activity consistently predicted girls’ behavior, home food availability was positively associated with girls’ intake of soft drinks and FV, and more frequent family meals were associated with greater FV intake. In contrast, few relationships were observed between the family environment and girls’ odds of successful behavior, BMI, and/or body composition change over the course of New Moves. However, the pattern of significant associations suggests that girls from less supportive family environments were more likely to successfully modify their behavior, BMI, and body composition. For example, girls from families that provided more support for PA had a lower odds of increasing their PA (OR=.62, p=.04), girls who had high home soft drink availability had a greater odds of decreasing their soft drink intake (OR=1.99, p<.01), girls with more TVs at home had a greater odds of decreasing their BMI (OR=1.65, p=.04), and girls with more media resources at home had a greater odds of decreasing their body fat (OR=1.87, p=.03). None of the family environment factors examined modified the effect of New Moves on girls’ behavior or body composition. However, the number of TVs in girls’ homes served as a modifier of the effect of New Moves on girls’ BMI with no intervention effect seen among girls with 3 or fewer TVs, while girls in the intervention condition with 4 or more TVs at home had a lower baseline-adjusted BMI post-intervention as compared to girls in the control condition with 4 or more TVs at home.

Conclusions: This dissertation provides additional support for the role of the family environment in youths’ weight-related behaviors, weight, and body composition. While girls with less supportive family environments were at greater risk for being physically inactive, having poor dietary intake, and being overweight or obese, few associations were observed between girls’ family environments and improvement of their weight-related behavior, BMI, and body composition during the course of a school-based intervention. These findings suggest that school-based interventions offer an opportunity to decrease the risk of obesity among all adolescent girls, especially those who receive less support and resources for healthful behavior from their families.
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Chapter 1: Introduction and Background

A growing body of evidence suggests that the family environment plays a role in adolescent girls’ weight status and participation in weight-related behaviors such as physical activity, sedentary behavior, and healthy dietary intake. However, unaddressed questions and inconsistencies in the literature remain as to how families can best support their daughters’ behavior and weight change efforts. Additionally, despite the proliferation of school-based efforts to address obesity among adolescents, little is known about whether the family environment of students may help or hinder the success of these programs. Therefore, research is needed to determine if schools can improve the health of adolescents in spite of their family environment, or if ensuring a supportive family environment for adolescents is a necessary component of successful obesity prevention interventions.

This chapter will address current evidence on the relationships between adolescent girls’ weight, selected weight-related behaviors, their family environment, and obesity prevention interventions, while highlighting the need for additional research in many of these areas. The prevalence of and trends in overweight and obesity among adolescent girls will be presented, as well as evidence to support the roles that physical activity, television use, and soft drink and fruit and vegetable intake play in overweight and obesity. Racial, ethnic, and socioeconomic disparities in girls’ weight and the selected predictors of weight will be highlighted. The role of parents and family in shaping adolescents’ health behaviors will be examined using Social Cognitive Theory, and current research on role of the family environment in girls’ weight and predictors of weight will be reviewed. The potential role of the family environment in the outcomes of school-based obesity prevention interventions will be explored via a review of family-based interventions, school-based interventions, and literature examining associations between family characteristics and youths’ success in school-based obesity prevention interventions.
1.1. Overweight and obesity among US adolescent girls

Between 1971 and 1999 the prevalence of overweight (age-adjusted Body Mass Index (BMI) ≥ 85th percentile and <95th percentile) and obesity (age-adjusted BMI ≥ 95th percentile) among adolescent girls aged 12-19 years has increased by 152%.1 While data from the National Health and Nutrition Examination Survey (NHANES) indicate that the prevalence of overweight and obesity among adolescents leveled off between 1999 and 2008, still approximately one-third of adolescent girls are overweight or obese.2 African American and Hispanic adolescent girls as well as girls from low socioeconomic status (SES) families are more likely to be overweight or obese compared to non-Hispanic white or high SES girls.3 In 2007/2008, 46.3% of African American and 39.7% of Hispanic adolescent girls were overweight or obese, compared to 29.9% of non-Hispanic white adolescent girls.2

Being overweight or obese during adolescence is associated with physical and psychosocial health concerns both during adolescence and into adulthood. Physical co-morbidities of obesity during adolescence include metabolic syndrome, Type 2 diabetes, hypertension, sleep disorders, and among girls, polycystic ovarian syndrome (PCOS). Psychological and psychosocial problems, such as depression, have also been associated with being overweight or obese as an adolescent. However, it is likely that the psychological problems associated with obesity are a result of social problems which overweight adolescents are more likely to experience, such as teasing and having fewer friends than non-overweight adolescents.4-6

1.2. Select determinants of overweight and obesity

Energy imbalance, or consuming more calories than one uses, leads to excess weight gain.6 Low amounts of regular physical activity coupled with high amounts of sedentary activity and high caloric intake create an excess of calories. Behaviors which may lead to maintenance of a healthy weight include engaging in daily physical activity including moderate-to-vigorous physical activity (MVPA), limiting television time, and regulating
dietary intake including drinking minimal amounts of sugar-sweetened soft drinks and consuming at least five fruits and vegetables per day.

1.2.1. Physical activity and adolescent weight

The Physical Activity Guidelines for Americans recommend that adolescents engage in MVPA for periods of time that equal or exceed 60 minutes per day.\(^7\) Despite the importance of regular physical activity, the majority of adolescents do not engage in the recommended amount. Among the racially, ethnically and socioeconomically diverse sample of adolescents participating in Project EAT (Eating Among Teens) in 1999 and 2004, high school-aged girls reported participating in between 4.9 and 5.1 hours of MVPA per week.\(^8\) Among a sample of girls aged 11-15 only 33.6% met national recommendations by engaging in at least 60 minutes of exercise per day\(^9\) while data from the Youth Risk Behavior Survey (YRBS), a national study of adolescents, found even fewer girls met national recommendations as only 24.3% of girls participated in 30 minute sessions of moderate physical activity most days of the week.\(^10\) Hispanic and African American adolescents, and adolescents of low SES are less likely to engage in regular physical activity compared to non-Hispanic white adolescents and those from high SES families.\(^11\)-\(^14\)

Several cross-sectional\(^15\),\(^16\) and longitudinal\(^17\)-\(^21\) studies have found that engaging in regular MVPA is associated with lower BMI and percent body fat among adolescent girls. Changes in physical activity levels through adolescence are associated with changes in body weight. Among the young-adolescent girls who participated in the Trial of Activity for Adolescent Girls (TAAG), girls whose MVPA increased from the 15\(^{th}\) to 85\(^{th}\) percentile, or by 10.7 minutes per day, between 6\(^{th}\) and 8\(^{th}\) grade, significantly decreased their percent body fat.\(^22\) Additionally, in a study of girls age 8 through 18, those who decreased their level of moderate physical activity had higher levels of adiposity over the 2 years of the study.\(^23\) However, a small number of studies have not found such a relationship between physical activity and weight status.\(^10\),\(^24\),\(^25\) For example, among the children and adolescents who participated in NHANES III between 1988 and 1994, there
were not differences between overweight girls and normal-weight girls in their odds of participating in 3 or more hours of vigorous activity per week.\textsuperscript{25}

1.2.2. Television watching and adolescent weight

The American Academy of Pediatrics (AAP) recommends that adolescents spend no more than 1 to 2 hours daily watching television.\textsuperscript{26} In 2009, adolescents reported watching 4 hours and 22 minutes of television a day on average,\textsuperscript{27} more than twice the maximum amount recommended by the AAP. Results from the YRBS as well as a study of media use by the Kaiser Family Foundation indicate that Hispanic and African American adolescents spend greater amounts of time watching television than their white peers, with African American adolescents reporting watching almost 6 hours of television per day, and Hispanic adolescents reporting over 5 hours of television per day, as compared to approximately 3.5 hours per day among white adolescents.\textsuperscript{11,27} Similarly, among Project EAT I participants, middle and high school-aged African American girls reported watching 23 hours of television per week, while white girls reported 17 hours of television use per week.\textsuperscript{28} Adolescent girls from families of low SES also report greater time being sedentary, including time spent watching television.\textsuperscript{14,29}

Both cross-sectional\textsuperscript{11,15,30-32} and longitudinal\textsuperscript{33-38} studies have observed a positive relationship between television watching and weight among children and adolescents. Dietz and Gortmaker\textsuperscript{39} found that for each hour of television watched by children and adolescents per week, the prevalence of overweight increased 1.2 to 2.9\%. The authors calculated that 29\% of the cases of obesity among children and adolescents in their sample could have been prevented if these youth watched no more than 1 hour of television per week.\textsuperscript{40} Despite the number of significant, positive relationships found between television use and adolescents’ weight, one meta-analysis concluded that this positive relationship may be too small to be of clinical relevance.\textsuperscript{41}

A number of pathways between television watching and weight gain have been proposed. Several studies have found an inverse yet small relationship between television watching
and amounts of MVPA among children and adolescents.\cite{11,31,42} Watching television is also associated with increased calorie consumption\cite{43} as people frequently consume meals and snacks while watching television.\cite{32,44} Experimental data provide evidence that more calories are consumed when meals are eaten while watching television than would have been if subjects had not been watching.\cite{45,46} Finally, television use is associated with greater intake of high fat and high sugar foods throughout the day, likely due to increased exposure to commonly advertised foods.\cite{47,48}

1.2.3. Soft drink intake and adolescent weight
According to the most recent data from NHANES, soft drinks are the most common sugar-sweetened beverage consumed by adolescents. Calories from soft drinks comprise 55% of all calories obtained from sugar-sweetened beverages in the diets of children and adolescents and this percentage is even higher when examining adolescents alone.\cite{49} Between 1977-78 and 1999-2000, consumption of soft drinks and fruit drinks doubled among adolescent girls.\cite{50} Based on national data from 1994/1998, French et al.\cite{51} found that 62% of adolescent girls report consuming a soft drink on any given day.

Both the AAP and the Dietary Guidelines for Americans recommend reducing consumption of soft drinks as a method to control weight.\cite{52,53} Cross-sectional and longitudinal studies have identified associations between soft drink intake and weight and weight gain over time among adolescent girls.\cite{54,55} Among the adolescent girls participating in the Growing up Today (GUTS) study, girls that drank at least one serving of soft drinks or fruit drinks per day gained more weight within one year than girls who reported no intake.\cite{56} Randomized trials have provided evidence supporting the link between soft drink intake and weight.\cite{58,59} In a pilot study which attempted to modify the sugar-sweetened beverage intake of a group of adolescents, non-sugar sweetened beverages were provided to the participants’ families as a means to decrease consumption of sugar-sweetened beverages. Among intervention condition participants, consumption
of sugar-sweetened beverages decreased by 82%, and compared to those in the control condition intervention participants lost a net of -.14 BMI units. This decrease was not statistically significant although further analysis found that the intervention resulted in a significant decrease in BMI among those participants that began the study with a BMI greater than 30.59

Consumption of soft drinks is thought to lead to weight gain via a number of mechanisms.60 It has been observed that children and adults fail to compensate for the calories obtained from drinks by reducing their intake of solid food.61 Therefore, in addition to the calories that soft drinks provide, it is likely that those who drink these beverages consume as many calories from solid food as they would have had they not drunk the beverage. Additionally, foods such as soft drinks that are high on the glycemic index and contain easily digestible sugar or high fructose corn syrup cause rapid increases in blood sugar. This increase leads the body to release insulin quickly, resulting in a rapid drop in blood sugar. This drop in blood sugar may lead to feelings of hunger shortly after consuming the beverage. Individuals may then be likely to consume food which they might not have been hungry for if they had not drunk the soft drink.62 Finally, it has been hypothesized that high-fructose corn syrup, which is used in many sweetened beverages, may affect various physiological mechanisms resulting in changes in insulin production, which in turn affects hunger and satiety cues.61

1.2.4. Fruit and vegetable intake and adolescent weight
Very few adolescents are meeting the Healthy People 2010 objective to consume at least 2 fruits and 3 vegetables per day.63 The United States Department of Agriculture’s Continuing Survey of Food Intakes of Individuals (CSFII) found that between 1999 and 2002 only 27% of adolescent females consumed at least 3 vegetables per day and 21% of females consumed at least 2 servings of fruit each day.64 Similarly, among the adolescent girls participating in the National Heart, Lung, and Blood Institute Growth and Health Study (NGHS), over 95% did not consume 2 fruits and 3 vegetables on even a single day of the three days that dietary data were collected.65 High school-aged girls participating in
Project EAT ate an average of between 1.9 and 2.3 servings of fruit per day, and 1.7 and 1.9 servings of vegetables per day. A secular decrease in fruit and vegetable consumption was observed over the five years of Project EAT, with total average fruit and vegetables servings per day decreasing from 4.2 in 1999 to 3.5 in 2004.\textsuperscript{66} Fruit and vegetable intake has been found to be positively associated with SES, and specifically higher household income.\textsuperscript{50} African American youth are less likely to meet the fruit and vegetable recommendations as compared to white and Hispanic youth.\textsuperscript{63}

There is some evidence that fruit and vegetable consumption is a protective factor against overweight and obesity,\textsuperscript{16,67-69} as well as other cardiovascular disease risk factors.\textsuperscript{6,70} In a study of college-age young adults, Economos et al\textsuperscript{71} found that consuming 5 fruits and vegetables per day was one of the few behaviors associated with weight loss of the course of the school year. It has been hypothesized that long-term management of a healthy weight can result from substituting fruits and vegetables for higher energy foods.\textsuperscript{72} Additionally, increasing intake of fruits and vegetables is thought to be a sustainable method through which adolescents can lose weight or maintain a healthy weight because adding to the diet instead of eliminating foods from the diet is less likely to lead to feelings of deprivation.\textsuperscript{73}

1.3. The family environment and adolescent girls’ weight and weight-related behaviors
There is a growing body of evidence that many parental behaviors and factors in the family environment are significant predictors of adolescent girls’ weight status, physical and sedentary activity levels, and soft drink and fruit and vegetable intake. However, questions still remain as to how the family environment supports healthy weight-related behaviors among adolescents. Additionally, studies of these relationships among racial and ethnic-minority families, as well as low SES families, are greatly needed.
1.3.1. *Social Cognitive Theory and the importance of the family environment*

Social Cognitive Theory (SCT) serves to explain the development and maintenance of an individual’s behaviors including health behaviors such as physical activity and dietary intake. Social Cognitive Theory posits that behaviors result from the continual interaction of three levels of influence: an individual’s personal beliefs or cognitions, behavioral factors, and the individual’s environment. This continual interaction of intra- and interpersonal influences, known as reciprocal determinism, is a key element of SCT, differentiating it from most other health behavior theories.\(^{74,75}\)

The intrapersonal components of the SCT are personal beliefs and behavioral factors. Personal factors, also known as cognitions, include an individual’s knowledge, attitudes and beliefs about a behavior, as well as self-efficacy, or belief in their ability to participate in a specific behavior. An example of self-efficacy is when an adolescent believes that they are capable of selecting and eating a vegetable while eating lunch in the school cafeteria when there are many non-nutritious foods available. Behavioral factors include things that are directly related to the performance of a health behavior such as skills and intention. An example of a behavioral factor is whether an adolescent eats in reaction to stress or boredom instead of eating because they are hungry.\(^{76}\)

An individual’s environment includes both the physical space in which behavior happens and the social contributions of peers, teachers, community members, and perhaps most importantly to youth, parents and the family.\(^{74}\) This conceptualization of the family offering adolescents both a physical and social environment is reflected in much of the research examining familial influences on youths’ weight-related behaviors.\(^{77,78}\) Examples of ways in which adolescents’ physical environment may influence their behaviors include emerging research on the relationships between home availability of food and adolescents’ dietary intake, and the presence of televisions in the home and adolescents’ sedentary activity habits.\(^{78,79}\)
Parents, peers, and other individuals that comprise the adolescents’ social environment influence behavior through methods including modeling, providing access or barriers to resources, reinforcing behaviors, and creating social norms for behaviors. Parental support for physical activity and healthy dietary intake can come in multiple forms including verbal encouragement, logistical support, and participating in the healthy behaviors with the adolescent. These actions tap into several of the methods of behavior change emphasized by SCT. For example, when families eat meals together the parents are providing a time and place where adolescents can eat healthy or unhealthy foods, they may be encouraging, supporting, and reinforcing adolescents’ food choices, and they are creating an expectation of what foods are appropriate to eat.

Learning through observation is a key component of SCT. Bandura believed that humans have an advanced capacity for observational learning which allows for the vicariously gain of knowledge or skills which are modeled. Additionally, not only can specific actions be taught via modeling, but the emotional experiences which are attached to these actions are also often learned by the observer. An example of this process is when a parent takes a nightly walk for exercise and returns from the walk having enjoyed being physically active and, because of the walk, feels more relaxed. Adolescents may learn from observing their parent’s routine that regular exercise is enjoyable and has multiple physical and emotional health benefits. Additionally, they may gain additional skills from observing their parent, such as time management, as they repeatedly see their parent finding ways to set aside a time for daily exercise.

Figure 1-1 is an adaptation of the theoretical model for the New Moves physical activity and nutrition intervention, which utilizes Social Cognitive Theory to highlight selected environmental, personal and behavioral factors that are believed to influence adolescent girls’ weight and selected weight-related behaviors. Specifically, ways in which the physical and social environment of the family may influence girls’ behavior are emphasized in this model and serve as a framework for identifying and assessing factors in the family environments of girls that may be associated with their behavior and weight.
status, as well as their changes in these outcomes during the New Moves intervention. The following sections of this literature review will describe current research on components of the physical and social family environment seen in this model as well as identify remaining gaps in the literature.
Figure 1-1: New Moves theoretical model of change with emphasis on the family environment

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<tr>
<th>Environmental factors</th>
<th>Personal factors</th>
<th>Behavioral factors</th>
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<td>Family Environment</td>
<td>Perceived benefits: healthy eating</td>
<td>Attention to portion size</td>
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<tr>
<td>Physical Environment</td>
<td>Perceived benefits: PA</td>
<td>Attention to hunger/satiety cues</td>
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<td>Binge eating</td>
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<td>Sedentary behavior resources</td>
<td>Perceived barriers to PA</td>
<td>Goal setting</td>
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<td>Social Environment</td>
<td>Self-esteem</td>
<td>Stage of change: eating and PA</td>
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<td>Role modeling</td>
<td>Body image</td>
<td>Fast food intake</td>
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<td>Family support</td>
<td>Internalization/comparison to “ideal body”</td>
<td>Binge eating behaviors</td>
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<td>Peer Environment</td>
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<td>School Environment</td>
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<td>Stress management skills</td>
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<td>Skills: healthy eating and PA</td>
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<td>Self reinforcements</td>
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Select Behavioral Outcomes
Moderate and vigorous physical activity
Television use
Consumption of soft drinks
Consumption of fruit and vegetables

Main Health Outcomes
Body fat and body weight
1.3.2. Adolescents’ psychosocial development and the role of family

Examining the developmental stage of adolescence provides a context for the role of the family in adolescents’ lives. Adolescents in high school who are moving into young adulthood rely on internalized values to guide their behaviors. Challenges to authority figures, which peak during the middle school years, begin to decrease during this time. While in middle school, peers and conforming to a peer group’s social norms were critical to the adolescent, the influence of peers tends to wane during high school. These older adolescents have developed a greater sense of self and therefore are often more confident in their own behavior choices than they were only a few years ago.81

A goal of this stage of life is obtaining emotional independence from parents,81 as adolescents begin to practice behaviors that they want to integrate into their future lifestyle.82 This drive for independence often alters the relationship adolescents have with their family during childhood, and the relationships seen between the family environment and youths’ health behaviors during childhood may not apply during adolescence. As adolescents are building life-long health behaviors, they may internalize what they learned from their family and it may be difficult to instill new health behaviors that were not modeled and supported by their family. Alternatively, adolescents may have a strong desire to develop new behaviors independent of their family, and the family environment may have little influence on adolescents’ ability to modify their health behaviors.

1.3.3. Physical activity and the family environment

A number of studies have examined the relationship between parental support and adolescents’ physical activity habits. Parental support for physical activity includes emotional encouragement to be active as well as logistical support such as providing transportation to a place where adolescents can be active. Several cross-sectional analyses have found a positive relationship between parental support and adolescents’ participation in regular physical activity.83-87 However, most of these studies were conducted in primarily white and high SES samples;83,85,86 therefore, there is limited evidence to help understand the role of parental support in racial and ethnic minority and
low SES families. In a cross-sectional analysis of predictors of physical activity among high school age participants in the first New Moves intervention, support for physical activity from parents, friends and teachers was one of the few factors associated with girls’ physical activity habits.

A small number of longitudinal studies have suggested that parental support is associated with changes in adolescents’ physical activity over time. Dowda et al found that girls who reported low family support had more rapid declines in physical activity between 8th and 12th grade. Among the racially, ethnically and socioeconomically diverse population of adolescents that participated in Project EAT II, a positive relationship between parental support for physical activity and increases in adolescent girls’ physical activity as they moved from middle to high school was suggested.

Studies examining the relationship between parental modeling of physical activity and adolescents’ physical activity habits have produced mixed results. While Davison et al found that fathers’ modeling of physical activity was associated with their 9-year-old daughters’ physical activity, most studies of adolescents have not found such a relationship. Among adolescents participating in Project EAT, the cross-sectional relationship between adolescent-reported parental concern about their own fitness and girls’ physical activity was marginally significant; however when examined longitudinally, parental concern for fitness was not associated with changes in adolescent girls activity habits after five years. Meanwhile, in a longitudinal study utilizing parents’ report of their physical activity habits, Anderssen et al found that adolescents whose mothers were active exhibited less of a decline in physical activity through adolescence. This association may be important as girls experience a sharp decline in physical activity participation through the high school years. Additional research is needed on the relationship between parental modeling of physical activity and adolescents’ physical activity habits. It has been suggested that modeling may be influential to adolescents in the presence of family support for physical activity. This may be because while parental modeling provides some skills and reinforcement to the
adolescent, parental support helps adolescents overcome the physical and emotional barriers to being active.\textsuperscript{85}

A less examined area of the family environment that may be relevant for adolescents’ physical activity is the availability of resources for activity and exercise in the home.\textsuperscript{93} The few studies that have examined the relationship between resources in the home and adolescents’ physical activity levels have had mixed results.\textsuperscript{89,94-96} In a study of college students’ activity habits, physical activity resources in the home environment were associated with participation in strength exercises and vigorous exercise, but not with walking for exercise.\textsuperscript{94} Studies conducted with high school-aged adolescents found that the presence of exercise equipment in the home was cross-sectionally, but not longitudinally, associated with self-reported physical activity.\textsuperscript{89,95,96} These findings suggest that if adolescents are physically active they are likely to have physical activity resources in the home. However, it remains unknown whether the presence of such equipment supports changes in physical activity over time.

1.3.4. Television use and family environment

Cross-sectional and longitudinal studies have identified factors in the family environment correlated with television use among children and adolescents. Factors positively related to television use among girls include number of televisions in the home,\textsuperscript{78,97,98} parents’ television habits,\textsuperscript{99-101} families watching television together,\textsuperscript{99,101} and eating meals and snacks while watching television.\textsuperscript{78,101} Davison et al\textsuperscript{100} found that among a cohort of girls and their mothers, mothers who reported high amounts of television watching at baseline had daughters who reported higher levels of television use after two years, as compared to girls who started off with mothers who did not watch much television. While a handful of studies have identified children and adolescents having a television in their bedrooms as a risk factor for excessive television use,\textsuperscript{78,99,102} some studies have suggested that having a television in the bedroom may be unrelated to girls’ TV habits.\textsuperscript{103} Family support for not watching television, and rules restricting the use of television have been
found to be associated with fewer hours of television watched by children and young adolescents.  

Research on the relationship between access to pay television (i.e. cable or satellite) and television habits has found mixed results. Hardy et al\textsuperscript{101} found that having pay television in the home was associated with twice the odds of watching 2 or more hours of television per day among young adolescents. Meanwhile, Salmon et al\textsuperscript{99} found that having pay television was associated with lower odds of engaging in sedentary behavior among primary school children. These mixed results might be a result of unaddressed confounding by SES; however, more research is needed to clarify these relationships. Similarly, little is known about the relationships between other new forms of technology, such as DVD players and electronic games, and adolescents’ television use habits.

Although a number of family environmental correlates of children and adolescents’ television use habits have been identified, findings across studies have been inconsistent and there are many areas in which additional research is needed. The majority of the studies referenced above have been conducted with children and young adolescents. There is very little information about the family environment and its relationship with television use among older adolescents. Similarly, almost all of these studies have been conducted among either white and high SES samples, or international samples of children. Little is known about factors in the family environment that may be associated with television use among racial and ethnic minority adolescents, adolescents whose families have immigrated from outside the United States, and adolescents of low SES.

### 1.3.5. Soft drink intake and the family environment

The family environment has great potential to influence adolescents’ intake of soft drinks. Based on data from NHANES between 1999 and 2004, the home was adolescents’ most common source of soft drinks.\textsuperscript{49} Parents appear to be strong influencers on adolescents’ soft drink intake. Several studies have found a consistent relationship between parental consumption of soft drinks and adolescents’ consumption
habits.105-109 A recent qualitative study which included interviews of children and their parents who were participating in a dietary-based diabetes treatment program explored the relationship between child and parent’s consumption of soft drinks, and the effect of parents reducing their soft drink intake. Many of the parents reported that when they stopped drinking soft drinks, their children modeled their behavior and learned to enjoy water or 100% fruit juice as a replacement.110

There has been less research on the relationship between parental support and adolescents’ soft drink intake. One study of middle school students found that social support from significant others, including parents, was not associated with girls’ soft drink intake.111 However, another study of Dutch adolescents found that parenting practices that restrict soft drink intake, as well as adolescents’ perception that their parents want them to reduce their soft drink intake, was associated with lower intake.112

Availability of soft drinks in the home has been found to predict soft drink consumption by youth.107-109 Bere et al108 examined a number of environmental determinants of soft drink consumption among adolescents and found that having soft drinks accessible in the home and served at dinner frequently was associated with a five-fold increase in odds of consuming two or more soft drinks per day. Additionally, Hanson et al113 found that among participants in Project EAT, soft drink availability in the home was associated with lower consumption of dairy intake. These findings support those of other studies which have suggested that soft drinks often replace consumption of healthier drinks such as milk.114 However, a study of middle school students in Belgium found that after adjusting for psychosocial factors such as self-efficacy for healthy eating and barriers and benefits to healthy eating, soft drink home availability was not associated with adolescent girls’ soft drink intake. These findings suggest that personal factors, such as self-efficacy for healthy eating, may allow adolescents to overcome a family environment that may not be supportive of healthy dietary intake.111
The frequency and quality of family meals has been found to be associated with adolescents’ soft drink intake. Both Gillman et al\textsuperscript{115} and Neumark-Sztainer et al\textsuperscript{116} found that greater frequency of family meals was associated with lower intake of soft drinks. Additionally, the content of the family meal also seems to be associated with soft drink intake. Boutelle et al\textsuperscript{117} found that families that consumed fast food for family meals were more likely to have soft drinks available in their home. It is unknown whether the soft drinks were purchased along with the fast food family meal, or whether having fast food for family meals and having soft drinks available in the home are both markers of a family environment which does not support healthy dietary intake.

Several gaps still remain in exploring the relationships between the family environment and adolescents’ soft drink intake. The majority of research has been conducted among primarily white samples. Exploring soft drink intake among a racially diverse population is essential as soft drink preferences have been found to vary among adolescents of different racial groups.\textsuperscript{118,119} Further examination of the relationship between parental support and adolescents’ soft drink intake is also necessary since parental support has been found to be a consistent predictor of other weight-related behaviors of adolescents.

\subsection*{1.3.6. Fruit and vegetable intake and the family environment}

As with other weight-related behaviors, parental support and encouragement to consume fruits and vegetables as well as parents’ own dietary intake have been associated with adolescents’ fruit and vegetable consumption.\textsuperscript{9,120-122} Using longitudinal data from Project EAT, Larson et al\textsuperscript{123} extended previous cross-sectional results\textsuperscript{121} and found that adolescent-reported parental support for healthy eating was associated with increases in adolescents’ intake of fruits and vegetables as they moved into young adulthood. Additionally, the majority of studies examining the relationship between parental modeling of healthy eating and children and adolescents’ dietary intake have found a positive relationship.\textsuperscript{113,120,124,125} Longitudinal studies have provided evidence for the long-term influence that parental modeling of fruit and vegetable intake may have on adolescents’ dietary habits.\textsuperscript{79}
Availability of food both in the home and at family meals may be an important determinant of adolescents’ fruit and vegetable intake. While a number of studies have found a positive association between fruit and vegetable availability and youths’ dietary intake, a fair number of studies have found no relationship. In Project EAT, the frequency of vegetables served with dinner was longitudinally associated with adolescents’ intake of vegetables, but general home availability of fruits and vegetables, as reported by the parents was not associated with adolescents’ intake.

The inconsistent findings between home availability of fruits and vegetables and adolescents’ intake may be due to the relationships between home food availability and other predictors of fruit and vegetable intake. For example, Young et al found that home availability of fruits and vegetables moderated the relationship between parental modeling of intake and adolescents’ intake. When fruit and vegetable availability was high, parental modeling had a stronger effect on adolescents’ intake. Cullen et al also found that among younger children fruit and vegetable availability was only important among those children that expressed low preference for fruits and vegetables. Another interaction between home availability and taste preference was found among the cohort of adolescents participating in Project EAT. In this sample, even if adolescents’ taste preferences for fruits and vegetables were low, high home availability of fruits and vegetables was positively associated with fruit and vegetable intake. Meanwhile, if home availability was low, adolescents’ fruit and vegetable intake was low regardless of their taste preference.

Data have also emerged supporting the hypothesis that fruit and vegetable intake and intake of unhealthy foods such as potato chips and candy may be exchangeable within the diet. Therefore, providing an environment where fruits and vegetables were more available than unhealthy foods can tip the scales in favor of healthier dietary intake. Larson et al found among adolescents participating in Project EAT, availability of unhealthy food in the home was associated with decreased fruit and vegetable intake after
five years. Additional research is needed to confirm that the presence of unhealthy food in the home, and not merely the presence of healthy food, can influence adolescents’ fruit and vegetable intake.

Family meals are another opportunity for parents to affect their children’s fruit and vegetable intake. Adolescents whose families frequently eat meals together report eating more fruits and vegetables.\textsuperscript{115,116} Data also suggest a long-term influence of family meals on adolescents’ dietary intake, as adolescent girls who report eating family meals during high school report increased vegetable intake during the young adult years.\textsuperscript{128}

\textbf{1.3.7. Sociodemographic differences in adolescents’ weight-related family environments}

As noted previously, adolescent girls’ weight status and weight-related behaviors often vary by race, ethnicity and SES. Several studies have identified differences in individual components of the weight-related family environment by adolescents’ sociodemographic characteristics which may explain some of the disparities in weight and behavior among adolescents.\textsuperscript{129,130} For example, among adolescents participating in Project EAT I and II, several characteristics of the weight-related family environment were found to differ by adolescents’ race, ethnicity and SES. African American adolescents and adolescents of low SES were more likely to have a television in their bedroom compared to Asian American and high SES adolescents.\textsuperscript{102} Similarly, family meals were more frequently reported among adolescents who were Asian American and of high SES.\textsuperscript{116} Further research is needed to examine a wider variety of factors in the family environment which predict adolescents’ weight-related behaviors among racial and ethnic minority and low SES families.

Additionally, very little is known about the differences in weight and weight-related behaviors of adolescents born outside the United States, as well as how the family environments of these adolescents may differ. While data indicate that adolescents from certain ethnic minority groups are at greater risk for obesity compared to white adolescents,\textsuperscript{131} most studies do not differentiate between adolescents who themselves
immigrated to the United States versus those who may be second or third generation immigrants. A small number of studies have found that being born outside the United States is a protective factor against obesity and poor dietary intake.\textsuperscript{132-135} However, first generation immigrant adolescents have also been found to be more sedentary than US-born whites.\textsuperscript{133} More research is needed to understand both the weight-related behaviors of adolescents from various backgrounds and the risk and protective factors within these adolescents’ family environments.

Understanding the family environments of girls from various racial, ethnic, and cultural groups and socioeconomic positions can help guide intervention development as well as allow for the targeting of programs for families with these various characteristics. Obesity prevention interventions are likely to be more successful if their messages are targeted to parents and families of specific demographic groups. Additionally, identifying population sub-groups that provide a health-supporting environment for their children can help elucidate what resources other families may need to be able to develop a supportive family environment for their adolescents.

1.3.8. Importance of parent report of family environment

Only a small minority of the research that has examined the family environment and its relationship to adolescents’ weight and weight-related behaviors has utilized parent-reported data. In a review of environmental correlates of children and adolescents’ physical activity, only 7.5% of studies used parents’ report of the family environment while 83.6% of studies used the child’s report; the remaining used a composite of the two or data obtained from a third source.\textsuperscript{136} A number of studies that examined differences in parent and adolescent reports of the family environment have found that parents and adolescents perceive and report their weight-related family environment very differently.\textsuperscript{137-142} It has been suggested that some of the inconsistencies in the literature may be due to the use of varying sources of data.\textsuperscript{137}
A study by van Assema et al\textsuperscript{137} specifically examined differences in parents’ and young adolescents’ perceptions of the home food environment. There was considerable disagreement in the parents’ and adolescents’ responses ranging from 9\% to 56\% gross disagreement. Overall, parents reported greater availability of fruits, vegetables, and snacks in the home than their adolescent children reported. These findings may be tapping into the idea that parents have a more objective perception of the family environment since they are often the ones responsible for food purchases. Meanwhile adolescents may misperceive their home food availability because they don’t like to eat certain foods that are purchased or they are unaware of the full variety of food in their homes. The hypothesis that parents are more valid reporters of the family environment has also been suggested by others.\textsuperscript{113,127}

Several studies that have compared the relationships between adolescents’ and parents’ reports of the family environment and adolescents’ weight-related behaviors have found that the adolescents’ perception is more frequently associated with their own behavior.\textsuperscript{137,138,142} A stronger link between adolescents’ perceptions and their own behavior is to be expected as the lens through which an adolescent views the world strongly influences their behavior choices. This association may also be a result of the bias in adolescents’ reporting of their family food environment as adolescents may be more likely to report the presence of food in their home which they frequently eat. Additionally, this relationship may partially be an artifact of study measurement, as factors that influence the adolescents’ response to questions about their family environment may similarly influence their response to items which assess their behaviors. Despite the fact that adolescents’ perception of the home is more strongly linked to their behavior choices, parents’ perceptions of the family environment play a critical, yet less understood, role in influencing adolescents’ behavior. Family-based interventions have found that modifying parents’ behavior may be a critical mechanism through which to modify children’s weight-related behaviors, likely because parents play such a large role in what occurs within the family environment.\textsuperscript{143-145} Parents are often responsible for purchasing resources that may support adolescents’ healthy weight including food as well
as exercise and media equipment. Therefore, understanding their perspective of the quantity and quality of these resources in the home can guide programs that aim to modify the presence of these resources. Additionally, parents are likely the best reporters of their own behavior and provide a valid assessment of what behaviors they model for their children. Finally, understanding parents’ perceptions of their interactions with their adolescent is important. Parents may not know the best ways to support their adolescent’s healthy behaviors; therefore, research that assesses how parents choose to support their children and identifies which types of parental support are helpful to adolescents is an essential component to developing obesity prevention interventions which target families.

1.4. Obesity prevention and the family environment

As existing research suggests that families contribute to children and adolescents’ physical activity, sedentary behavior, and dietary intake habits, it has been hypothesized that obesity prevention programs may be more successful among youth whose parents encourage, support, and model healthful behavior and provide resources to help their children make healthier choices. Schools are believed to be an ideal venue for obesity prevention efforts because they allow for the inclusion of all youth, not just youth who have access to clinic-based services. Unfortunately, few school-based interventions for adolescents have been able to modify participants’ weight status, and it is unknown whether lack of support from students’ families has contributed to the poor outcomes observed. Additionally, school-based interventions that have aimed to promote a supportive family environment have not been consistently more effective than interventions that did not attempt to work with families and many studies have documented the challenges in engaging parents of adolescents in school-based health promotion programming. These factors contribute to the uncertainty of the role of the family in adolescents’ efforts to improve their physical activity, dietary intake, and weight status. Research to determine whether specific family environment characteristics contribute to better outcomes among adolescents participating in school-based obesity prevention programs can address questions regarding importance of a supportive family environment to the success of school-based interventions and provide evidence for the
need to devote resources to intervention activities that aim to promote change in participants’ family environments.

1.4.1. Family-based interventions
The success of many family-based obesity treatment programs provides support for the important role that the family can play in children and adolescents’ weight loss efforts. In an intervention with obese children between the ages of 6 and 12, Epstein et al\textsuperscript{146} found that children in the intervention arm which targeted both parents and children to lose weight were more successful than children in the intervention arm in which only children were targeted to lose weight. The effect of this intervention remained after five years.

Golan et al\textsuperscript{143,144,147} have conducted several family-based obesity treatment studies and have found that targeting parents for weight loss was a successful method to reach children. Golan and colleagues conducted two obesity prevention studies for grade school and middle-school aged children. In the first study, two intervention arms were compared, one in which only parents were targeted for weight-related behavior change, and the other in which only children were targeted for behavior change. In the second study, a parent-only intervention arm was compared to an intervention arm in which parents and children were together targeted for weight-related behavior change. In both studies, the groups of children who were in the parent-only arm saw greater reductions in the prevalence of overweight at follow up. The authors hypothesized that this was because changes to the family environment via parents are necessary for long-term weight maintenance among children.

Additional information about the role of the family in the success of obesity treatment programs comes from studies that examine whether there were differences in the family environments of youth who lost weight while participating in a clinical treatment program as compared to those adolescents who were not successful. The handful of studies which have conducted this type of analysis have produced mixed results. For example, some studies found that children with family members who are obese and
whose mothers report depressive symptomology have less success in obesity treatment programs. Other studies found that these and other familial factors such as families’ SES did not influence youths’ weight loss during treatment. Heinberg et al also found that level of parent engagement in the intervention was associated with successful weight loss among children in an obesity treatment program, but it is unknown if the effect of engagement was mediated by improvements in the family environment or some other mechanism. Additionally, the type of parent who self-selects to participate in their child’s obesity treatment may have other qualities that contributed to their child’s weight loss.

While family-based obesity treatment interventions can inform obesity prevention efforts, the parents that participate in treatment programs may be quite different than parents whose children participate in obesity prevention interventions. Because of this, creating parental components to school and community-based interventions that mimic family-based treatment interventions may not be feasible or effective. Family-based obesity treatment interventions focus on weight loss and target obese adolescents. In comparison, primary prevention efforts aim to improve behavior among the general population of adolescents or targeted groups of youth such as girls, and work to prevent excessive weight gain over time. Due to these differences, parents of obese adolescents who enroll in family-based interventions are likely motivated to assist their children in modifying their weight-related behaviors, and many may be interested in losing weight themselves. In comparison, obesity prevention interventions are more likely to tap into a population of students from very diverse family environments. Some parents may be motivated to help their child achieve a healthy weight, while others may not be willing or able to actively participate in an obesity prevention intervention with their child. This wide variety of parental support, or lack thereof, is one reason why primary prevention interventions, especially those that take place in schools, are so important. School-based interventions have the potential to reach all adolescents, regardless of their parents’ interest or ability in supporting them or participating in behavior modification programs.
1.4.2. School-based obesity prevention interventions

Schools are by far the most common site of obesity prevention interventions for adolescents.\textsuperscript{152,153} Schools are an ideal setting for interventions because they offer access to adolescents, particularly adolescents from families of low SES who might not have access to clinic-based programming. Schools have the facilities for either classroom or physical activity-based lessons, provide ample opportunities for policy interventions such as modifying cafeteria or vending machine food options, and employ personnel trained in education who are able to implement obesity prevention curricula. However, few school-based interventions have been achieved their goal of improving adolescents’ weight status, and many have had only partial success at modifying participants’ dietary intake, physical activity, and/or sedentary behavior.\textsuperscript{154-158}

Both theory and research suggest that school-based interventions work to ensure that participants’ families are providing them a home environment supportive of physical activity and healthful dietary intake.\textsuperscript{159,160} A common approach to addressing this concern is developing and implementing a family-oriented intervention component which complements the obesity-prevention activities occurring at school. Despite the proliferation of intervention components for families, there are little data available to confirm that parental involvement or the presence of a supportive family environment contributes to better intervention outcomes, or even that families are receptive to participating in such programs and increasing the support and/or resources that they provide their adolescents.

The Child and Adolescent Trial for Cardiovascular Health (CATCH) intervention, which aimed to promote cardiovascular health among elementary school children, is one of the only studies to provide experimental evidence of the contribution of a family component to a school-based intervention. CATCH was designed to compare the results from two intervention arms, one that solely had a school-based intervention, and one that provided the same school-based intervention and a family component. While children in the school plus family intervention arm reported greater gains in dietary knowledge than those in the
school-only arm, and there was a relationship between parent participation and parents’
reinforcement of food choice and support for physical activity, there were not any
significant differences in children’s behavior nor children’s physiological measurements
between the two arms.\textsuperscript{161}

In a meta-analysis of obesity prevention programs for children and adolescents, the
majority (84\%) of which were school-based interventions, Stice et al\textsuperscript{162} found that
providing methods for parental involvement in the intervention was not associated with
greater success of the intervention. The authors first examined four levels of parental
involvement ranging from none to attempted modification of parents’ weight-related
behaviors. However, because so few studies offered intensive parental involvement
strategies, the authors chose to dichotomize the parental involvement variable into no
parental involvement or psychosocial materials only versus parental attendance in
sessions or parental behavior change. No significant effect of parental involvement was
seen when using either the four category or dichotomous parental involvement variable.
The lack of effect may be due to great heterogeneity of activities within the categories.
Studies were also considered to have these parental involvement components if such
components were included in the study design. The actual amount of parent involvement
in the interventions was not considered in this analysis. Another meta-analysis by
O’Connor et al\textsuperscript{163} similarly aimed to examine the utility of a parental involvement
component to physical activity promotion interventions. The authors concluded that
because of the high amount of heterogeneity both in the types of parental outreach
activities conducted and the study designs used that there was insufficient evidence to
determine that the addition of a parent component contributed to better intervention
outcomes.

Katz et al\textsuperscript{164} recently published a meta-analysis examining the success of various
strategies used by school-based nutrition and physical activity interventions. In this
analysis, parental and family involvement in the intervention was associated with a slight
improvement in weight-reduction efforts by youth. However, the effect was minimal and
only two of the seven interventions examined targeted adolescents. As the family environment might be more influential on children’s behavior change than adolescents’, the findings of this analysis have limited applicability to an adolescent population. Additionally, as in the Stice et al meta-analysis, parental and family involvement was determined solely by the design of the intervention. No process data regarding actual parental involvement or modifications of the family environment attributable to the intervention were assessed.

Several reasons have been suggested as to why studies with family components have not produced better results than those without if a supportive family environment is a critical component of intervention success. For example, it may be that studies have not provided an intensive enough intervention to modify the family environment.\textsuperscript{154,165} Common methods of parent involvement in school-based interventions require minimal effort by parents and include homework assignments that require or suggest parent involvement, sending newsletters or postcards to the students’ homes, or hosting parent activity nights at the school.\textsuperscript{156,157,161,166,167} Additionally, parental participation in school-based interventions has been lower than anticipated. Therefore, even if the family component was intensive enough to produce change in the family environment, parents did not receive a strong enough dose of the intervention to promote change.\textsuperscript{167,168} Several studies have documented that many parents are unwilling or unable to participate in intervention activities and/or make significant modifications to their family environment. Families, particularly those of lower SES,\textsuperscript{169,170} often find it difficult to participate in school-based interventions as they have limited time and financial resources. Parents may have multiple jobs and need to work or take care of children in the evenings and weekends, which is when activities are often scheduled at the school. In one school-based weight loss intervention, none of the parents of students from the urban schools attended the parent sessions offered as part of the intervention. Many cited competing responsibilities as the reason why they could not attend.\textsuperscript{171} Similarly, Gimme 5, a fruit and vegetable promotion intervention which contained a parental outreach component, reported that attendance at parent-teacher meetings where the intervention was discussed was poor.\textsuperscript{172}
Research from the field of prevention of alcohol, tobacco, and other drug (ATOD) use has identified similar barriers to parental participation as what has been observed in the obesity prevention literature. Specifically, Beatty and Cross\textsuperscript{173} surveyed 200 parents of middle school-aged children to determine why ATOD use prevention interventions have had such little success engaging parents. In addition to the time, financial, and childcare concerns cited in the obesity prevention literature, parents reported feeling that intervention activities were boring and too time consuming, that there were too many materials to read, that they didn’t feel the topic was a priority for their children, that alcohol and tobacco use was a private matter, that schools can be threatening locations, and that they feared being judged or stigmatized. Because of these barriers to parental participation, which may be more likely to exist for the families of adolescents who are most in need of support for physical activity and healthful dietary intake, it is essential to understand whether school-based interventions have the ability to help increase physical activity and healthy dietary intake and promote a healthy weight status among adolescents regardless of their parents’ ability to provide a supportive family environment.

1.4.3. \textit{Relationships between the family environment and school-based interventions} 
Taking into account the lack of success of many obesity prevention interventions with parent components, an inability of many school-based interventions to produce an intensive enough intervention to promote change among families, and the economic and social barriers to parents’ participation in these programs, it is essential to understand to whether school-based interventions would see greater success if they were able to ensure that families were engaged in the intervention and providing support for youths’ behavior change efforts.\textsuperscript{158,174,175} Examining the contribution of parents and the family environment to youths’ behavior and weight change in school-based programs can provide further direction to obesity prevention programming including whether specific characteristics of the family environment contribute to children and adolescents’ success
in school-based programs and whether school-based interventions can be effective at promoting change among girls who come from unsupportive families.

The Kiel Obesity Prevention Study (KOPS) was an intervention aimed at first graders with the goal of improving cardiovascular risk factors and reducing the prevalence and incidence of overweight. KOPS was a school-based intervention with family outreach activities offered to those families that were interested in participating. At the end of the first year of the intervention, improvement in body composition was observed among both children who received the school-based intervention only and those who participated in the family activities. No data have been published on the long-term outcomes observed among students who participated in the family activities, after 4 years there was no overall effect of the intervention on children’s BMI among those who only participated in the school-based intervention. However, children from high SES families had a significantly decreased risk of being overweight after four years, while children from low and middle SES families did not have any decrease in overweight status. SES was assessed by asking parents the highest educational level attained by either parent. Low SES was defined as having less than 9 years of school, middle SES was defined as having 10 years of school, and high SES was defined as having 12 or greater years of school. Additionally, children of normal-weight mothers had a marginally significant decrease in BMI after 4 years, while children with overweight mothers did not benefit from the intervention.

While this series of studies only examined the relationships between family SES and maternal weight status on children’s study outcomes, these findings provide evidence for the differential effect that family characteristics can have on the outcomes of a school-based intervention. The pattern of associations suggests that similar obesity prevention programs may achieve better outcomes if they worked with children of normal weight mothers and from higher SES families, or if the intervention was modified to be more appropriate for low and middle SES students and students with overweight family members. This modification may need to include family outreach to address dynamics of
the family environment that may be inhibiting the children’s improvement in weight. However, the relationships between the family and children’s outcomes observed in KOPS might not be true among an adolescent cohort, who might be more able to modify their weight-related behaviors independent of their family environment. Additionally, examination of other family environment factors known to be related to adolescents’ weight status and behaviors, such as parental behaviors and physical resources in the home, could further illuminate whether there is a relationship between the family environment and students’ success in school-based interventions.

To our knowledge, only one study has examined familial predictors of adolescents behavior change during the course of a school-based intervention. The intervention, Krachtvoer, was conducted in 18 Dutch vocational schools, whose student populations are often of lower SES. The goal of the intervention was to increase adolescents’ fruit and fruit juice intake, decrease the consumption of high-fat snacks, and increase breakfast frequency and quality. After the 3-month intervention, students in the intervention schools reported consuming significantly more fruit and fruit juice than students in the control condition. No differences were observed in students high-fat snack or breakfast intake. A variety of family environment factors were also reported by the adolescents’ parents including their parenting style, food purchasing habits, family rules regarding fruit and snack consumption, and home fruit and snack availability. Analyses revealed that there were no associations between any of the family environment factors and change in fruit consumption and snack consumption among adolescents in the intervention condition. The authors concluded that the lack of associations between the family environment and adolescents’ behavior change indicated that there were no subgroups of adolescents that profited less from the intervention due to their family environment, therefore it may not be necessarily to involve families in interventions and attempt to improve the family environment in order to affect behavior change among adolescents.
In light of the small number of studies examining the impact of the family environment on the outcomes of school-based obesity prevention programs, additional research is needed in this area. If specific factors in the family environments of adolescents contribute to better intervention outcomes, interventions may need to develop novel methods to promote these qualities in a variety of family types. Additionally, as schools are an ideal venue for accessing youth whose parents do not provide a supportive family environment, interventions may need to find ways to identify and engage adolescents from less supportive families. However, if adolescents can succeed in school-based obesity prevention interventions regardless of their family environment, or if students from unsupportive family environments thrive in school-based interventions, parent outreach activities may not be needed and resources can be devoted to intervention components that have greater potential to promote behavior change.

1.5. Conclusions

Both theory and empirical research have highlighted the many connections between adolescent girls’ family environments and their weight and weight-related behaviors. However, unaddressed questions and inconsistencies in the literature remain, especially with regard to the family environments of girls from racially and ethnically diverse backgrounds, girls who immigrated to the United States, and girls from families of low SES. Additionally, while family-based obesity treatment programs have provided evidence that working with parents to improve the family environment can reduce adolescents’ prevalence and incidence of obesity, conducting resource intensive family-based interventions is not feasible on a population level. School-based obesity prevention interventions have the greatest potential to affect adolescents from a wide variety of circumstances. It has been hypothesized that engaging parents and motivating them to improve the family environment will contribute to greater efficacy of school-based obesity prevention interventions for adolescents but there are little data to support this hypothesis. Research is needed to determine if adolescents can improve their physical activity, sedentary behavior, dietary intake and weight independent of their family environments, or if ensuring a supportive family environment and finding ways to help
adolescents from non-supportive families are critical components to effective school-based obesity prevention interventions.

The objective of this study is to understand the weight-related family environments of a racially, ethnically, and socioeconomically diverse cohort of adolescent girls and to assess the relationship between the girls’ family environment and their success in a school-based intervention aimed at addressing obesity and other weight-related problems. These objectives will be achieved by the pursuit of the following three aims:

**Specific Aim 1**: Explore sociodemographic differences in the weight-related family environment of the racially, ethnically, and socioeconomically diverse population of adolescent girls participating in New Moves, a school-based physical activity and nutrition intervention.

**Hypotheses for Specific Aim 1**: Families of high SES and girls of white race will provide more modeling of and support for physical activity and healthy dietary intake, and less modeling of and support for television watching than families of low SES and African American/black and Hispanic girls. High SES families will also have greater availability of physical activity resources and healthy food. The weight-related family environments of girls born outside the United States will be more supportive of healthy dietary intake but will provide less support for physical activity, as compared to the families of girls born in the United States.

**Specific Aim 2**: Test cross-sectional baseline associations between girls’ weight-related family environment and girls’ BMI, percent body fat, and behaviors including total PA, MVPA, TV use, soft drink intake, and FV intake, among all New Moves participants.

**Hypothesis for Specific Aim 2**: Elements of a supportive weight-related family environment including parental modeling and support for physical activity, healthy dietary intake, and limiting sedentary activity, along with the presence of physical
resources in the home that support healthy behaviors, will be positively associated with girls’ physical activity and fruit and vegetable intake, and negatively associated with time spent watching television and soft drink intake.

**Specific Aim 3:**

1) Among girls participating in the intervention condition of New Moves, test whether the baseline weight-related family environment is associated with successful change in girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat, over the course of the intervention.

2) Conduct an exploratory analysis using data from girls both in the intervention and control conditions of New Moves to assess whether girls’ baseline weight-related family environment modifies the effect of the New Moves intervention on girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat.

**Hypothesis for Specific Aim 3:** Girls whose parents report a more supportive weight-related family environment will have greater improvements in total PA, MVPA, and FV intake, and greater decreases in soft drink intake and TV use, compared to girls whose parents report an unsupportive weight-related family environment.
Chapter 2: Methods and Analysis Plan

The objective of this dissertation is to understand the weight-related family environment among the sociodemographically diverse cohort of sedentary adolescent girls who participated in New Moves, a school-based physical activity and nutrition intervention to address obesity and other weight-related problems, and to assess the relationship between the girls’ family environment and their successful behavior and weight change in the New Moves intervention.

2.1. Study design and timeline

The New Moves Parent Project (NMPP) is a longitudinal cohort study of parents and their adolescent daughters who are concurrently participating in New Moves. New Moves is a school-based group randomized trial for adolescent girls (PI: D. Neumark-Sztainer). The NMPP was designed and implemented as an ancillary study to New Moves. A total of twelve schools participated in New Moves with six offering the active intervention and six serving as comparison schools. New Moves was implemented in two phases with three intervention and three comparison schools participating during the 2007-2008 school year (Phase I), and three intervention and three comparison schools participating during the 2008-2009 school year (Phase II). Baseline data were collected from the parents and the girls either in the spring of the previous school year or during the beginning of the school year during which they participated in New Moves. After the trimester/semester long New Moves PE class, post-class data were collected from the girls, and at the end of the school year, approximately 9 to 12 months after baseline data collection, follow-up data were collected from the girls. At this time, follow-up data were also collected from the parents who completed a baseline survey. The analyses outlined in this proposal will utilize data from the parents collected at baseline and data from the girls collected during the baseline and follow-up evaluation periods.
Table 2-1: Study timeline with emphasis on New Moves Parent Project

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<td>Baseline evaluation period</td>
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<td><strong>Phase II</strong></td>
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<tr>
<td>Baseline evaluation period</td>
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<tr>
<td>Follow-up evaluation period</td>
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<td>Data entry and cleaning</td>
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<td>Data analysis and interpretation</td>
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</tr>
</tbody>
</table>

Abbreviation: S/F = Summer/Fall, W/S = Winter/Spring

2.2. Recruitment

2.2.1. Girls’ recruitment

Girls entering the 9th through 12th grades at each of the twelve participating high schools were recruited into New Moves during the spring and fall prior to study implementation. The New Moves class was advertised to be a class suited for girls who are currently inactive, not comfortable with being physically active, or who do not enjoy team sports. Additionally, the class was advertised as being ideal for girls who have a desire to be healthier and learn about new ways to get fit that don’t involve competition or advanced skills. Girls who were already very active such as those who play on varsity sports teams, and girls who were very underweight or had an eating disorder were not targeted for recruitment. Girls who participated in New Moves received physical education credits that fulfilled their physical education graduation requirements. While the recruitment
process varied slightly by school due to the differing needs of each school, recruitment methods included: 1) having school staff such as physical education teachers and guidance counselors distribute informational materials to girls, 2) placing recruitment posters in the girls’ locker room and around school, 3) placing a description of the New Moves class in the school’s course catalog, 4) having New Moves study staff conduct presentations about New Moves at the schools, and 5) mailing study materials to girls identified by school staff. To enroll, girls completed a screening tool to assess their current stage of change for physical activity, their self-reported height and weight, and their frequency of engaging in disordered eating behaviors. Highest priority was given to sedentary girls, identified as those who were not currently engaging in regular physical activity based on their response to the physical activity stage of change question. Four girls were excluded because of high levels of physical activity (one hour or more/day). No girls were excluded because of eating disorder behaviors (vomiting or laxative use weekly or more). Once deemed eligible for New Moves, girls under 18 years of age completed an assent form, and their parent completed a consent form and returned it to the school. A small number of girls who were 18 years or older completed a consent form for themselves. Consent forms were provided in Spanish and Hmong due to the diverse ethnic population in the participating schools. Girls’ addresses and home phone numbers were obtained via both the consent and assent forms.

2.2.2. Parents’ recruitment

After a girl’s consent and assent forms were returned, a mailing addressed to her parents was sent to the girl’s home address. The mailing contained 1) a letter inviting a parent of the girl to enroll in the NMPP, 2) a form which parents could complete and return if they wanted to refuse further contact from the NMPP, 3) consent information for the NMPP, 4) a baseline survey, and 5) a stamped envelope to return the baseline survey and/or refusal form to the University of Minnesota. Parents were mailed this packet up to three times. If, after repeated mailings, the parent either did not complete and return the baseline survey or return the refusal form, at least one phone call was made to their home. Study staff conducted the phone calls during the early evening hours to increase the
likelihood that a parent would be home. If a parent was home when the call was made, the parent was encouraged to complete the survey over the phone. If a parent was home but unable to complete the survey at that time, the parent was asked if another time would be better, and was reminded that they could complete and return the paper survey. If no parent was home, a message was left with a reminder for a parent to complete the paper survey and a phone number was provided so a parent could call to complete the survey over the phone or be re-sent a survey via mail. During Phase II, selected phone calls to homes where Spanish was the primary language of the parents were made by a study staff member who is a fluent Spanish speaker. No preference for a specific parent (i.e. mother) was stated as to allow any parent motivated to participate to do so. However based on previous survey research with parents of adolescents we expected primarily mothers would participate.

2.3. Description of the study population
Of the 356 girls who participated in New Moves, 253 (71.1%) had a parent enroll in the NMPP. Of the 253 parent/daughter dyads who were enrolled in the study and provided data at baseline, 248 of the girls completed follow-up data collection. Table 2-2 compares the sociodemographic characteristics of girls whose parents participated in the NMPP versus those whose did not. Parents who participated were more likely to have daughters of white race and/or born in the United States, and were more likely to have higher educational attainment. Table 2-3 contains sociodemographic information for girls and their parents who participated in the New Moves Parent. Mothers were the most frequent participants as 79% of respondents were mothers. The remaining parents were fathers, another guardian/relative, a stepmother, or a stepfather. Approximately equal percentages of girls were white, black/African American, and Asian, 10.7% of girls were Hispanic or Latino, 2.8% were American Indian, and 7.5% were of mixed or other race. Among the girls who identified as Asian, 86.7% were Hmong. Parents’ racial/ethnic identities were similar with a slightly larger percentage of parents reporting that they were white, 23.1% black/African American, 22.3% Asian, 10.0% Hispanic or Latino, 2.0% American Indian, 0.4% Hawaiian/Pacific Islander, and 6.0% of mixed or an other race. Parents’
educational attainment was fairly evenly distributed across categories with almost 50% having not completed high school or completed high school but having no further formal education. Three-quarters of girls were born in the United States, and approximately half were overweight or obese.
Table 2-2: Sociodemographic differences among parent survey completers vs. non-completers

<table>
<thead>
<tr>
<th>Completed Parent Survey</th>
<th>No Parent Survey</th>
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<tr>
<td><strong>n (%)</strong></td>
<td><strong>n (%)</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>253 (71.1)</td>
</tr>
<tr>
<td></td>
<td>103 (28.9)</td>
</tr>
<tr>
<td><strong>Girls’ Race</strong></td>
<td></td>
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<tr>
<td>White</td>
<td>74 (29.6)</td>
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<tr>
<td></td>
<td>13 (12.6)</td>
</tr>
<tr>
<td>African American/Black</td>
<td>65 (25.7)</td>
</tr>
<tr>
<td></td>
<td>36 (34.0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>27 (10.7)</td>
</tr>
<tr>
<td></td>
<td>24 (23.3)</td>
</tr>
<tr>
<td>Asian</td>
<td>61 (24.1)</td>
</tr>
<tr>
<td></td>
<td>21 (20.4)</td>
</tr>
<tr>
<td>American Indian</td>
<td>7 (2.8)</td>
</tr>
<tr>
<td></td>
<td>2 (1.9)</td>
</tr>
<tr>
<td>Mixed/Other</td>
<td>19 (7.5)</td>
</tr>
<tr>
<td></td>
<td>7 (6.8)</td>
</tr>
<tr>
<td><strong>p=.0017</strong></td>
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</tr>
<tr>
<td><strong>Parent Education</strong></td>
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</tr>
<tr>
<td>(girls’ report)</td>
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</tr>
<tr>
<td>Did not finish high school</td>
<td>33 (16.1)</td>
</tr>
<tr>
<td></td>
<td>27 (34.2)</td>
</tr>
<tr>
<td>Finished HS/GED</td>
<td>51 (24.9)</td>
</tr>
<tr>
<td></td>
<td>20 (25.3)</td>
</tr>
<tr>
<td>Some college/training</td>
<td>48 (23.4)</td>
</tr>
<tr>
<td></td>
<td>19 (24.1)</td>
</tr>
<tr>
<td>College/University</td>
<td>49 (23.9)</td>
</tr>
<tr>
<td></td>
<td>12 (15.2)</td>
</tr>
<tr>
<td>Beyond 4 year degree</td>
<td>24 (11.7)</td>
</tr>
<tr>
<td></td>
<td>1 (1.3)</td>
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<tr>
<td><strong>p=.0013</strong></td>
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<tr>
<td><strong>Girl born in United States</strong></td>
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<tr>
<td>Yes</td>
<td>194 (76.7)</td>
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<tr>
<td></td>
<td>62 (60.2)</td>
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<tr>
<td>No</td>
<td>59 (23.3)</td>
</tr>
<tr>
<td></td>
<td>41 (39.8)</td>
</tr>
<tr>
<td><strong>p=.0017</strong></td>
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Table 2-3: Sociodemographic characteristics of the New Moves Parent Project sample

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<th></th>
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<tbody>
<tr>
<td>NMPP parent/daughter dyads</td>
<td>253</td>
<td>71.1</td>
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**Parent Type**

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<thead>
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<th>Type</th>
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<tbody>
<tr>
<td>Mother</td>
<td>199</td>
<td>79.3</td>
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<tr>
<td>Stepmother</td>
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<td>2.0</td>
</tr>
<tr>
<td>Other female guardian</td>
<td>6</td>
<td>2.4</td>
</tr>
<tr>
<td>Father</td>
<td>24</td>
<td>9.6</td>
</tr>
<tr>
<td>Stepfather</td>
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<td>0.4</td>
</tr>
<tr>
<td>Other male guardian</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>Other guardian/relative</td>
<td>13</td>
<td>5.2</td>
</tr>
</tbody>
</table>

**Girls’ Race/Ethnicity**

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>74</td>
<td>29.3</td>
</tr>
<tr>
<td>African American/Black</td>
<td>65</td>
<td>25.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>27</td>
<td>10.7</td>
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<tr>
<td>Asian</td>
<td>61</td>
<td>24.1</td>
</tr>
<tr>
<td>American Indian</td>
<td>7</td>
<td>2.8</td>
</tr>
<tr>
<td>Mixed/Other</td>
<td>19</td>
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**Parents’ Race/Ethnicity**

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<thead>
<tr>
<th>Race/Ethnicity</th>
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<tbody>
<tr>
<td>White</td>
<td>91</td>
<td>36.3</td>
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<tr>
<td>Black/African American</td>
<td>58</td>
<td>23.1</td>
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<tr>
<td>Hispanic or Latino</td>
<td>25</td>
<td>10.0</td>
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<td>Asian</td>
<td>56</td>
<td>22.3</td>
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<tr>
<td>Hawaiian/Pacific Islander</td>
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<td>0.4</td>
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<td>American Indian</td>
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**Parents’ Education Level**

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<td>Did not finish high school</td>
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<td>27.6</td>
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<td>Finished HS/GED</td>
<td>52</td>
<td>20.8</td>
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<tr>
<td>Some college/training</td>
<td>66</td>
<td>26.4</td>
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<tr>
<td>College/University</td>
<td>47</td>
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<tr>
<td>Beyond 4 year degree</td>
<td>16</td>
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**US-born Girls**

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<td>52.6</td>
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<tr>
<td>Overweight</td>
<td>44</td>
<td>17.4</td>
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<tr>
<td>Obese</td>
<td>76</td>
<td>30.0</td>
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</tbody>
</table>

1 The percentage of parents of all girls participating in New Moves that enrolled in the New Moves Parent Project

2.4. Description of the New Moves intervention

New Moves is a school-based physical activity and nutrition intervention for high school-aged girls. New Moves aims to decrease participants’ BMI and percent body fat via eight behavioral objectives: 1) aim to be physically active at least one hour each day, 2) reduce
leisure “screen time” to not more than one hour a day, 3) avoid unhealthy weight loss practices, 4) choose fruits and vegetables as snacks, 5) choose water or low-calorie drinks instead of soda pop and sweetened beverages, 6) eat breakfast every day, 7) pay attention to portion size and to your body’s signs of hunger and fullness and, 8) focus on your positive traits.\textsuperscript{182}

The intervention was delivered primarily through a girls-only physical education class. During class time, girls participated in physical activity lessons that focused on life-long activity within a non-competitive environment, nutrition education sessions that stressed a non-dieting approach to healthy weight management, and social support sessions that focused on enhancing self-esteem and body image. The physical education components were delivered by each school’s physical education teacher, and the nutrition education and social support sessions were taught by New Moves intervention staff. Guest instructors from the community were also invited to lead many of the physical education sessions throughout the semester to teach girls fun and non-competitive physical activities such as kickboxing, belly dancing, and hip hop dancing. Girls from schools which served as comparison schools participated in an all-girls physical education class but did not receive the New Moves curriculum or additional intervention components.

Additional components of New Moves designed to complement the skills gained during the classroom components included individual counseling sessions with a New Moves coach using motivational interviewing techniques, maintenance sessions where a healthy lunch was provided and behavioral messages reinforced after the completion of the physical education class, and parental outreach activities.

New Moves was designed to have a minimal parental component. The parental outreach activities included sending postcards to the parents of New Moves participants and hosting an annual event for New Moves participants and their families. The postcards highlighted New Moves behavioral messages and included healthy recipes, local resources for physical activity, and a “table talk” question to help parents initiate
conversations with their daughters. The postcards were sent to parents six times during the school year corresponding to the lessons taught in the classroom. The annual New Moves family event provided an opportunity for girls and their families to participate in fun activities such as a mini yoga lesson, a relaxing chair massage, and a healthy lunch. New Moves staff were available during the event to meet with parents to answer any questions about New Moves. During Phase I, New Moves study staff attended open house events and parent-teacher conferences at some of the intervention schools. This provided parents another opportunity to talk with study staff about New Moves.

2.5. Data collection procedures
2.5.1. Girls’ data
For data collection during the baseline and follow-up evaluation periods, girls were transported to the General Clinical Research Center (GCRC) on the University of Minnesota campus. The girls were brought to the GCRC during the school day in groups of approximately 6 to 12. As a group, girls received instructions on how to complete the survey (Appendix B) and the physical activity recall instrument (3DPAR) (Appendix C) by a trained New Moves staff member. The New Moves staff member remained in the room while the girls completed the survey and 3DPAR, and was available to answer questions. While at the GCRC, the girls were individually selected to complete a single 24-hour dietary recall and have their height measured by a portable stadiometer, and weight and body fat measured by a Tanita body composition analyzer. Girls also had a dual-energy X-ray absorptiometry (DXA) scan taken of their body to assess body composition. Prior to the DXA scan, girls were asked to provide a urine sample with which a pregnancy test was conducted. If the girl tested positive for pregnancy or refused to provide a urine sample, she was deemed ineligible to participate in the DXA scan. The 24-hour recall, height, and weight and body fat measurements via Tanita were all conducted by trained New Moves staff members. The nursing staff of the GCRC conducted the DXA scan. A small number of girls were not able to come to the GCRC either at baseline or follow-up, due to either not wanting to leave school during the day or
switching schools before the follow-up evaluation period. These girls completed the survey, 3DPAR and had their height, weight and Tanita-measured body fat assessed by a New Moves staff member at a location that was convenient for the girl. Girls received a $25 gift card for their participation during each of the evaluation periods and an additional $25 gift card for their completion of all three evaluation periods.

2.5.2. Parents’ Data
As described in the Parents’ Recruitment section, the majority of parents completed a written survey that was mailed to them. A small percentage of parents completed the survey over the phone. After parents completed the survey they were sent a gift card to Target valued either $10 or $20. A more valuable gift card was offered as an incentive to parents who did not respond to the first two enrollment mailings.

2.6. Contributions of the author
Katherine Bauer has been a member of the New Moves study team since September of 2005. She has assisted with survey development, development of intervention materials, and data collection, management and analysis. Katherine is also the Principal Investigator for the New Moves Parent Project. She obtained a J.B. Hawley Student Research Award to fund the NMPP and was responsible for study conceptualization and design, development and pilot testing of the parent survey, data collection with the parents, overseeing data entry and management, and data analysis.

2.7. Description of measures
2.7.1. Independent variables
Surveys to be completed by parents were designed to measure the theoretically-based components of the weight-related family environment specific to each of the behavioral outcomes (total PA, MVPA, television use, and soft drink and fruit and vegetable intake). These components include the physical environment/resources available in the home and the social environment, which is comprised of support/encouragement for the activity and parental modeling of the activity. Specific items measuring these components, along with
original sources and psychometric information, when available, are described in Table 2-5. Appendix D contains the complete parent survey.

Survey items were selected based on their psychometric properties when used previously in similar populations, as well as their applicability to the study population. All survey items were reviewed by New Moves study staff members. Additionally, 10 parents of adolescents participated in pilot testing of the survey to assess applicability and comprehension of the items. Based on feedback from New Moves study staff and pilot testing, some items were modified to increase ease of understanding. One item asking about the presence of a television in the girls’ bedroom was included on the girls’ survey. It was determined that this item did not need to be included on the parent survey also as girls’ responses to this item are likely highly valid.
Table 2-4: Independent variables to assess the weight-related family environment

<table>
<thead>
<tr>
<th>Family Environment Variables</th>
<th>Question (psychometrics included when available)</th>
</tr>
</thead>
</table>
| Physical Activity Resources  | Please indicate which items you have in your home, yard, or apartment complex that are available to your daughter:  
  a. stationary aerobic equipment (bicycle, treadmill, etc.)  
  b. bicycle  
  c. dog to walk  
  d. weight lifting equipment (free weights, Nautilus, etc.)  
  e. exercise workout videotapes or DVDs  
  f. in-line, roller, or ice skates  
  g. sports equipment (balls, racquets, jump ropes, hula hoops)  
  h. skis or snowboard  
  i. stretching or yoga equipment  
  Response options included “Yes” and “No” |
| Parental modeling of physical activity | In the past week (7 days), how many HOURS did you spend doing the following activities?  
  a. Strenuous exercise (heart beats rapidly) Examples: biking fast, aerobic dancing, running, jogging, swimming laps, rollerblading, skating, tennis, cross-country skiing, soccer, basketball  
  b. Moderate exercise (not exhausting) Examples: walking quickly, dancing, baseball/softball, gymnastics, easy bicycling, volleyball, strength training  
  c. Mild exercise (little effort) Examples: walking slowly, bowling, yoga, stretching muscles, household chores  
  Ten response options ranged from “None” to “7 or more hours” (r=.48-.94) |
| Family support for physical activity | During a typical week, how often have you or another member of your household:  
  a. encouraged your daughter to do physical activities or play sports?  
  b. done a physical activity or played sports with your daughter?  
  d. provided transportation to a place where your daughter can do physical activities or play sports?  
  e. watched your daughter participate in physical activities or sports?  
  g. told your daughter that she was doing well in physical activities or sports?  
  Five response options ranged from “Never” to “Every day” (α = .78, r=.81) |
<table>
<thead>
<tr>
<th>Television Use</th>
</tr>
</thead>
</table>
| **Media resources** | Please indicate which of the following you have in your home:
| a. Pay television (cable, satellite, etc.)
| b. Video/DVD player
| c. Electronic game (Nintendo, Playstation, etc.)
| d. Computer
| e. Internet access
| Response options included “Yes” and “No” |

| Televisions in the home | How many televisions do you have in your home?
| Response options ranged from “0” to “4 or more” (r=.95) |
| **Television in bedroom** | Do you have a television in the room where you sleep?
| Response options included “Yes” and “No” |

| Parental modeling of television use | On a typical weekday (Monday through Friday), how many hours do you spend doing the following?
| a. Watching TV/Videos/DVDs
| On a typical weekend day (Saturday and Sunday), how many hours do you spend doing the following?
| a. Watching TV/Videos/DVDs
| Seven response options ranged from “0 hr” to “5+ hr” |

| Familial encouragement to limit television use | During a typical week, how often have you or another member of your household encouraged your daughter to watch less TV?
| Five response options ranged from “Never” to “Every day” |

| Dietary Intake | In the past 7 days:
| a. vegetables were available in my home
| b. vegetables were served at meals in my home
| c. fruit was available in my home
| d. fruit was served at meals in my home
| Four response options ranged from “Never” to “Always” (α = .63, r=.54-.59) |

| Unhealthy home food availability (SD, FV) | In the past 7 days:
| a. regular soda pop or other sugar-sweetened drinks were available in my home
| b. regular soda pop or other sugar-sweetened drinks were served at meals in my home
| c. chips or other salty snacks were available in my home
| d. candy was available in my home
| Four response options ranged from “Never” to “Always” (α = .80, r=.55-.72) |

| Parental modeling of fruit intake (FV) | Thinking back over the PAST WEEK, how many servings of FRUIT did you USUALLY eat on a typical day? A serving would be a medium piece of fruit or ½ cup of fruit. Do not include fruit juice.
| Seven response options ranged from “None” to “5 or more servings” |

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| Parental modeling of vegetable intake (FV) | Thinking back over the PAST WEEK, how many servings of VEGETABLES did you USUALLY eat on a typical day? A serving would be a ¼ cup of cooked vegetables or 1 cup of raw vegetables. Do not include potatoes or French fries. Seven response options ranged from “None” to “5 or more servings” |
| Parental modeling of soft drink intake (SD) | Thinking back over the PAST WEEK, how often did you drink regular soda pop (not diet)? Seven response options ranged from “None” to “5 or more servings” |
| Familial support for healthy eating (SD, FV) | During a typical week, how often have you or another member of your household encouraged your daughter to eat healthy foods? Five response options ranged from “Never” to “Every day” (r=.70) |
| Family meals (SD, FV) | During the past 7 days, how many times did all, or most, of your family living in your house eat a meal together? Nine response options ranged from “0 times” to “More than 7 times” (r = .74) |
| Fast food for family meals (SD, FV) | During the past 7 days, how many times was a family meal purchased at a fast food restaurant (McDonalds, KFC, pizza, etc.) and eaten either at the restaurant or at home? Nine response options ranged from “0 times” to “More than 7 times” |

1 Item included on girls’ survey
2 Items marked with (SD) to be used to predict girls’ soft drink intake, items marked with (FV) to be used to predict girls’ fruit and vegetable intake

2.7.2. Dependent variables

Body composition: Girls’ percent body fat was assessed at the baseline and follow-up evaluation periods using dual-energy X-ray absorptiometry (DXA). The DXA full body scan was performed using a Lunar Prodigy DXA apparatus (Lunar Radiation Corp., Madison, WI) at the University of Minnesota’s GCRC. The software for adults was used as the high-school-aged girls participating in New Moves are likely to be menstruating and close to full physical maturity. Each scan provided an estimate of fat mass, fat-free mass, and bone composition. Total percent body fat as well as android and gynoid percent body fat were calculated. Jensen et al found that duplicate scans showed a difference of 0.6% ± 0.5% body fat using DXA. In a study of adults, the coefficient of variation for percent body fat when measured by DXA was 3.3% and the test-retest correlation was .99. Several studies have shown reasonable agreement between DXA
and other methods to measure body composition including deuterium dilution, underwater weighing, 40K-counting, neutron activation, and skin-fold thickness.\textsuperscript{190}

**Body Mass Index (BMI):** BMI was calculated using girl’s body weight measured using a Tanita Body Composition Analyzer TBF-300A (Tanita Corporation of America, Arlington Heights, IL) and height measured using a portable stadiometer. For measurement, the girls wore light street clothes and removed their shoes and socks. In order to account for clothing, .5 kg was subtracted from the weight measurement for all girls. Trained study staff conducted the measurements at each evaluation period. Girls’ weight was measured twice and both measurements were recorded to the nearest .1 kg. If between the two measurements there was a discrepancy of greater than .5 kg, a third measurement was taken. Similarly, girls’ height was measured twice and both measurements were recorded to the nearest .1 cm. If there was a discrepancy > .5 cm, a third measurement was taken. The multiple measurements were then averaged to produce a single height and weight for each subject at each time point.\textsuperscript{191} BMI was calculated using the formula weight in kilograms divided by height in meters squared.

BMI percentiles were also calculated based on the 2000 CDC Growth Charts for children and adolescents between the ages of 2 and 20. These growth charts take the participant’s gender and age in months into account to calculate a BMI-for-age percentile relative to US children between the years of 1963 to 1980.\textsuperscript{192} Participants with a BMI percentile less than 85\textsuperscript{th} percentile categorized as healthy weight, between the 85\textsuperscript{th} and less than 95\textsuperscript{th} percentile were categorized as overweight, and at or above the 95\textsuperscript{th} percentile were categorized as obese.\textsuperscript{193} Since the CDC’s Growth Charts do not provide BMI-for-age percentiles for people who have passed their 20\textsuperscript{th} birthday, the one participant who was 20 years and a few months old at baseline was considered to be exactly 20 years old for the purposes of determining her BMI percentile.

**Total physical activity and moderate-to-vigorous physical activity:** Girls’ total physical activity (PA) and moderate-to-vigorous physical activity (MVPA) was assessed using the
3-Day Physical Activity Recall (3DPAR) (Appendix B). The 3DPAR assesses the sedentary and physical activities that the subjects participated in during each half hour time block between 6 AM and midnight on the three days previous to the day of data collection. The 3DPAR was shown to be a valid measure of moderate and vigorous activity as compared to accelerometry in a multi-ethnic sample of 8th and 9th grade girls in South Carolina. The 3DPAR was also found to be a reliable measure of MPA and VPA. McMurray et al had adolescents complete the 3DPAR on 2 successive days and compared the recalls from the common days. The test-retest correlations among girls were .71 and .77 for MPA and VPA respectively.

In order to complete the 3DPAR, participants were provided with a list of 65 common sedentary behaviors and physical activities and were asked to select the activity that they participated in for the majority of every half hour block. If a participant recorded engaging in a physical activity during a half hour block they were asked to report whether their exertion level during that block was light, moderate, hard or very hard. Guidelines and illustrations of different activities were provided to help participants distinguish between the various levels of exertion. All sedentary behaviors were assumed to be performed at a single intensity.

For each physical activity at each exertion level, a corresponding MET value was identified using the Compendium of Physical Activities. Activities with a corresponding MET value greater than 3 but less than 6 were classified as moderate intensity. Activities with a corresponding MET value of 6 or greater were classified as vigorous intensity. The number of half hour blocks of both moderate and vigorous activity in which each girl participated were summed over the three days and then divided by three to obtain the average number of moderate intensity blocks per day and the average number of vigorous activity blocks per day. These numbers were then summed to create an average MVPA blocks per day. A block should not be interpreted as 30 minutes of activity as it is possible that the girls did not participate in the physical activity for the full half hour.
Television use: Daily average television watching was measured using the 3DPAR. TV use was determined by the average number of blocks per day in which girls reported participating in, “Watching TV or movies” over the 3 days captured by the recall. Other studies of physical activity and sedentary behavior have assessed TV use in this manner.199-201

Soft drink intake: Girls’ intake of soft drinks was assessed with the following survey item: “Over the past month, how often did you drink regular soda pop (not diet)?” Response options included: “Never”, “Less than once a week”, “1-2 times per week”, “3-4 times per week”, “5-6 times per week”, “1 time per day”, “2 times per day”, “3 times per day”, “4 times per day”, “5 or more times per day”. This response options were adapted from existing beverage intake items in the literature.202

Fruit and vegetable intake: Fruit and vegetable intake was assessed on the girls’ survey using the questions, “Thinking back over the past week, how many servings of fruit did you usually eat on a typical day? A serving would be a medium piece of fruit. Do not include juice” and “Thinking back over the past week, how many servings of vegetables did you usually eat on a typical day? A serving would ½ cup of cooked vegetables or 1 cup of raw vegetables. Do not include potatoes or French fries.” Response options for both questions included: “None”, “Less than 1 serving”, “1 serving”, “2 servings”, “3 servings”, “4 servings”, and “5 or more servings”. These items were used previously in the Project EAT parent survey,79,113 and were modified from their original use on the 5-a-Day Power Plus parent survey.185

2.7.3. Sociodemographic characteristics
Parental education: Parental education was measured by parents’ response to the question, “How far did you go in school? (indicate highest level)” Response options included “did not finish high school”, “finished high school or got GED”, “did some college or training after high school”, “graduated from a college or university”,
“professional training beyond a four-year college degree”. This question mirrored the question asked of the girls regarding their parents’ educational attainment. The item was modified from a question used in the TEENS study.203

Girls’ race/ethnicity: Girls’ and parents’ race/ethnicity was assessed by the following item, “Do you think of yourself as….” Response options included, “White”, “Black or African American”, “Asian”, “Native Hawaiian or other Pacific Islander”, “American Indian or Alaskan Native”, “Hispanic or Latina”, and “Other”. If a participant selected “Other” there was a space to fill in what racial/ethnic category they identified themselves as. Participants were prompted to select all categories that applied to them. If two categories were selected and included “White” and another category, the individual was coded as the other category. For example, if a girl selected “White” and “Asian” they were coded as Asian. If a participant selected three or more categories, they were coded as being of mixed race. If participants selected two or more racial/ethnic categories that did not include “White” they were coded as being of mixed race. As girls’ race/ethnicity was assessed at all evaluation periods, if after this recoding there were discrepancies between girls’ report of their race/ethnicity over time, the racial category or categories that were selected during two of three of the evaluation periods were selected. Due to small sample size in some of the categories, some racial/ethnic categories were collapsed for some analysis.

Girls’ age: Girls’ age was calculated from the number of days between their birth date (as recorded on their consent form) and the date on which they completed baseline data collection.

Relationship to girl: Parents’ relationship to the girl participating in New Moves was assessed at baseline on the parent survey with the following question, “What is your relationship with your daughter who is participating in New Moves?” Response options included, “Mother”, “Stepmother”, “Other female guardian”, “Father”, “Stepfather”,

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“Other male guardian” and “Other”. Those responding “Other” were asked to write in what their relationship was.

US Nativity: Girls’ US nativity was assessed at baseline by the following item: “Were you born in the US?” The response options were “Yes” and “No”. If a girl responded “No” she was asked to write in what country she was born in.

2.8. Data management
Data from the girls’ surveys were cleaned and double entered into a computer file by staff from the University of Minnesota School of Public Health’s Health Survey Research Center (HSRC). Body composition measurements and data from the 3DPAR were entered into computer files by New Moves study staff. Body composition measurements were double entered and data from the 3DPAR were double checked. All data entry was confirmed by the New Moves Evaluation Coordinator (SF). All data collected from parents were double entered by research assistants into an Excel spreadsheet. Inconsistencies between the entries were corrected by KWB. Spreadsheets were converted into SAS datafiles for use in analyses.

2.9. Missing data
Being aware of the potential for missing data is an important aspect of any study as differential missingness may bias study results. Extensive efforts were made to reduce girls’ attrition over the course of the New Moves intervention. However, a small number of girls who participated in the baseline survey may have missing data at post-class or follow-up. If the missingness is random conditional on covariates (MAR), analyses that use only the available data are unbiased. Missingness that is not ignorable occurs when participants drop out or are lost to follow-up based on the outcome. It is possible that non-successful students in the intervention were more likely to not attend the post-class and follow-up evaluation sessions. However, because New Moves focuses on increasing body satisfaction and making realistic goals for physical activity and dietary intake, it is believed that even girls who have not lost weight or significantly improved
their health behaviors will feel comfortable participating in data collection. Therefore, longitudinal analyses will not be biased due to differential participation and resulting missing data.

Although only baseline data from the parents will be used in these analyses, therefore loss to follow up is not a concern for the parent data, only a subset of the total eligible parents of New Moves participants enrolled in the NMPP. Those parents that did not enroll in the NMPP were more likely belong to sociodemographic minority groups and/or may have not felt comfortable completing a written survey in English. Bias may be introduced into the study if the relationship between the family environment and girls’ outcomes varies by family sociodemographic characteristics. In order to determine if there was a differential response from parents by sociodemographic characteristics, analyses were conducted to examine potential differences in girls’ outcomes for girls whose parents enrolled in the NMPP compared to those whose parents did not.

2.10. Human subjects
The New Moves intervention study and the New Moves Parent Project were separately approved by the University of Minnesota’s Institutional Review Board (Appendix A). Approval to conduct the New Moves study at each high school was also obtained from all of the participating school districts.

2.11. Sample size
Sample size calculations show that this study is sufficiently powered to address all of its specific aims. The following sample size calculation was based on addressing the first half of the third specific aim, which uses data only from girls and parents in the intervention condition. Analyses for the other specific aims are better powered than this, as they are using data from parent/girl dyads from both the intervention and control conditions.
Due to non-response and refusal, on average 22.5 parents per intervention school enrolled in the NMPP. This represents representing 74.2% of all eligible parents. Fisher’s $Z_F = \frac{1}{2} \ln((1+\rho)/(1-\rho))$ is used to normalize the distribution of $\rho$; $\text{var}(Z_F)=1/(N-3)$. To allow for clustering the effective $n$ per school is used, $n_{\text{eff}} = n/\text{DEFF}$, where DEFF is the Design Effect=$1+(n-1)\text{ICC}$. The ICC for a regression coefficient (correlation) is the product of the ICC of the dependent and the independent variables\(^2\) Taking BMI and family meal frequency as an example, in Project EAT II the ICCs were 0.028 and 0.026 respectively. ICCs for change are typically smaller than ICCs for level. Hence we expect the ICC($\rho$) $\approx 0.001$, making DEFF$=1+21.5*0.001 = 1.0215$. Therefore, the $n_{\text{eff}}$ per school $= 22.03$, and $SE(Z_F)=0.087$. The $Z_F$ reliably detectable with power 80%, using a two-sided test at the 5% level, satisfies $Z_F/SE(Z_F) \geq (Z_{1-\alpha/2} + Z_{\text{power}})$ or $Z_{Fdet}=2.8*0.087 = 0.244$.

Transforming back to a correlation coefficient, the detectable $\rho_{det} = 0.24$. This is a reasonable expectation based on the literature.

For the second half of the third specific aim which aims to detect an interaction between intervention condition and family environment factors represented continuously, with a two-sided alpha of .05 calculations indicate that there is 52% power, or 48% Type II error, to detect a net effect size of 0.26. This translates to approximately a .5 unit BMI net between those with supportive versus unsupportive family environments by study condition. Based on this moderate ability to detect an association if one exists, this half of the third specific aim was determined to be exploratory.

2.12. **Analysis plan**

Specific Aim 1: Explore sociodemographic differences in the weight-related family environment of the racially, ethnically, and socioeconomic diversely diverse population of adolescent girls participating in New Moves, a school-based physical activity and nutrition intervention.

The following statistical model represents the regression equation that was used to test the first and second specific aims. In this model, $Y_{ij}$ represents the dependent variable.
which for Specific Aim 1 is the family environment characteristic, \( P_{ij} \) is the individual-level independent variable, \( c_{ij} \) is the individual-level covariate, \( \mu \) is a grand mean, \( U_i \) is the realized values for the random main effects of school, and \( e_{ij} \) is random error. This model allows for the simultaneous estimation of the regression coefficients for the independent variable(s) included in the model (\( \beta \) and \( \gamma \)) as well as the individual and group-level components of variance. As there was the potential for homogeneity of the home environment and of girls’ outcomes by school attended, school was introduced as a random effect. By including school as a random effect partial adjustment for school is made using empirical Bayes estimates of the school-specific effect, which reduces the residual variance. Therefore, the precision of the estimates of the independent variables are increased, increasing our ability to detect a statistically significant relationship between the independent and dependent variables. However, it was anticipated that the variance inflation of the regression coefficient due to clustering would be very small, as the interclass correlation (ICC) of a regression coefficient is the product of the ICC for the independent variable and the ICC of the dependent variable (e.g. FV intake).

\[
Y_{ij} = \mu + U_i + \beta P_{ij} + \gamma c_{ij} + e_{ij}
\]

(school \( i=1,12 \) and girl/parent dyad \( j=1, 253 \))

In order to examine differences in the family environment by each of the sociodemographic characteristics, hierarchical multiple regression models were developed both with each sociodemographic factor of interest as the single dependent variable, and with all sociodemographic characteristics simultaneously entered into each model to obtain the independent association between the sociodemographic characteristic of interest and the family environment factor. The patterns of relationships between the sociodemographic characteristics and the family environment variables were very similar in both the single predictor and mutually adjusted analyses; therefore, only the results from the adjusted analyses are presented. From the mutually-adjusted model, least-squares adjusted means were calculated for each level of each sociodemographic characteristic. For analyses examining differences by race/ethnicity and US nativity, if
the overall F-statistic was significant a Tukey test was used to highlight sources of differences between the means. A linear test of trend was used to determine whether there was a significant linear relationship between the family environment components over the four ordered levels of parental educational attainment.

Specific Aim 2: Test cross-sectional baseline associations between girls’ weight-related family environment and girls’ BMI, percent body fat, and behaviors including total PA, MVPA, TV use, soft drink intake, and FV intake, among all New Moves participants.

The second specific aim of this dissertation investigated the cross-sectional relationships between parent-reported characteristics of the weight-related family environment and study outcomes. Figure 2-1 identifies individual weight-related family environment predictors, organized in outcome-specific blocks, along with the predicted direction of relationship between the family environment predictor and the associated behavioral outcome.
Figure 2-1: Conceptual model for Specific Aim 2

Weight-related Family Environment

Physical activity-specific predictors
- Physical activity resources (+)
- Parental Total PA/MVPA (+)
- Parental support for physical activity (+)

Television-specific predictors
- Sedentary behavior resources (+)
- Parental sedentary behaviors (+)
- Familial encouragement to limit television use (-)

Soft drink-specific predictors
- Healthy home food availability (-)
- Soft drink home availability (+)
- Parental soft drink intake (+)
- Familial support for healthy eating (-)
- Family meal frequency (-)
- Fast food family meal frequency (+)

Fruit and vegetable-specific predictors
- Healthy food availability (+)
- Unhealthy food availability (-)
- Parental fruit and vegetable intake (+)
- Familial support for healthy eating (+)
- Family meal frequency (-)
- Fast food family meal frequency (+)

Girls’ Baseline Outcomes

Total PA/MVPA

Television Use

Body fat BMI

Soft Drink Intake

Fruit & Vegetable Intake

Sociodemographic Characteristics
As all of the baseline outcomes were represented as continuous variables, univariate hierarchical linear regression models were developed to examine the relationships between each of the family environment variables and girls’ behaviors (PA, MVPA, TV, and soft drink and FV intake), and BMI and percent body fat. Family environment variables were standardized to have a mean of 0 and a standard deviation of 1 to allow for comparison of strength of regression coefficients across predictors for each outcome. Girls’ age, race/ethnicity, and parental education were included as covariates in the models to reduce potential confounding. In order to account for potential clustering of behaviors among girls who attended school together, school was included in the regression models as a random effect. The outcome variables of girls’ total PA, MVPA, TV use and SD intake were also square-root transformed to an approximate Gaussian distribution, and models examining relationships between the family environment factors and these transformed outcomes were developed. The strength and significance of resulting parameter estimates were similar in models with the transformed and non-transformed outcomes; therefore, models with the non-transformed outcomes were presented for ease of interpretation. In addition to examining the relationship between each family environment variable and corresponding behavioral or body composition outcome, single multivariate regression models were developed to examine the total association between all of the outcome-specific family environment variables and the girls’ outcomes.

To understand the explanatory power of the family environment on girls outcomes, two models were developed to estimate the percent of variance ($R^2$) in each outcome explained by (1) age, race/ethnicity, and parental education, and (2) age, race/ethnicity, parental education, and the family environment variables. The school-level variance was not partitioned from the $R^2$ making the estimate of variance accounted for by the model a conservative estimate.
Specific Aim 3:

1) Among girls participating in the intervention condition of New Moves, test whether the baseline weight-related family environment is associated with successful change in girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat, over the course of the intervention.

2) Conduct an exploratory analysis using data from girls both in the intervention and control conditions of New Moves to assess whether girls’ baseline weight-related family environment modifies the effect of the New Moves intervention on girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat.

To address the first part of this specific aim, baseline to follow-up change for each of the study outcomes (total PA, MVPA, TV, soft drink and FV consumption, BMI and percent body fat) was calculated for girls who had parent data available (n=135). Each outcome-specific change score was divided into quintiles. Girls were characterized successful in improving their PA, MVPA, and FV intake if they were in the upper two quintiles of change (greatest increase) in the anticipated direction, while girls were characterized as unsuccessful if their change score was in the lower two quintiles. Similarly, girls were characterized as successful in improving their TV use, soft drink intake, BMI and percent body fat if their change score fell in the lower two quintiles (greatest decrease), while girls were characterized as unsuccessful if their change score was in the upper two quintiles. In order to reduce misclassification bias, girls whose change score was in the middle quintile for a specific outcome were excluded from further analyses of that outcome. For comparison, cut points for successful behavior, weight and body composition change were determined and girls were stratified into “successful” and “unsuccessful” for each outcome based on this value. Girls were determined to be successful if they increased their total PA by 2 30-minute blocks/day, increased their MVPA by 1 30-minute block/day, decreased their TV use by 1 30-minute block/day, decreased their soft drink intake by .5 times per day, increased their FV intake by 2 servings per day, decreased their BMI by 1 unit, or decreased their body fat by 2%.
Hierarchical logistic regression models were developed to examine the univariate relationship between the outcome-specific family environment characteristics and the odds of being successful at improving behavior. To aid comparison across family environment variables, each was standardized to a mean of zero and a standard deviation of one. Regression models were adjusted for race/ethnicity, age, and parental education, and school was included in the models as a random effect to account for potential clustering of behaviors among girls who attended school together. Similar models were also used to determine the relationship between each family environment characteristic and the odds of girls successfully reducing their BMI and percent body fat.

The second part of this specific aim is to examine potential effect modification of the New Moves intervention by each of the family environment characteristics. The full sample of girls and parents was used for these analyses (n=253). Baseline-adjusted hierarchical linear regression models were used to determine if there were significant differences in the relationship between the baseline-adjusted follow-up mean behavior by family characteristic and intervention condition. These models included the main effects of condition and the family characteristic variable, as well as a condition by family characteristic interaction term. Models also allowed for a random intercept and included the family characteristic as a random coefficient. School was nested within condition implying that the variance of means for the intervention and control conditions include school variability, and the significance of the interaction term was based on the t statistic with 10 degrees of freedom. Due to the exploratory nature of this analysis, significant interaction terms pointed to areas that might warrant further research, one of which was explored graphically.

2.13. Concerns due to multiple tests
As numerous independent tests were conducted to examine the relationships between each of the individual measures of the weight-related family environment and the relevant outcomes, there is an increased likelihood of Type I error occurring. Using the customary α level of .05 to determine statistical significance, one would expect 5% of
statistically significant relationships to occur by chance. Because of this, caution was
used in interpretation of statistically significant findings.

Moves
In order to better understand the weight and weight-related characteristics of the sample
of girls who participated in New Moves and had parent data available, baseline BMI,
percent body fat, total PA, MVPA, TV use, soft drink intake and FV intake were
calculated for the whole sample as well as by race/ethnicity, parental education, and US
nativity (Table 2-5). As intended, New Moves was successful at recruiting a
predominantly overweight sample of girls. On average, girls had a mean BMI of 25.8,
which is considered overweight in an adult population, and 37.3% body fat. Girls
participated in 4.54 30-minute blocks of physical activity a day, which translates to
between 1.1 and 2.3 hours of PA per day, approximately half of which was MVPA. Girls
reported watching 4.54 30-minute blocks of TV per day, which translates to between 1
and 2.25 hours of TV per day. At baseline girls consumed slightly less than 1 soft drink
per day and 4.43 servings of fruits and vegetables per day.
Table 2-5: Unadjusted baseline means and standard deviations for BMI, body composition, and behavioral outcomes by sociodemographic characteristics

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>N</th>
<th>BMI Mean (SD)</th>
<th>Body Fat % (SD)</th>
<th>Total PA blocks/day Mean (SD)</th>
<th>MVPA blocks/day Mean (SD)</th>
<th>Television blocks/day Mean (SD)</th>
<th>Soft Drinks times/day Mean (SD)</th>
<th>Fruits and Vegetables servings/day Mean (SD)</th>
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<tr>
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<td>253</td>
<td>25.8 (6.8)</td>
<td>37.3 (0.1)</td>
<td>4.54 (3.7)</td>
<td>2.98 (3.0)</td>
<td>2.63 (2.9)</td>
<td>0.81 (1.4)</td>
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<td>3.09 (3.3)</td>
<td>2.32 (2.7)</td>
<td>0.59 (1.1)</td>
<td>4.49 (2.8)</td>
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<td>35.7 (0.1)</td>
<td>3.90 (4.4)</td>
<td>1.92 (2.3)</td>
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<td>0.46 (1.1)</td>
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<th></th>
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<td>194</td>
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<td>37.7 (0.1)</td>
<td>4.61 (3.7)</td>
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<td>3.39 (3.1)</td>
<td>0.60 (1.2)</td>
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Chapter 3: Sociodemographic disparities in adolescent girls’ weight-related family environments

Introduction: Research shows large sociodemographic disparities in obesity among young people, but little is known about how familial factors that are associated with obesity vary across sociodemographic characteristics. The objective of the current study is to examine differences and similarities in the family environments of adolescent girls at risk for obesity by race/ethnicity, parental educational attainment, and US nativity.

Methods: Data are from the baseline assessment of 253 parent/daughter dyads that participated in New Moves, a school-based physical activity and nutrition intervention. Participants completed survey items assessing multiple aspects of the weight-related family environment as well as sociodemographic characteristics. Hierarchical linear regression models were used to test relationships between the family environment and sociodemographic characteristics.

Results: Family environments varied in many ways by girls’ race/ethnicity, parental education, and US nativity. Parents of Asian girls reported many qualities supportive of physical activity and healthy eating. Greater parental education was associated with more modeling of and support for physical activity and greater frequency of family meals. Parents of foreign-born girls reported having fewer televisions in the home, more frequent family meals, and fewer fast food family meals.

Conclusion: The weight-related family environments of adolescent girls differ across race/ethnicity, parental education, and US nativity. Understanding sociodemographic differences in the family environments of girls at high risk for obesity can inform program development and help in decreasing the disparities in adolescents’ weight status and weight-related behaviors.
3.1. Introduction

In the United States, large disparities exist in the prevalence of overweight and obesity among adolescent girls’ by their race/ethnicity, socioeconomic status (SES), and United States nativity.\textsuperscript{3,207} For example, African American and Hispanic girls are more likely to be overweight or obese compared to non-Hispanic white girls.\textsuperscript{207} Differences in participation in weight-related behaviors including physical activity, sedentary activity, and healthful dietary intake have been observed by these same sociodemographic characteristics. Several studies have found that African American and Hispanic adolescents and those of low SES are less likely to engage in regular physical activity,\textsuperscript{11,13,14,208} are more likely to engage in sedentary behaviors such as watching television,\textsuperscript{11,14,29} and are less likely to report healthful dietary intake\textsuperscript{50,63} compared to white and/or high SES adolescents. Studies have also observed that first generation Asian and Latina adolescents are less likely to be regularly physically active than white non-immigrant adolescents\textsuperscript{133,209} yet also report more healthful dietary intake.\textsuperscript{132}

There is a growing body of evidence that both the social and physical family environment contribute to adolescents’ participation in weight-related behaviors. For example, parental support for physical activity\textsuperscript{85-87,89,90} as well as parental modeling of physical activity\textsuperscript{28,92,93} have been associated with adolescents’ physical activity habits. Similarly, parental support for youth limiting their time spent watching television\textsuperscript{104} and parental modeling of television use\textsuperscript{99-101} have been associated with adolescents’ television habits. Consistent relationships have been found between parental support for and modeling of dietary behaviors and adolescents’ dietary intake including consumption of soft drinks\textsuperscript{105-108,112} and fruits and vegetables.\textsuperscript{9,113,120-124} Family meals have also emerged as an influential factor in the family environment. Adolescents whose families frequently eat meals together are more likely to have better dietary intake.\textsuperscript{115-117} In addition to these social influences, relationships have been observed between the resources available to adolescents in the home and adolescents’ physical and sedentary activity and dietary intake. The presence of exercise equipment in the home has been associated with adolescents’ physical activity habits\textsuperscript{94,95} while excessive television use has been linked to
the number of televisions found in the home, having a television in youths’ bedrooms, and having cable or satellite television. Availability of food in the home, including both healthy and unhealthy options, has been associated with adolescents’ dietary intake in the expected directions both cross-sectionally and longitudinally.

Despite the significant disparities in adolescent girls’ weight and participation in weight-related behaviors, and growing evidence of the strong influence that the family environment has on youths’ weight-related behaviors, few studies have examined whether girls’ family environments differ in ways that may contribute to the observed disparities. Studies that have examined the relationships between race/ethnicity and SES and selected elements of the family environment suggest that compared to youth from other racial/ethnic groups, African American adolescents are more likely to have a television in their bedroom and have greater availability of full-fat foods in their homes. Additionally, compared to adolescents from lower SES families, those of higher SES report greater availability of fruits and vegetables at home and served at meals, as well as greater frequency of family meals. Although these studies provide preliminary evidence that weight-related factors in the family environment vary by sociodemographic characteristics, previous research has only examined a limited number of family environment factors, and the majority of studies relied on adolescents’ report of their family environment which may be a less valid measure as compared to parental report of the family environment. Additional research is needed to more fully understand how families may be differentially supporting or inhibiting adolescent girls’ participation in physical activity, sedentary behavior, and healthful dietary intake.

The goal of the present study is to examine how elements of the family environment of relevance to physical activity, television use, and fruit, vegetable and soft drink intake differ by adolescent girls’ race/ethnicity and US nativity, and parental education, an indicator of families’ SES, among a sample of adolescent girls who are overweight, obese, or at risk for obesity due to a sedentary lifestyle. Understanding the family
environments of adolescent girls can help guide obesity prevention programs by aiding the targeting and tailoring of programs to families who may benefit most from interventions to improve the family environment. Additionally, identifying population sub-groups that provide a family environment which is supportive of physical activity and healthful food behaviors and discourages sedentary behavior can help elucidate what resources other families may need to be able to maintain or develop a health-promoting family environment.

3.2. Methods
Data for the current analyses are drawn from the baseline assessment of adolescent girls in grades 9 through 12 who participated in the New Moves study between 2007 and 2009 and one of their parents. New Moves was designed to prevent obesity and other weight-based problems via a girls-only physical education class and supplementary school-based activities. Girls who were overweight or obese, had a sedentary lifestyle, and/or were interested in learning about healthy weight management were targeted for study recruitment. Seventy-one percent of parents completed a survey to assess the family environment, resulting in a sample of 253 parent/girl dyads. Trained research staff collected girls’ data at the high schools and a university clinic, and the majority of parents completed a survey via mail with 2% completing the survey over the phone with the help of research staff. The study was approved by the University of Minnesota’s Institutional Review Board and by each participating school district. Girls and parents provided consent/assent for their participation in the study.

The study sample was racially/ethnically diverse with 29% of girls reporting that they were white, 26% African American/black, 11% Hispanic, 24% Asian American, 3% American Indian, and 8% of mixed race or another racial/ethnic group. Among the Asian American girls, 87% percent identified as Hmong. There was also a diverse range of parents’ educational attainment with 28% of parents having not completed high school, 21% having only a high school diploma, 26% having attended some college and 25% having completed college and/or have post-graduate training. Approximately one quarter
(23%) of girls were foreign-born. Mothers were the most common respondents to the parent survey, with 79% of parent participants being mothers. Parents’ description of the family environment did not significantly differ by the type of parent (mother vs. father vs. other) who participated in the study. Three girl/parent dyads were missing sociodemographic information and were excluded from the analyses.

3.2.1. Description of Measures

Independent variables

Family Physical Activity (PA) Environment: Home availability of PA resources was assessed by parents’ response to whether each of nine common types of exercise equipment (e.g. bicycle, exercise workout videotapes or DVDs, skis or snowboards) was available in their home, yard or apartment complex. Parental modeling of PA was determined by parents’ response to three questions regarding the time spent participating in light, moderate and vigorous PA per week (test-retest r=.48-.94). To assess family support/encouragement for PA, parents responded to five questions regarding the frequency with which they or others in their family provided various types of logistical and emotional support for physical activity to their daughter. Examples of types of support include providing transportation to a place where their daughter could participate in PA, participating in PA with their daughter, and telling their daughter she did well in a physical activity or sport (Cronbach’s α = .78, test-retest r=.81).

Family Television (TV) use Environment: Media resources in the home were assessed by parents’ response to whether they had each of five types of media technology (e.g. cable television and video/DVD player) in their home. Parents were also asked to report how many televisions they had in their home (response options ranged from 0 to 4 or more), and girls were asked whether they had a television in the room where they sleep. Parents’ television use was assessed with two questions regarding the number of hours they spend watching TV/videos/ DVDs on weekdays and weekends. These questions were combined to produce the average weekly hours of parental TV use. Family support
for limiting TV use was assessed with a single question regarding how often the parent or family member encouraged their daughter to watch less TV.

**Family Food Environment:** Parents reported on the availability of healthy food in the home with two questions regarding the frequency with which fruits and vegetables (FV) are available in the home, and two questions regarding how often FV are served at meals (Cronbach’s $\alpha = .63$, test-retest $r = .54-.59$). Unhealthy home food availability was measured with three questions regarding the availability of soft drinks, salty snacks, and candy, and one question regarding the frequency with which soft drinks are served at meals (Cronbach’s $\alpha = .80$, test-retest $r = .55-.72$). Parental modeling of fruit and vegetable intake was assessed with two questions regarding the number of servings of each type of food eaten on a typical day. Parents’ soft drink intake was assessed with a single item regarding how many servings of regular soft drinks they drank in a typical week. Frequency of family support for healthy eating was assessed with a single item (test-retest $= .70$) with response options ranging from “Never” to “Always”. Weekly frequency of family meals (test-retest $= .74$) and fast food for family meals were also each measured with a single item.

**Parental Education:** Parental education was determined by parents’ response to the question, “How far did you go in school? (indicate highest level)” Response options included “did not finish high school”, “finished high school or got GED”, “did some college or training after high school”, “graduated from a college or university”, “professional training beyond a four-year college degree”. The highest two categories were combined in analyses to create a “college and post graduate training” category.

**Girls’ race/ethnicity:** Girls’ race/ethnicity was assessed by girls’ response to the following item, “Do you think of yourself as….” Response options included, “White”, “Black or African American”, “Asian”, “Native Hawaiian or other Pacific Islander”, “American Indian or Alaskan Native”, “Hispanic or Latina”, and “Other”. Girls could select all categories that applied to them. If a girl selected two categories including
“White” she was categorized as the non-white category. If a girl selected two racial/ethnic categories that did not include “White”, or selected three or more categories, she was included in the “mixed/other” category. Due to the infrequent selection of “American Indian or Alaskan Native” these girls were included in the “mixed/other” category.

**United States (US) nativity:** Girls’ nativity was assessed with their response to the question, “Were you born in the US?” (yes/no).

### 3.2.2. Statistical Analysis

Separate hierarchical linear regression models were fit to examine the relationships between families’ sociodemographic characteristics and family environment constructs. Regression models were developed both with only the sociodemographic characteristic of interest as the predictor, and with all sociodemographic characteristics simultaneously entered into each model to obtain the independent association between the characteristic of interest and the family environment component. The patterns of relationships between the sociodemographic characteristics and the family environment variables were very similar in both the single predictor and mutually adjusted analyses; therefore, only the results from the adjusted analyses are presented. In order to account for potential clustering of behaviors among girls who attended school together, school was included in the regression models as a random effect. In the mutually adjusted model, adjusted means were calculated for each level of each sociodemographic characteristic. If the overall F-statistic was significant, a Tukey test was used to highlight sources of differences between the adjusted means. A linear test of trend was used to determine whether there was a significant linear relationship between the family environment components over the four ordered levels of parental educational attainment. Analyses were conducted using SAS 9.2 (Cary, NC).
3.3. Results

Family environment by girls’ race/ethnicity

Several elements of the family environment differed by girls’ race/ethnicity after adjustment for parental education and US nativity (Table 3-1). Overall parents of Asian girls were most likely to provide a supportive family environment, including being least likely to have a television in their daughter’s bedroom ($p<.001$), watching less television ($p=.018$), having less unhealthy food available in the home ($p=.019$), drinking fewer soft drinks ($p<.001$), and consuming the most fruits and vegetables ($p=.018$). Parents of Hispanic girls and girls of mixed/other race, and to a lesser extent parents of African American/black girls, reported fewer supportive elements of the family environment as compared to Asian and white parents when overall significant differences were observed.

Family environment by parental education

Girls’ family environments also differed by parental education after adjustment for race/ethnicity and US nativity (Table 3-2). All of the physical activity-related family environment components were positively associated with parental education including availability of physical activity resources ($p$ for trend $<.001$), parental modeling of MVPA ($p$ for trend $=.008$), and familial support for their daughter’s physical activity ($p$ for trend $=.014$). Several elements of the family environment related to food behaviors were associated with parental education including less parental soft drink intake ($p$ for trend $=.005$) and greater frequency of family meals. Parents who did not complete high school reported having family meals 3.8 times per week as compared to 5.4 times per week among parents with a college degree or greater ($p$ for trend$=.006$). The percentage of girls with a television in their bedroom was associated with parental education. Girls with parents who had either the lowest or highest level of educational attainment were less like to have a television in their bedroom compared to girls with parents who either completed high school or had some college ($p=.003$).
Family environment by girls’ US nativity

Parents of foreign-born girls reported several differences in their family environment as compared to parents of girls who were born in the United States, after controlling for race/ethnicity and parental education (Table 3-3). Parents of foreign-born girls reported having fewer televisions in their home (p<.001), watching less TV (p=.040), more frequent family meals (p=.008), and having fast food for family meals less often (p=.045). Parents of foreign-born girls were also less likely to report providing familial support for their daughters’ physical activity (p=.004) and healthy eating (p=.026).

3.4. Discussion

The goal of the current analyses was to explore differences in adolescent girls’ weight-related family environments by race/ethnicity, parental education, and US nativity. Although many aspects of the family environment were similar across demographic groups, several noteworthy differences emerged. Overall, Asian parents reported providing a more health promoting environment for their daughters including being less likely to have a television in their daughters’ bedroom, having less unhealthy food in the home, modeling greater fruit and vegetable intake, and modeling less soft drink consumption. Parental education was positively associated with the presence of health-supportive factors in the family environment including parental modeling of and familial support for physical activity and healthy eating, as well as having frequent family meals. Parents of girls born outside the United States reported having fewer televisions in the home, more frequent family meals, and fewer fast food family meals, but also provided less support for physical activity and healthy eating than the parents of girls born in the United States.

The presence of several protective factors in the families of Asian girls may be contributing to the lower prevalence of overweight and obesity in this racial/ethnic group. Using nationally-representative data, Gorden-Larsen et al found that Asian girls reported viewing significantly fewer hours of television than black and Hispanic adolescent girls. This disparity may in part be due to the differences in the family
environments of Asian girls identified in the current study. The lack of racial/ethnic
differences in the frequency of family meals observed in the current study is consistent
with one study’s findings, but other studies observed that Asian and white families
were more likely to have meals together than African American/black families. The
current study’s finding that white adolescents have more physical activity resources at
home, even after controlling for SES, may be associated with the trend of greater
participation in physical activity among white adolescent girls compared to African
American/black, Hispanic, and Asian girls.

The associations found between parental education and home physical activity resources,
parental MVPA, and parental soft drink consumption are similar to the findings of
previous studies which noted that families with higher parental education/SES provided
multiple resources to support their children’s physical activity and healthy eating. The
positive associations found between parental education and a supportive family
environment may contribute to other studies’ findings that adolescents with parents of
greater education engage in more physical activity and have healthier dietary habits.
Despite evidence that lower SES adolescents are more likely to watch television than
high SES adolescents, few associations were seen in the current study between parental
education and factors in the family environment related to television use. Therefore,
differences in television by SES may be attributable to factors in the home or outside of
the home not assessed in the current study, such as amount of unsupervised time at home
or lack of community-based opportunities for adolescents after school or on weekends in
low SES neighborhoods. One notable observation from the current study is the non-linear
relationship between parental education and the presence of a television in girls’
bedrooms, which differs from previous findings that low SES adolescents are likely to
have a television in their bedroom. The low prevalence of a television in the bedroom
at both the low and high levels of parental education seen in the current study may reflect
different forces, such as the expense of a television for families from lower SES
backgrounds and an incorporation of messages to restrict televisions in children’s
bedrooms by parents of higher educational attainment. Despite increasing efforts to
inform parents of the detrimental effect that excessive television use can have on children’s health, parental encouragement for their daughters to limit television use was relatively low and did not differ by any of the sociodemographic characteristics assessed in this study.

Results of the current study indicate that parents of girls born outside the United States provide many resources to support their daughters’ participation in healthy weight-related behaviors. These findings align with previous research that showed that adolescents of white, black and Asian descent born outside the United States were less likely to watch excessive television and many adolescents born outside the United States consume healthier diets compared to their US-born peers. In contrast, families of foreign-born girls were less likely to report providing support for their daughter’s physical activity and healthy eating. Further research is needed to understand the cultural, social, or economic mechanisms that contribute to these findings. Understanding why certain families choose not to or are unable to provide logistic or emotional support for their children’s health behaviors may guide interventions to help such families. However, as a whole these results highlight the need for practitioners to support recent immigrant families’ maintenance of a resource-rich family environment in order to protect against the development of unhealthy weight-related behaviors often observed as foreign-born adolescents acculturate to United States society.

This is one of the few studies that has collected data on the weight-related family environment from parents rather than only measuring adolescents’ perceptions. Parents’ and adolescents’ reports of their family environment have been found to be quite discrepant, and it has been hypothesized that parents may provide a more valid assessment of the family environment as they are responsible for purchases, and are more likely than their children to report on their own behavior in a valid manner. Parents’ perceptions of the family environment play a critical, yet less understood, role in influencing adolescents’ behavior, and data collected from parents can be used to develop programs to help parents improve their family environment. A limitation of the study is
that there was only a single item, parent education, as a marker of family SES which may not fully reflect a family’s socioeconomic position. Additional items to measure the educational status of another parent in the home, family income, or parents’ occupation would result in a more comprehensive assessment of SES.

Overall, the current analyses have identified several important differences in adolescent girls’ family environments by race/ethnicity, parental education, and US nativity. These differences may contribute to sociodemographic disparities observed by a number of studies in girls’ weight status, physical and sedentary activity, and dietary intake. Understanding sociodemographic differences in the weight-related family environments of youth is an important step to the development of interventions to address families’ specific needs and ultimately, reduce disparities in obesity among adolescents.
Table 3-1: Family physical activity, television use, and food environment factors by girls’ race/ethnicity

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<tr>
<th>Family Physical Activity Environment</th>
<th>White (n=74)</th>
<th>African American/Black (n=65)</th>
<th>Hispanic (n=27)</th>
<th>Asian (n=61)</th>
<th>Mixed/Other (n=25)</th>
<th>F</th>
<th>p df=4</th>
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<td>2.8bc</td>
<td>3.6c</td>
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</tr>
<tr>
<td>Parent’s MVPA hours/week</td>
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<td>3.0</td>
<td>3.4</td>
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<td>12.9</td>
<td>13.1</td>
<td>14.0</td>
<td>0.71</td>
<td>.586</td>
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<td>3.9</td>
<td>3.8</td>
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<tr>
<td>Percent of girls with TV in bedroom</td>
<td>46.3a</td>
<td>56.5a</td>
<td>48.3a</td>
<td>14.1b</td>
<td>79.3c</td>
<td>10.15</td>
<td>&lt;.001</td>
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<tr>
<td>Number of TVs</td>
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<td>3.0</td>
<td>2.6</td>
<td>3.1</td>
<td>1.65</td>
<td>.164</td>
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<tr>
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<td>5.3ab</td>
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<td>5.0ab</td>
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<tr>
<td>Frequency of family meals/week</td>
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</table>

1 Parents’ education and girls’ US nativity included as covariates, school included as random effect.
2 Least squares means with different alphabetical superscripts are statistically different at an alpha level of p<.05
Table 3-2: Family physical activity, television use, and food environment factors by parental education

<table>
<thead>
<tr>
<th>Family Physical Activity Environment</th>
<th>&lt; High School (n=69)</th>
<th>Completed High School (n=52)</th>
<th>Some College (n=66)</th>
<th>College and Postgraduate Training (n=63)</th>
<th>p for Linear Trend</th>
<th>p df=3 from ANOVA</th>
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<tr>
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<td>2.9</td>
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<td>.007</td>
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<tr>
<td>Parent’s MVPA hours/week</td>
<td>2.5</td>
<td>2.4</td>
<td>4.2</td>
<td>3.7</td>
<td>.008</td>
<td>.007</td>
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<td>Support for physical activity</td>
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<td>13.2</td>
<td>13.8</td>
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<td>.105</td>
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</tr>
<tr>
<td>Family Television Use Environment</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Media resources</td>
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<td>4.0</td>
<td>4.0</td>
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<tr>
<td>Percent of girls with TV in bedroom</td>
<td>39.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>54.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>56.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>28.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.284</td>
<td>.003&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>Number of TVs</td>
<td>2.6</td>
<td>3.1</td>
<td>2.9</td>
<td>2.9</td>
<td>.218</td>
<td>.088</td>
</tr>
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<td>Range: 0 to 4+</td>
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<td>Parent’s TV hours/week</td>
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<td>19.4</td>
<td>17.3</td>
<td>15.6</td>
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<td>.241</td>
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<td>3.0</td>
<td>.771</td>
<td>.954</td>
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<td>Family Food Environment</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Healthy home food availability</td>
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<td>11.7</td>
<td>12.4</td>
<td>.114</td>
<td>.191</td>
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<td>Unhealthy home food availability</td>
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<td>.642</td>
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<tr>
<td>Parent’s fruit and vegetables servings/day</td>
<td>4.4</td>
<td>5.2</td>
<td>5.5</td>
<td>5.2</td>
<td>.122</td>
<td>.257</td>
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<td>Parent’s soft drink servings/week</td>
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<td>2.6</td>
<td>1.6</td>
<td>1.1</td>
<td>.005</td>
<td>&lt;.001</td>
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<tr>
<td>Familial encouragement to eat healthy foods</td>
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<td>4.0</td>
<td>4.0</td>
<td>4.1</td>
<td>.043</td>
<td>.179</td>
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<tr>
<td>Frequency of family meals/week</td>
<td>3.8</td>
<td>4.3</td>
<td>4.9</td>
<td>5.4</td>
<td>.006</td>
<td>.054</td>
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<tr>
<td>Frequency of fast food family meals/week</td>
<td>1.3</td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
<td>.926</td>
<td>.573</td>
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</tbody>
</table>

1 Girls’ race/ethnicity and US nativity included as covariates, school included as random effect.
2 Least squares means with different alphabetical superscripts are statistically different at an alpha level of p<.05.
Table 3-3: Family physical activity, television use, and food environment factors by girls’ US nativity¹

<table>
<thead>
<tr>
<th>Family Physical Activity Environment</th>
<th>US Born (n=194)</th>
<th>Foreign Born (n=59)</th>
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<th>p  df=1</th>
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<td>Index range: 0-9</td>
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<tr>
<td>Parent’s MVPA hours/week</td>
<td>3.2</td>
<td>3.3</td>
<td>0.05</td>
<td>.828</td>
</tr>
<tr>
<td>Support for physical activity</td>
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<td>10.9</td>
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<td>.004</td>
</tr>
<tr>
<td>Scale range: 5-15</td>
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</tbody>
</table>

Family Television Use Environment

| Media resources                       | 3.9             | 3.7                 | 0.60 | .438   |
| Range: 0-5                            |                 |                     |     |        |
| Percent of girls with TV in bedroom   | 46.0            | 40.2                | 0.52 | .473   |
| Number of TVs                         | 3.0             | 2.3                 | 19.61| <.001  |
| Range: 0 to 4+                        |                 |                     |     |        |
| Parent’s TV hours/week                | 17.9            | 14.0                | 4.27 | .040   |
| Encouragement to limit TV             | 3.1             | 2.8                 | 1.39 | .240   |
| Range: 1-5                            |                 |                     |     |        |

Family Food Environment

| Healthy home food availability        | 12.0            | 11.2                | 2.41 | .122   |
| Scale range: 4-16                    |                 |                     |     |        |
| Unhealthy home food availability     | 11.5            | 11.3                | 0.10 | .756   |
| Scale range: 4-16                    |                 |                     |     |        |
| Parent’s fruit and vegetable servings/day | 5.1           | 5.0                 | 0.01 | .916   |
| Parent’s soft drink servings/week    | 1.9             | 1.3                 | 3.02 | .084   |
| Encouragement to eat healthy foods   | 4.0             | 3.6                 | 5.02 | .026   |
| Range: 1-5                           |                 |                     |     |        |
| Frequency of family meals/week       | 4.3             | 5.7                 | 7.11 | .008   |
| Frequency of fast food family meals/week | 1.6          | 1.0                 | 4.08 | .045   |

¹ Parents’ education and girls’ race/ethnicity included as covariates, school included as random effect.
Chapter 4: Does family matter? Associations between the family environment and adolescent girls’ physical activity, television use, dietary intake, weight, and body composition

Introduction: The family environment offers a number of potential targets for intervention to improve adolescents’ physical activity, sedentary behavior, dietary intake, and weight status. The purpose of the current study is to examine relationships between the family environment and physical activity (PA), TV use, soft drink and fruit and vegetable (FV) intake, weight, and body composition among a diverse sample of adolescent girls who are either currently overweight or obese, or at high risk for obesity.

Methods: Subjects included girls (mean age = 15.7, SD = 1.1) and one of their parents. Parents completed surveys assessing the family environment. Girls’ PA and TV use were measured by 3-Day Physical Activity Recall, and dietary intake by survey measures. BMI was measured by study staff, and body fat by dual-energy X-ray absorptiometry (DXA). Hierarchical linear regression models were used to test univariate and mutually-adjusted relationships between family environment factors and girls’ outcomes.

Results: In univariate and mutually-adjusted models, parental modeling of PA, TV, and soft drink intake were positively associated with girls’ behavior. In univariate models, family support for PA was positively associated with girls’ total PA (p=.011) and moderate-to-vigorous PA (p=.016). Home availability of soft drinks and FV was positively associated with girls’ intake (p<.001 and p<.001, respectively), and family meal frequency was positively associated with FV intake (p=.023). Media resources and number of televisions in the home were positively associated with girls’ BMI (p=.018 and p=.030, respectively), while family meal frequency was negatively associated with BMI (p=.023).

Conclusions: Helping parents improve their own activity and dietary intake practices, as well as provide support for their adolescents’ PA, promote family meals, and ensure healthy home food availability may aid in adolescent girls’ efforts to be active and eat healthfully.
4.1. Introduction

One-third of adolescent girls in the United States are overweight or obese. While girls from all backgrounds are at risk for obesity and associated health outcomes, those from racial/ethnic minority groups and of low socioeconomic status (SES) are particularly at risk. This high prevalence of overweight and obesity among adolescent girls and specifically African American, Hispanic, and girls from low SES families may be attributable to their participation in behaviors known to be associated with higher weight and excess weight gain including lack of regular physical activity, frequent sedentary behavior including watching television, and poor dietary intake including frequent consumption of sugar-sweetened soft drinks and less than adequate intake of fruits and vegetables.

Factors in the family environment such as parental support/encouragement, parental modeling of behavior, and resources available in the home such as healthy food are thought to play an important role in adolescents’ weight and weight-related behaviors. Several studies have found associations between parental support and encouragement for physical activity and healthy eating and adolescents’ physical activity and dietary intake, while other studies have not found similar associations. However, little is known about the relationship between parental encouragement for restricting television use and adolescents’ television use. Studies also suggest that parents’ own television use and dietary intake influence adolescents’ behavior, although studies examining relationships between parents’ physical activity habits and adolescents’ activity have produced inconsistent results. Family meals have also emerged as an important factor in the family environment with adolescents whose families frequently eat meals together reporting better dietary intake. Finally, studies suggest that physical resources in the home such as number of televisions, having a television in youths’ bedrooms, and having healthy food available in the home contribute to adolescents’ behavior.
Despite this growing body of literature, inconsistencies across studies and unaddressed questions limit our understanding of how to help families best support their daughters’ physical activity, healthy dietary intake, and weight loss or maintenance. Specifically, many of the studies examining relationships between the family environment and weight-related behaviors have been conducted with predominantly white, higher SES, or international samples, or among grade school children or young adolescents for whom the family may have a different influence on behavior as compared to older adolescents. Few studies have examined the family environment and its relationship with adolescents’ weight-related behaviors among racially and ethnically diverse or lower SES adolescents within the United States, the youth who are most at risk for overweight and obesity.\(^88\) Also, few studies have comprehensively examined the weight-related family environment by assessing potential predictors of both the activity and dietary intake sides of the energy balance equation, and only a handful of studies have assessed novel factors in the family environment such as the presence of physical activity equipment\(^{89,94-96}\) and media resources.\(^{99,101}\) Finally, the majority of studies of the family environment utilize adolescents’ report of their parents’ behavior and home resources.\(^{136}\) Adolescents’ and parents’ reports are often quite discrepant,\(^{137-142}\) and it has been found that parents’ report of their own behaviors and the resources available in their home to be more valid than adolescents’ report.\(^{137}\) This discrepancy, and the resulting reduction in validity of measurements, may have contributed to the inconsistent relationships across studies assessing relationships between the family environment and adolescents’ behavior. Understanding parents’ perspectives is essential for the successful development and implementation of family-based obesity prevention interventions.

In order to fill gaps in the literature, the objective of this study is to examine the cross-sectional relationships between multiple factors in the family environment and girls’ physical activity, television use, soft drink intake, fruit and vegetable intake, weight and body composition. The study was conducted with a sample of racially/ethnically and socioeconomically diverse adolescent girls who are overweight or obese, or at high risk for obesity due to a sedentary lifestyle. Results can be used to inform the development of
obesity prevention interventions to improve adolescent girls’ family environments, as well as provide guidance for clinicians who work with parents to help create family environments that support adolescents’ healthy weight.

4.2. Methods

4.2.1. Study Design

Subjects in the current study were high school-aged girls (mean age = 15.7; SD = 1.1) who participated in New Moves, a school-based nutrition and physical activity intervention, and one of their parents (N = 253). New Moves was designed to prevent obesity and other weight-based problems via a girls-only physical education class combined with supplementary school-based activities. New Moves targeted girls who were overweight, inactive, and/or interested in learning about healthy weight management. Data for the current analyses were drawn from the baseline assessment of girls and their parents. Girls completed study measures at either their school or the University of Minnesota’s General Clinical Research Center. An invitation for parents to participate in the study was mailed to the girls’ homes after parents provided consent for their daughter’s participation in New Moves. Of the 356 girls who participated in New Moves, 71% of their parents participated in the study resulting in a sample of 253 parent/girl dyads for the current analyses. The majority of parents completed a survey assessing the family environment via mail, with 2% completing the survey over the phone with the help of research staff. All parents completed an English version of the survey, although many parents whose primary language was Spanish were offered the opportunity to complete the survey with the help of a native Spanish speaker. The study was approved by the University of Minnesota’s Institutional Review Board and by each participating school district. Girls and parents provided consent/assent for their participation in the study.

4.2.2. Study sample description

The study sample was racially/ethnically diverse with 29% of girls reporting that they were white, 26% African American/black, 11% Hispanic, 24% Asian, 3% American
Indian, and 8% of mixed race or another racial/ethnic group. Among the Asian girls, 87% percent identified as Hmong. Parents reported a similar racial breakdown, with 26% reporting they were white, 23% African American/black, 10% Hispanic, 22% Asian, 2% American Indian, and 6% of mixed race or another racial/ethnic group. Mothers comprised 79% of parent participants, 10% were fathers, and the remaining were other relatives or guardians. Parents’ report of the family environment did not differ by parent type. There was a diverse range of parental educational attainment with 28% of parents having not completed high school, 21% having only a high school diploma, 26% having attended some college, and 25% having completed college and/or post-graduate training.

4.2.3. Description of Measures

Independent variables

Family Physical Activity (PA) Environment: Home availability of PA resources was assessed by parents’ response to whether each of nine common types of exercise equipment (e.g. bicycle, exercise workout videotapes or DVDs, skis or snowboards) was available in their home, yard or apartment complex.\(^94\) Parental modeling of PA was determined by parents’ response to three questions regarding the time spent participating in light, moderate and vigorous PA per week (test-retest r=.48-.94).\(^184\) To assess family support/encouragement for PA, parents responded to five questions regarding the frequency with which they provided various types of logistical and emotional support for physical activity to their daughter. Examples of types of support include providing transportation to a place where their daughter could participate in PA, participating in PA with their daughter, and telling their daughter she did well in a physical activity or sport (Cronbach’s \(\alpha = .78\), test-retest r=.81).\(^85\)

Family Television (TV) use Environment: Media resources in the home were assessed by parents’ response to whether they had each of five types of media resources (e.g. cable television and video/DVD player) in their home.\(^99\) Parents were also asked to report how many televisions they had in their home (response options ranged from 0 to 4 or more),\(^99\) and girls were asked whether they had a television in the room where they sleep.\(^102\)
Parents’ television use was assessed with two questions regarding the number of hours they spend watching TV/videos/DVDs on weekdays and weekends. These questions were combined to produce the average weekly hours of parental TV use. Family support for limiting TV use was assessed with a single question regarding how often the parent encouraged their daughter to watch less TV.

**Family Food Environment:** Parents reported on the availability of healthy food in the home with two questions regarding the frequency with which fruits and vegetables (FV) are available in the home, and two questions regarding how often FV are served at meals (Cronbach’s α = .63, test-retest r = .54-.59). Unhealthy home food availability was measured with three questions regarding the availability of soft drinks, salty snacks, and candy, and one question regarding the frequency with which soft drinks are served at meals (Cronbach’s α = .80, test-retest r = .55-.72). Parental modeling of fruit and vegetable intake was assessed with two questions regarding the number of servings of each type of food eaten on a typical day. Parents’ soft drink intake was assessed with a single item regarding how many servings of regular soft drinks they drank in a typical week. Frequency of family support for healthy eating was assessed with a single item (test-retest = .70) with response options ranging from “Never” to “Always.” Weekly frequency of family meals (test-retest = .74) and fast food for family meals were also each measured with a single item.

**Dependent variables**

**Physical activity and television use:** Girls’ total daily PA, daily moderate-to-vigorous physical activity (MVPA), and TV use was assessed using the 3-Day Physical Activity Recall (3DPAR). The 3DPAR has been shown to be a valid measure of MVPA as compared to accelerometry, and among adolescent girls had a test-retest reliability of r = .71 and r = .77 for moderate and vigorous activity, respectively. The 3DPAR asks participants to recall the activities that they participated in during the majority of each 30 minute time block between 6 AM and midnight on the three days previous to the day of data collection. A list of 65 common physical activities and sedentary behaviors was
provided, and participants selected the activity that they participated in for the majority of each half hour block. If a participant recorded engaging in a physical activity during a block, she was also asked to report whether her exertion level during that block was light, moderate, hard or very hard. For each physical activity at each exertion level, a corresponding metabolic equivalent (MET) value was identified.\textsuperscript{196,197} Total PA was defined as a per day average of number of blocks for which any physical activity was reported. MVPA was defined as the per day average of number of blocks for which physical activities with a MET value greater than 3 were recorded.\textsuperscript{194,198} TV use was determined by the average daily number of blocks during which subjects reported participating in, “Watching TV or movies”\textsuperscript{199}

**Soft drink intake:** Girls’ intake of soft drinks was assessed with the following item: “Over the past month, how often did you drink regular soda pop (not diet)?” Response options included: “Never”, “Less than once a week”, “1-2 times per week”, “3-4 times per week”, “5-6 times per week”, “1 time per day”, “2 times per day”, “3 times per day”, “4 times per day”, “5 or more times per day”. These response options were adapted from existing beverage intake items in the literature.\textsuperscript{202}

**Fruit and vegetable intake:** Girls’ FV intake was assessed using the questions, “Thinking back over the past week, how many servings of fruit did you usually eat on a typical day? A serving would be a medium piece of fruit. Do not include juice” and “Thinking back over the past week, how many servings of vegetables did you usually eat on a typical day? A serving would ½ cup of cooked vegetables or 1 cup of raw vegetables. Do not include potatoes or French fries.” Response options for both questions included: “None”, “Less than 1 serving”, “1 serving”, “2 servings”, “3 servings”, “4 servings”, and “5 or more servings”.\textsuperscript{79,113,185}

**Body Mass Index (BMI):** Trained study staff measured each girl’s body weight using a Tanita Body Composition Analyzer TBF-300A (Tanita Corporation of America, Arlington Heights, IL) and height using a portable stadiometer. BMI was calculated using
the formula: weight in kilograms divided by height in meters squared. Age and gender appropriate BMI percentiles were calculated based on the 2000 CDC Growth Charts. Participants with a BMI percentile less than 85th percentile categorized as healthy weight, between the 85th and less than 95th percentile were categorized as overweight, and at or above the 95th percentile were categorized as obese.

**Percent body fat:** Girls’ total percent body fat was assessed using a Lunar Prodigy dual-energy X-ray absorptiometry (DXA) apparatus (Lunar Radiation Corp., Madison, WI) at the University of Minnesota’s General Clinical Research Center. The software for adults was used as the high-school-aged girls participating in New Moves were all menstruating and close to full physical maturity. DXA has been found to be a highly valid and reliable measure of body fat.

Sociodemographic information was also collected. Girls reported their race/ethnicity, parents reported their highest level of educational attainment, and girls’ ages were calculated from their birthdate as recorded on their consent form to the date which they completed baseline data collection.

**4.2.4. Statistical Analysis**

Univariate hierarchical linear regression models were developed to examine the relationships between each of the family environment variables and girls’ behaviors (PA, MVPA, TV, and soft drink and FV intake), and BMI and percent body fat represented as continuous variables. Family environment variables were standardized to have a mean of 0 and a standard deviation of 1 to allow for comparison of strength of regression coefficients across predictors for each outcome. Girls’ age, race/ethnicity, and parental education were included as covariates in the models to reduce potential confounding. In order to account for potential clustering of behaviors among girls who attended school together, school was included in the regression models as a random effect. The outcome variables of girls’ total PA, MVPA, TV use and SD intake were also square-root transformed to an approximate Gaussian distribution, and models examining relationships
between the family environment factors and these transformed outcomes were developed. The strength and significance of resulting parameter estimates were similar in models with the transformed and non-transformed outcomes; therefore, models with the non-transformed outcomes were presented for ease of interpretation. In addition to examining the relationship between each family environment variable and corresponding behavioral or body composition outcome, single regression models were developed to examine the total association between all of the outcome-specific family environment variables and the girls’ outcomes. In order to understand the explanatory power of the family environment on girls outcomes, two models were developed to estimate the percent of variance ($R^2$) in each outcome explained by (1) age, race/ethnicity, and parental education, and (2) age, race/ethnicity, parental education, and the family environment variables. The school-level variance was not partitioned from the $R^2$ making the estimate of variance accounted for by the model a conservative estimate. Analyses were conducted using SAS 9.2 (Cary, NC).

4.3. Results
Girls reported participating in an average of 4.54 (SD=3.7) 30-minute blocks of total physical activity per day, 2.98 (SD=3.0) of which were of MVPA, and watched television 2.63 (SD=2.9) 30-minute blocks per day, on average. Girls also reported consuming soft drinks 0.81 (SD=1.4) times per day, and consuming 4.43 (SD=2.8) FV servings per day. About half (53%) of girls were normal weight (BMI <85th percentile), while 17% were overweight (85th ≤BMI<95th) and 30% were obese (BMI≥ 95th percentile).

Associations between the family environment and girls’ physical activity
In univariate analyses adjusted for race/ethnicity, parental education, and age, parents’ own total PA and family support for girls’ PA were both significantly associated with girls’ total PA (Table 4-1). Similar significant associations were seen between parents’ MVPA and family support for girls’ PA and girls’ MVPA. The presence of PA resources including exercise equipment, bicycles, and workout DVDs was marginally associated with girls’ PA and MVPA. In the mutually adjusted model, when parental modeling of
MVPA, support for PA, and PA resources were included in the same model, parents’ PA emerged as an independent predictor of girls’ MVPA. The sociodemographic characteristics of age, race/ethnicity, and parental education explained 2% of the variance in girls’ total PA and the addition of the family environment variables to the model increased the explained variance to 8%. Similarly, sociodemographic characteristics explained 4% of girls’ MVPA and the addition of the family environment variables to the model increased the explained variance to 8%.

**Associations between the family environment and girls’ TV use**
Parents’ TV use was the only family environment variable significantly associated with girls’ TV use in both the univariate and mutually adjusted models (Table 4-1). Media resources in the home, number of TVs in the home, the presence of a TV in girls’ bedroom, and familial encouragement for their daughter to decrease TV were all unrelated to girls’ TV use in both models. Sociodemographic characteristics explained 6% of the variance in girls’ TV use and the addition of the family environment variables to this model increased the variance explained to 11%.

**Associations between the family environment and girls’ soft drink intake**
In the univariate models, home availability of soft drinks and parental soft drink intake were strongly positively associated with girls’ soft drink intake (Table 4-2). These items remained independently predictive of girls’ intake in the mutually-adjusted model. Sociodemographic characteristics explained 3% of the variance in girls’ SD intake, and the addition of all of the family environment variables increased the variance explained to 15%.

**Associations between the family environment and girls’ fruit and vegetable intake**
In the univariate models, home availability of FV parents’ FV intake, familial encouragement to eat healthy food, and the frequency of family meals were all positively associated with girls’ FV intake (Table 4-2). In the mutually-adjusted analysis, parent’s FV intake remained predictive of girls’ intake. Sociodemographic characteristics
explained 9% of girls’ FV intake and the addition of the family environment variables increased the variance explained to 20%.

Associations between the family environment and girls’ BMI and percent body fat
The majority of behavior-specific family environment factors were not associated with girls’ BMI or percent body fat in either the univariate or multivariate models (Table 4-3). However, a positive relationship was observed between the number of media resources in the home and both girls’ percent body fat and BMI. The positive association between number of media resources and percent body fat remained significant in the multivariate model after adjusted for other family environment factors. Additionally, girls with more televisions in their home were more likely to have a higher BMI. Family meal frequency was inversely associated with girls’ BMI. No associations were observed between girls’ PA, TV, and dietary intake and BMI or percent body fat (Table 4-4). This indicates that the positive relationship observed between number of TVs in the home and girls’ BMI was not mediated by TV use, and the relationship between family meal frequency and girls’ BMI was not mediated by girls’ FV intake. Sociodemographic characteristics accounted for 6% of the variation in girls’ BMI, and 5% of the variation in girls’ percent body fat. The inclusion of all of the family environment factors in the models raised the variance explained to 15% for BMI and 18% for percent body fat.

4.4. Discussion
The purpose of this study was to examine the cross-sectional associations between a wide range of characteristics of the family environment and girls’ physical activity, television use, dietary behaviors, BMI, and body composition. Across all of the behavioral outcomes, in both the univariate and mutually-adjusted analyses, parents’ own behavior was strongly associated with their daughters’ behavior. As indicated by the univariate models, parental/family support and encouragement for healthy behaviors was associated with girls’ PA and FV intake, but not girls’ TV use or soft drink intake. Consistent with previous studies, family meal frequency was associated with greater intake of FV, although this association does not remain in the mutually-adjusted analyses where only
parental FV intake is independently associated with girls’ intake. In univariate models, the presence of FV and soft drinks in the home were associated with girls’ higher intake of those foods, and there was a trend suggesting PA resources in the home were associated with girls’ PA, while the presence of sedentary resources, number of TVs, and having a TV in the bedroom were not associated with girls’ TV use. The family environment factors observed in this study explained between 4 and 12 percent of the variance in girls’ weight-related behaviors beyond the contribution of sociodemographic characteristics. Few associations were observed between the family environment factors and girls’ BMI and body fatness. Only the presence of media resources, such as the number of televisions in the home, and family meal frequency were associated with girls’ BMI (positive and negative associations, respectively). These relationships between the family environment factors and BMI were not mediated by girls’ television use or FV or soft drink intake.

The family environment and girls’ physical activity
Findings that family support and encouragement play an important role in the PA habits of high-school aged girls from diverse sociodemographic backgrounds are in line with findings from previous studies, many of which included younger adolescents or predominantly white and/or high SES adolescents. While previous studies examining the relationship between parents’ own PA habits and adolescents’ activity have produced mixed results, a strong association between parental PA and girls’ PA was observed in the current study. This relationship occurring among a racially and ethnically diverse sample of adolescent girls is especially unique in that the small number of studies conducted with samples of African American girls tended to not find associations between parental activity and girls’ activity, while studies of Caucasian girls have been more likely to find such associations. However, in their meta-analysis of environmental correlates of PA in youth, Ferriera et al. noted that studies that utilized parental report of their own activity were more likely to show associations between parental PA and adolescents’ activity, a factor which may have contributed to the associations observed in the current study. Additionally, as girls who were not regularly
physically active were specifically recruited for New Moves, it may be that sedentary girls are likely to have sedentary parents, while there is a weaker association between parent and girl behavior among regularly active girls. In light of previous hypotheses that parental modeling may not be influential to adolescents’ PA habits in the absence of parental support for PA, it is informative to observe that in the mutually-adjusted model parental PA makes a unique contribution to girls’ PA, independent of parental support for PA. The findings of the current study, along with previous studies’ results, suggest that family-based PA interventions that help parents engage in physical activity, in addition to providing parents tools so they can increase the amount of support and encouragement they provide for their daughters’ PA, have potential to be successful at modifying the PA habits of the whole family.

In the univariate analyses, marginally positive relationships between home PA resources and girls’ MVPA and total PA were observed. Previously, Sallis et al found that among college students, home PA resources were associated with participation in strength exercises and vigorous exercise, and others have observed associations between physical activity, cardiovascular fitness, and home PA resources among adolescent girls. However, longitudinal examinations of these relationships found that home PA resources were not associated with changes in girls’ PA habits over time. Additional research is needed to clarify the relationship between home PA resources and adolescent girls’ PA and determine if the presence of PA resources in the home can aid efforts to help girls increase their PA.

The family environment and girls’ TV use
Despite previous studies observing multiple family environment predictors of youths’ TV use, in the current study only parental TV use was associated with girls’ TV use. This lack of consistent findings with other studies may be attributable to the fact that most previous studies examined relationships between the family environment and TV use among grade school children or younger adolescents, whose behavior may be more influenced by parents’ restriction of their TV time or by physical resources in the home.
Additionally, for the current study girls who were sedentary, did not enjoy physical activity, and were at risk for obesity were actively recruited. These girls’ TV use may be influenced by different social and environmental factors as compared to girls who are not sedentary. As the home is the venue at which most adolescents watch excessive TV, and modifying TV use has great potential to influence weight and body composition due to the associations between TV use, physical activity and dietary intake, identifying methods to intervene on adolescents’ TV use is of vital importance. Future research on ways in which the family environment influences the TV habits of girls at high risk for obesity may benefit from including qualitative methodologies to identify previously unmeasured factors.

The family environment and girls’ dietary intake
Consistent with previous studies, factors in the family environment including parental intake of soft drinks and FV, home availability of these foods, and frequency of family meals were associated with girls’ dietary intake. Of note, parental intake of both soft drinks and FV remained an independent predictor of girls’ intake, above and beyond the influence of availability of these foods in the home and at meals. These findings suggest that the positive relationship observed between parents and girls’ intake is not merely due to greater presence of these foods in the home because both parents and children eat them, but that dietary behavior can be instilled in youth through parental modeling of intake and when parents and children eat these foods together.

The family environment and girls’ BMI and body composition
Although a number of studies have examined the relationships between adolescents’ weight and family characteristics such as socioeconomic status, parental weight status, and parenting style, few studies have examined relationships between behavior-specific family environment factors such as support for and modeling of physical activity and nutrition and adolescents’ weight and body composition. In the current study, relationships were observed between media resources in the home and number of televisions in the home and girls’ BMI and between sedentary resources in the home and
This relationship was not mediated by girls’ television viewing, as a significant relationship was not observed between television viewing and girls’ BMI or body composition. A significant inverse association was also found between the frequency of family meals and girls’ BMI, a relationship which was observed cross-sectionally among young adolescent girls participating in Project EAT, a study utilizing a similarly sociodemographically diverse adolescent population\textsuperscript{221} as well as cross-sectionally among adolescents participating in the Growing Up Today Study (GUTS).\textsuperscript{222} However, in longitudinal analyses of the Project EAT and GUTS data, relationships were not observed between family meal frequency and change in weight status. As with the relationship between media resources, number of televisions and BMI, the relationship between family meals and BMI was not mediated by girls’ fruit and vegetable intake or by soft drink intake. This lack of mediation by television use and dietary intake suggests that family environment factors may influence weight and body composition via pathways other than the weight-related behaviors assessed in this study. For example, perhaps the number of media resources and televisions in the home is associated with weight status because adolescents spend time on the computer or playing video games at the expense of sleeping, an emerging risk factor for obesity.\textsuperscript{223} Future research is needed to clarify the multiple pathways through which adolescents’ family environments may influence girls’ weight. Additionally, it is possible a null relationship was observed between the behaviors assessed in this study and girls’ weight and body composition due to reporting bias in the self-report measures. For example, if there is differential bias in the reporting of television use by girls’ weight status and girls who are overweight underestimate their television use, a relationship between television use and weight would not be observed, despite its existence. More refined methodologies are needed to increase the validity of measurement of adolescents’ physical activity, sedentary activity, and dietary intake which may clarify relationships between these behaviors and weight and body composition.

This study addressed a number of gaps in the literature by examining the role of the family environment in girls’ weight-related behaviors among a racially, ethnically and
socioeconomically diverse group of adolescent girls who were either currently overweight or obese or at risk for obesity due to a sedentary lifestyle. An additional strength of this study was the use of parental report of the family environment, which may be more valid than adolescents’ report, and highlights key areas for interventions aiming to modify parental behavior and the presence of resources in the home. Limitations of the current study include its cross-sectional design, which does not allow for an examination of the temporal relationship between family environment factors and girls’ behavior, and the use of self-report measures for family environment factors as well as girls’ behavior, which may be subject to reporting bias.

In conclusion, the family environment provides a number of opportunities through which adolescent girls’ participation in physical activity and healthy dietary intake may be improved. Specifically, parental behavior, familial encouragement for physical activity, home food availability, and frequency of family meals appear to play significant roles in youths’ behavior. While longitudinal observational and intervention research is needed to better discern causal relationships, interventions that aim to modify parents’ behavior, together with or in the absence of intervening on adolescents’ behavior, may be successful in reducing obesity risk for both parents and children. However, despite the number of significant associations observed between the family environment and girls’ behavior and weight status, the family environment factors assessed in the current study accounted for only a small percentage of the variation in girls’ behavior suggesting that future research examine the influence of both novel components of the family environment and factors outside of the home on girls’ weight-related behaviors.
Table 4-1: Physical activity and sedentary activity–related family environment factors and associations with girls’ total physical activity, moderate-to-vigorous physical activity, and television use

<table>
<thead>
<tr>
<th>Outcome: Girls’ Total Physical Activity (PA)</th>
<th>N</th>
<th>Univariate Analyses</th>
<th>Mutually Adjusted Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>252</td>
<td>.51 .067</td>
<td>0.29 .308</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>251</td>
<td>.59 .016</td>
<td>0.48 .062</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>249</td>
<td>.63 .011</td>
<td>0.41 .121</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ Moderate-to-Vigorous Physical Activity (MVPA)</th>
<th>N</th>
<th>Univariate Analyses</th>
<th>Mutually Adjusted Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>252</td>
<td>.41 .063</td>
<td>0.22 .336</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>251</td>
<td>.48 .014</td>
<td>0.40 .047</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>249</td>
<td>.47 .016</td>
<td>0.28 .169</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ Television (TV) Use</th>
<th>N</th>
<th>Univariate Analyses</th>
<th>Mutually Adjusted Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media resources</td>
<td>251</td>
<td>.19 .318</td>
<td>0.27 .182</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>248</td>
<td>.28 .125</td>
<td>0.04 .861</td>
</tr>
<tr>
<td>TV in bedroom</td>
<td>239</td>
<td>.31 .136</td>
<td>0.25 .265</td>
</tr>
<tr>
<td>Parental TV use</td>
<td>248</td>
<td>.49 .008</td>
<td>0.43 .033</td>
</tr>
<tr>
<td>Familial encouragement to decrease TV use</td>
<td>250</td>
<td>-.14 .446</td>
<td>0.04 .836</td>
</tr>
</tbody>
</table>

1 Models adjusted for race/ethnicity, parental education, age, and school as random effect.
2 Model included outcome-specific independent variables, race/ethnicity, parental education, age, and school as random effect.
Table 4-2: Nutrition–related family environment factors and associations with girls’ soft drink and fruit and vegetable intake

<table>
<thead>
<tr>
<th>Outcome: Soft Drink (SD) Intake</th>
<th>N</th>
<th>Estimate</th>
<th>p</th>
<th>N</th>
<th>Estimate</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy food available at home</td>
<td>251</td>
<td>-0.11</td>
<td>.238</td>
<td>251</td>
<td>-0.09</td>
<td>.347</td>
</tr>
<tr>
<td>Home SD availability</td>
<td>251</td>
<td>0.41</td>
<td>&lt;.001</td>
<td>250</td>
<td>0.31</td>
<td>.003</td>
</tr>
<tr>
<td>Parental SD intake</td>
<td>250</td>
<td>0.44</td>
<td>&lt;.001</td>
<td>250</td>
<td>0.30</td>
<td>.005</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy foods</td>
<td>249</td>
<td>0.03</td>
<td>.706</td>
<td>249</td>
<td>0.14</td>
<td>.156</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>252</td>
<td>0.05</td>
<td>.546</td>
<td>252</td>
<td>0.09</td>
<td>.308</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>252</td>
<td>0.02</td>
<td>.782</td>
<td>252</td>
<td>-0.09</td>
<td>.310</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Fruit and Vegetable (FV) Intake</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Home availability of FV</td>
<td>251</td>
<td>0.71</td>
<td>&lt;.001</td>
<td>251</td>
<td>0.28</td>
<td>.174</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>247</td>
<td>0.06</td>
<td>.749</td>
<td>247</td>
<td>0.10</td>
<td>.574</td>
</tr>
<tr>
<td>Parental FV intake</td>
<td>251</td>
<td>0.85</td>
<td>&lt;.001</td>
<td>251</td>
<td>0.66</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Parental encouragement to eat healthy food</td>
<td>249</td>
<td>0.53</td>
<td>.003</td>
<td>249</td>
<td>0.28</td>
<td>.155</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>252</td>
<td>0.41</td>
<td>.023</td>
<td>252</td>
<td>0.08</td>
<td>.687</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>252</td>
<td>0.10</td>
<td>.563</td>
<td>252</td>
<td>0.05</td>
<td>.773</td>
</tr>
</tbody>
</table>

1 Models adjusted for race/ethnicity, parental education, age, and school as random effect.
2 Model included outcome-specific independent variables, race/ethnicity, parental education, age, and school as random effect.
Table 4-3: Family environment factors and associations with girls’ weight and body composition\(^1\)

<table>
<thead>
<tr>
<th>Family Environment Factor</th>
<th>Univariate analyses</th>
<th>Mutually-adjusted analysis</th>
<th>Univariate analyses</th>
<th>Mutually-adjusted analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>p</td>
<td>Estimate</td>
<td>p</td>
</tr>
<tr>
<td>PA-related Family Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home PA Resources</td>
<td>0.24</td>
<td>.630</td>
<td>0.09</td>
<td>.892</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>0.03</td>
<td>.943</td>
<td>0.10</td>
<td>.924</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>0.08</td>
<td>.850</td>
<td>0.10</td>
<td>.918</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>0.22</td>
<td>.623</td>
<td>0.09</td>
<td>.884</td>
</tr>
<tr>
<td>Television-related Family Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media resources</td>
<td>1.04</td>
<td>.018</td>
<td>0.68</td>
<td>.199</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>0.97</td>
<td>.030</td>
<td>0.58</td>
<td>.322</td>
</tr>
<tr>
<td>Television in bedroom</td>
<td>0.74</td>
<td>.123</td>
<td>0.71</td>
<td>.215</td>
</tr>
<tr>
<td>Parental television use</td>
<td>0.67</td>
<td>.128</td>
<td>0.30</td>
<td>.576</td>
</tr>
<tr>
<td>Familial encouragement to decrease television use</td>
<td>0.18</td>
<td>.689</td>
<td>-0.17</td>
<td>.759</td>
</tr>
<tr>
<td>Dietary intake-related Family Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy food available at home</td>
<td>-0.15</td>
<td>.728</td>
<td>0.19</td>
<td>.757</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>-0.32</td>
<td>.472</td>
<td>-0.04</td>
<td>.964</td>
</tr>
<tr>
<td>Home soft drink availability</td>
<td>-0.58</td>
<td>.211</td>
<td>-0.98</td>
<td>.347</td>
</tr>
<tr>
<td>Parental soft drink intake</td>
<td>0.26</td>
<td>.565</td>
<td>0.40</td>
<td>.510</td>
</tr>
<tr>
<td>Parental F&amp;V intake</td>
<td>-0.40</td>
<td>.376</td>
<td>-0.47</td>
<td>.386</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy food</td>
<td>0.52</td>
<td>.235</td>
<td>0.52</td>
<td>.394</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>-0.99</td>
<td>.023</td>
<td>-0.81</td>
<td>.117</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>0.35</td>
<td>.410</td>
<td>0.33</td>
<td>.491</td>
</tr>
</tbody>
</table>

\(^1\)Models adjusted for race/ethnicity, parental education, age, and school as random effect.
Table 4-4: Cross-sectional associations between girls’ weight-related behaviors and BMI and percent body fat\(^1\)

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th></th>
<th>Percent Body Fat</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>(p)</td>
<td>Estimate</td>
<td>(p)</td>
</tr>
<tr>
<td>Total physical activity</td>
<td>0.07</td>
<td>.879</td>
<td>-0.42</td>
<td>.511</td>
</tr>
<tr>
<td>Moderate-to-vigorous physical</td>
<td>0.20</td>
<td>.654</td>
<td>-0.29</td>
<td>.646</td>
</tr>
<tr>
<td>activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television use</td>
<td>-0.18</td>
<td>.684</td>
<td>0.51</td>
<td>.432</td>
</tr>
<tr>
<td>Soft drink intake</td>
<td>0.13</td>
<td>.770</td>
<td>0.33</td>
<td>.610</td>
</tr>
<tr>
<td>Fruit and vegetable intake</td>
<td>0.14</td>
<td>.748</td>
<td>-0.20</td>
<td>.763</td>
</tr>
</tbody>
</table>

\(^1\)Independent variables have been standardized to have a mean = 0 and standard deviation = 1. Age, race/ethnicity, and parental education included as covariates.
Chapter 5: Relationships between the family environment and school-based obesity prevention efforts: Can school programs help adolescents most in need?

**Introduction**: Little is known about the role that adolescents’ family environments play in the outcomes of school-based obesity prevention interventions. The objectives of the current analyses are to examine whether factors in adolescent girls’ family environments are associated with girls successfully increasing physical activity (PA) levels and fruit and vegetable (FV) consumption, decreasing television use (TV) and soft drink intake, and improving body mass index (BMI) and body composition over the course of New Moves, a school-based physical activity and nutrition intervention and to explore whether factors in the family environment serve to modify the effect of New Moves.

**Methods**: Subjects included high school-aged girls who were enrolled in New Moves and one of their parents (n = 253). At baseline and follow-up 9 months later, girls’ behavioral outcomes were measured by self-report, height and weight were measured by study staff, and body fat was measured by dual-energy X-ray absorptiometry (DXA). At baseline, parents completed surveys assessing the family environment. Hierarchical logistic regression was used to determine the relationship between family environment factors and girls’ odds of improvement in study outcomes. Baseline-adjusted hierarchical linear regression models were used to examine modification of the effect of New Moves by family characteristics.

**Results**: Few family environment factors were associated with girls’ successful behavior, weight, and body composition change during New Moves. However, for some outcomes such as soft drink intake and BMI, girls from family environments that were less supportive of healthful behaviors were more likely to improve over the course of the intervention. Only one family environment characteristic modified the effect of New Moves; a reduction in BMI was observed among girls in the intervention condition with 4 or more TVs in their home, as compared to girls in the control condition with 4 or more televisions at home (p=.052).
Conclusions: Overall, adolescent girls who improved their weight-related behaviors, BMI, and body composition did so independent of their family environment. Interventions that aim to prevent obesity among high-school aged adolescents may not need to ensure that participants’ families are supportive of their behavior change efforts, and may particularly be successful in promoting healthful behavior and weight among adolescents whose families are not able to provide support and resources.
5.1. Introduction

Factors in the family environment such as parental modeling of and support for physical activity, the frequency of family meals, and resources available in the home including healthy foods and exercise equipment, are believed to play a role youths’ physical activity levels, sedentary behavior, healthful dietary intake, and weight status.\textsuperscript{104,106,120,136} Although additional research is still needed to better understand the mechanisms through which the family environment influences the development and maintenance of children’s health behavior, the family is thought to be an important target for obesity prevention and treatment interventions. Many clinic-based obesity treatment programs for youth have been successful at improving children’s physical activity, dietary intake, and weight status through working with parents,\textsuperscript{143,144,146,147,224,225} adding evidence to the belief that the parents and families are key players in efforts to prevent obesity among youth.

Despite the importance of the family environment for the development and sustainment of healthful behavior, the majority of obesity prevention efforts access youth through schools. Schools are considered an ideal venue for obesity prevention programming as almost all youth spend a significant number of hours at school each day. Also, schools have the facilities for either classroom or physical activity-based lessons, provide ample opportunities for policy interventions such as modifying cafeteria or vending machine food options, and employ personnel trained in education who are able to implement obesity prevention curricula. Since adolescents are autonomous from their families and increasingly rely on support from their peers and as well as have their own financial and transportation resources, schools are an especially ideal location for obesity prevention efforts aimed at this age group. School-based interventions may also be particularly useful for accessing adolescents from lower socioeconomic status (SES) backgrounds or specific racial/ethnic groups who are at particularly high risk for obesity\textsuperscript{2} and who may have received limited support and resources for physical activity and healthful dietary intake from their families.\textsuperscript{102,116,127,226} Unfortunately, few school-based interventions for adolescents have been successful at improving participants’ weight status or participation in weight-related behaviors such as physical activity and dietary intake.\textsuperscript{154-158}
In light of the benefits of implementing programs to affect youth via schools, the strong relationship between the family environment and youths’ behavior, and the disappointing results thus far of school-based interventions for adolescents, an important question is whether school-based interventions have the potential to improve the weight and weight-related behaviors of all adolescents, or whether factors in adolescents’ family environments help or hinder the ability of school-based interventions to succeed. The answers to this question impact the development of school-based interventions, including whether school-based interventions need to reach out to parents and improve students’ family environments in order to ensure success of the intervention, as well as whether intervention activities should be targeted and tailored to specific populations of adolescents depending on their families’ ability to provide the support and resources adolescents may need to obtain a healthy weight.

To our knowledge, only two studies have examined whether students with specific family characteristics have a greater likelihood of success in a school-based obesity prevention program. Among first graders in Germany who participated in the school-based intervention of the Kiel Obesity Prevention Study (KOPS), those from higher SES families had a significantly decreased risk of being overweight after 4 years, while children from lower and middle SES families did not have any decreased risk of being overweight. Additionally, children of normal weight mothers had a marginally significant decrease in BMI after 4 years, while children with overweight mothers did not benefit from the intervention. These findings suggest a differential effect of a school-based intervention due to students’ family environment. However, as KOPS targeted younger children and examined the influence of a limited number of familial characteristics, the importance of the family environment to adolescents’ change in weight and weight-related behaviors via school-based obesity prevention interventions may be different due to adolescents’ increasing independence. In comparison, Martens et al examined associations between family environment factors including parenting style, parental food purchasing habits, family rules regarding fruit and snack
consumption, and home fruit and snack availability, and young adolescents’ improvement in fruit and low-fat snack consumption during the Krachtvoer intervention which was conducted in 18 Dutch schools that targeted low SES students. Analyses revealed that there were no associations between any of the family environment factors and students’ change in fruit and snack consumption. The authors concluded that the lack of associations between the family environment and adolescents’ behavior change indicated that there were no subgroups of adolescents who profited less from the intervention due to their family environment, and therefore it may not be necessary to involve families in interventions and attempt to improve the family environment in order to affect behavior change among adolescents.

Utilizing data from New Moves, a school-based physical activity and nutrition intervention for adolescent girls who are overweight, obese, or at high risk for obesity due to a sedentary lifestyle, the current study aims to fill gaps in the existing literature on the role of family in the outcomes of school-based interventions to prevent obesity and other weight-related problems. New Moves was designed to prevent obesity and other weight-related problems via a girls-only physical education class and supplementary school-based activities. New Moves was effective in improving a number of weight-related behaviors including decreasing the time girls spent engaging in sedentary behavior and decreasing girls’ use of unhealthy weight control behaviors. To address questions regarding the ability of school-based interventions to improve the behaviors and weight of students who do not have a supportive family environment, the research questions this study aims to explore are: 1) Are there differences in the family environments of girls who successfully improved their physical activity, television use, dietary patterns, weight, and body composition over the course of the New Moves intervention, as compared to girls who were unsuccessful at making healthful changes? and 2) Was the New Moves intervention differentially effective among girls whose families provide them support and resources for physical activity and healthful dietary intake, as compared to girls who do not have a supportive family environment?
5.2. Methods

5.2.1. Study Design
Subjects were high school-aged girls (mean age = 15.7, SD =1.1) who participated in New Moves, a school-based nutrition and physical activity intervention, and one of their parents. Of the 356 girls from 12 schools who participated in the intervention, 71.3% had a parent or guardian complete a survey about their family environment, resulting in a sample of 253 parent/girl dyads for the current analyses. Girls and their parents completed a baseline assessment before participation in the New Moves intervention, and girls participated in a follow-up assessment that occurred at the end of the school year in which they participated in New Moves. Most girls completed study measures at the University of Minnesota’s General Clinical Research Center, but a small number completed the study measures at their school if they were unable to leave during the school day due to class obligations. An invitation for parents to participate in the study was mailed to the girls’ homes after parents provided consent for their daughter’s participation in New Moves. The majority of parents completed a survey assessing the family environment via mail, with 2% completing the survey over the phone with the help of research staff. The study was approved by the University of Minnesota’s Institutional Review Board and by each participating school district. Girls and parents provided consent/assent for their participation in the study.

5.2.2. Description of New Moves intervention
New Moves targeted girls who were overweight or obese, inactive and/or interested in learning about healthy weight management. A total of twelve schools were recruited with six randomly selected to offer the active intervention and six randomly selected to serve as comparison schools. The intervention was delivered primarily through a girls-only physical education class during which girls participated in physical activity lessons that focused on life-long activity within a non-competitive environment, nutrition education sessions that stressed a non-dieting, healthy eating approach to healthy weight management, and social support sessions that focused on enhancing self-esteem and body image. Additional components of New Moves that were designed to complement the
skills gained during the classroom components included individual counseling sessions with a New Moves coach using motivational interviewing techniques, maintenance sessions where a healthy lunch was provided and behavioral messages reinforced after the completion of the physical education class, and minimal parental outreach activities. In the comparison schools, girls participated in an all-girls physical education class without the supplementary activities.80

5.2.3. Description of Measures

*Family environment measures*

Selection of constructs to assess in the weight-related family environment was guided by Social Cognitive Theory which emphasizes the importance of individuals’ environment in influencing health behaviors,74,228 as well as previous research on the weight-related family environment which views the family environment as being comprised of both physical resources and space where behavior occurs, as well as the social environment which includes the provision of support by families and health behavior modeling.77,78 Survey items were selected based on their psychometric qualities and were pilot tested by 10 parents of adolescents for applicability and comprehension.

*Family Physical Activity (PA) Environment:* Home availability of PA resources was assessed by parents’ response to whether each of nine common types of exercise equipment (e.g. bicycle, exercise workout videotapes or DVDs, skis or snowboards) was available in their home, yard or apartment complex.94 Parental modeling of PA was determined by parents’ response to three questions regarding the time spent participating in light, moderate and vigorous PA per week. (test-retest r=.48-.94)184 To assess family support/encouragement for PA, parents responded to five questions regarding the frequency with which they or others in their family provided various types of logistical and emotional support for physical activity to their daughter. Examples of types of support include providing transportation to a place where their daughter could participate in PA, participating in PA with their daughter, and telling their daughter she did well in a physical activity or sport (Cronbach’s α = .78, test-retest r=.81).85
Family Television (TV) use Environment: Media resources in the home were assessed by parents’ response to whether they had each of five types of media technology (e.g. cable television and video/DVD player) in their home. Parents were also asked to report how many televisions they had in their home (response options ranged from 0 to 4 or more), and girls were asked whether they had a television in the room where they sleep. Parents’ television use was assessed with two questions regarding the number of hours they spend watching TV/videos/DVDs on weekdays and weekends. These questions were combined to produce the average weekly hours of parental TV use. Family support for limiting TV use was assessed with a single question regarding how often the parent or someone else in the household encouraged their daughter to watch less TV.

Family Food Environment: Parents reported on the availability of healthy food in the home with two questions regarding the frequency with which fruits and vegetables (FV) are available in the home and two questions regarding how often FV are served at meals (Cronbach’s $\alpha = .63$, test-retest $r = .54-.59$). Unhealthy home food availability was measured with three questions regarding the availability of soft drinks, salty snacks, and candy, and one question regarding the frequency with which soft drinks are served at meals (Cronbach’s $\alpha = .80$, test-retest $r = .55-.72$). Parental modeling of fruit and vegetable intake was assessed with two questions regarding the number of servings of each type of food eaten on a typical day. Parents’ soft drink intake was assessed with a single item regarding how many servings of regular soft drinks they drank in a typical week. Frequency of family support for healthy eating was assessed with a single item (test-retest = .70) with response options ranging from “Never” to “Always”. Weekly frequency of family meals (test-retest = .74) and fast food for family meals were also each measured with a single item.

Dependent variables
Physical activity and television use: Girls’ total daily PA, daily moderate-to-vigorous physical activity (MVPA), and TV use were assessed using the 3-Day Physical Activity
Recall (3DPAR). The 3DPAR has been shown to be a valid measure of MVPA compared to accelerometry, and among adolescent girls had a test-retest reliability of $r=.71$ and $r=.77$ for moderate and vigorous activity, respectively. The 3DPAR asks participants to recall the activities that they participated in during the majority of each 30-minute block between 6 AM and midnight on the three days previous to the day of data collection. A list of 65 common physical activities and sedentary behaviors was provided. If a participant recorded engaging in a physical activity during a block, she was also asked to report whether her exertion level during that block was light, moderate, hard or very hard. For each physical activity at each exertion level, a corresponding metabolic equivalent (MET) value was identified. Total PA was defined as a per day average of number of blocks for which any physical activity was reported. MVPA was defined as the per day average of number of blocks for which physical activities with a MET value greater than 3 were recorded. TV use was determined by the average daily number of blocks during which subjects reported participating in, “Watching TV or movies”.

**Soft drink intake:** Girls’ intake of soft drinks was assessed with the following item: “Over the past month, how often did you drink regular soda pop (not diet)?” Response options included: “Never”, “Less than once a week”, “1-2 times per week”, “3-4 times per week”, “5-6 times per week”, “1 time per day”, “2 times per day”, “3 times per day”, “4 times per day”, “5 or more times per day”. These response options were adapted from existing beverage intake items in the literature.

**Fruit and vegetable intake:** Girls’ FV intake was assessed using the question, “Thinking back over the past week, how many servings of fruit did you usually eat on a typical day? A serving would be a medium piece of fruit. Do not include juice” and “Thinking back over the past week, how many servings of vegetables did you usually eat on a typical day? A serving would ½ cup of cooked vegetables or 1 cup of raw vegetables. Do not include potatoes or French fries”. Response options for both questions included: “None”, “Less than 1 serving”, “1 serving”, “2 servings”, “3 servings”, “4 servings”, and “5 or more servings”. FV intake was also assessed by a single 24-hour dietary recall.
conducted by trained research staff (Nutrition Data System for Research software version 2006 developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN). Data from a single 24-hour dietary recall can be used when examining group level changes in average consumption, such as when examining modification of the intervention effect by family characteristics.

**Body Mass Index (BMI):** Trained study staff measured girl’s body weight using a Tanita Body Composition Analyzer TBF-300A (Tanita Corporation of America, Arlington Heights, IL) and height using a portable stadiometer. BMI was calculated using the formula: weight in kilograms divided by height in meters squared.

**Percent body fat:** Girls’ total percent body fat was assessed using a Lunar Prodigy dual-energy X-ray absorptiometry (DXA) apparatus (Lunar Radiation Corp., Madison, WI) at the University of Minnesota’s General Clinical Research Center. The software for adults was used as the high-school-aged girls participating in New Moves were all menstruating and close to full physical maturity. DXA has been found to be a highly valid and reliable measure of body fat.188-190

Sociodemographic information was also collected. Girls reported their race/ethnicity, parents reported their highest level of educational attainment, and girls’ ages were calculated from their birthdate as recorded on their consent form to the date which they completed baseline data collection.

**5.2.4. Statistical Analysis**

Two analytic techniques were used to examine whether girls’ baseline family environment was associated with girls’ successful change in weight-related behavior, weight and body composition among girls who participated in the intervention condition, and whether family environment factors served as effect modifiers of the New Moves intervention. First, to examine relationships between the family environment factors and girls’ successful change, outcome-specific baseline to follow change scores were
calculated and divided into quintiles. Girls were classified as being successful in modifying their PA, MVPA, and FV intake if they were in the upper two quintiles of change (greatest increase) in the anticipated direction, while girls were classified as unsuccessful if their change score was in the lower two quintiles. Similarly, girls were classified as being successful in modifying their TV use, soft drink intake, BMI and percent body fat if their change score fell in the lower two quintiles (greatest decrease), while girls were classified as unsuccessful if their change score was in the upper two quintiles. In order to reduce misclassification bias, girls whose change score was in the middle quintile for a specific outcome were excluded from further analyses of that outcome. For comparison, cut points for successful behavior, weight and body composition change were determined and girls were stratified into “successful” and “unsuccessful” for each outcome based on this value. Girls were determined to be successful if they increased their total PA by 2 30-minute blocks/day, increased their MVPA by 1 30-minute block/day, decreased their TV use by 1 30-minute block/day, decreased their soft drink intake by $\frac{1}{2}$ times per day, increased their FV intake by 2 servings per day, decreased their BMI by 1 unit, or decreased their body fat by 2%. Hierarchical logistic regression models were then developed to examine the univariate relationship between the outcome-specific family environment characteristics and the odds of being successful at improving behavior classified both by quintile of change as well as specific cutpoints of change. To aid comparison across family environment variables, each was standardized to a mean of 0 and a standard deviation of 1. Regression models were adjusted for race, age, and parental education, and school was included in the models as a random effect to account for potential clustering of behaviors among girls who attended school together. However, it was anticipated that the variance inflation of the regression coefficient due to clustering would be very small, as the interclass correlation (ICC) of a regression coefficient is the product of the ICC for the independent variable (e.g. family meal frequency) and the ICC of the dependent variable (e.g. FV intake). Similar models were also used to determine the relationship between each family environment characteristic and the odds of girls successfully reducing their BMI and percent body fat. Due to non-convergence of the logistic regression models, analyses
that examined the association between family environment factors and girls’ successful decreasing in percent body fat using a cutoff of a decrease of 2% body fat to define success did not include the random effect of school.

To determine whether there was effect modification of the New Moves intervention by each of the family environment characteristics among the full sample of girl/parent dyads, baseline-adjusted hierarchical linear regression models were developed. These models included the main effects of condition and the family characteristic variable, as well as a condition by family characteristic interaction term. Models also allowed for a random intercept and included the family characteristic as a random coefficient. School was nested within condition implying that the variances of means for the intervention and control conditions include school variability. The significance of the interaction term was based on the t statistic with 10 degrees of freedom. Due to the exploratory nature of this analysis, significant interaction terms pointed to areas that might warrant further research, one of which was explored graphically.

5.3. Results

5.3.1. Family environment predictors of girls’ successful behavior, BMI, and body composition change

Table 5-1 demonstrates the mean change and range of change among girls who were successful or unsuccessful at modifying their behavior, weight, and/or body composition during New Moves. For example, among girls successful at decreasing their soft drink intake, mean intake decreased by 1.02 times per day, with a range of decrease between 0.11 and 5.29 times per day. Meanwhile, girls who were not successful at decreasing their soft drink intake drank soft drinks 0.38 times more often per day at follow-up (range: 0-5 times/day).

The likelihood of girls’ success at improving their weight-related behaviors, BMI, or percent body fat did not differ by girls’ race/ethnicity or parental education (Table 5-2). Girls’ age was associated with girls’ likelihood of successfully improving their FV
intake, with 16-year-old girls being more likely to successfully improve intake compared to younger girls. Weight status was also unrelated to the likelihood of improving activity and dietary behavior. However, there was an association between girls’ baseline weight status and success in decreasing BMI over the course of the intervention, with 61.9% of girls who started the program overweight successfully decreasing their BMI as compared to 28.8% of normal weight girls and 46.5% of obese girls.

Few associations were observed between family environment factors and the odds of girls successfully improving their physical activity, television use, or soft drink or FV intake (Table 5-3). However, girls with greater parental support for physical activity at baseline had a lower odds of successfully improving their MVPA (OR=.62, p=.042), while girls with higher availability of soft drinks at home had a greater odds of successfully decreasing their soft drink intake (OR=1.99 p=.005). Additionally, girls with more TVs in the home had a greater odds decreasing their BMI (OR=1.65, p=.035), and girls with more media resources such as DVD players and cable had a greater odds of decreasing their percent body fat (OR=1.87, p=.026) (Table 5-4). This pattern of statistically significant associations suggests that girls from less supportive family environments had greater odds of success in improving their behavior, weight and body composition.

When examining analyses that used specific cutpoints to categorize girls’ successful behavior, weight or body composition change, the majority of the relationships that were seen in the previous analysis that were statistically significant remained in the same direction but became marginally significant. Family support for PA was associated with a lower odds of girls successfully increasing their MPVA (OR=0.67, p=.068) and greater home availability of soft drinks was associated with higher odds of successfully decreasing soft drink intake (OR=1.65, p=.062). The association with TVs in the home and girls’ successful decrease in BMI remained statistically significant (OR = 4.54, p=.003), while the association between media resources in the home and successful reduction of percent body fat was no longer significant (OR=1.29, p=.373).
In light of the positive cross-sectional associations observed between number of televisions in the home and girls’ BMI, and media resources in the home and girls’ percent body fat, questions arose as to whether these family environment factors were associated with girls’ successful change because they were an indicator of girls starting the study at a higher BMI or percent body fat. However, the associations between number of televisions in the home and success at reducing BMI, and media resources and success at decreasing percent body fat, remained significant after adjustment for baseline BMI or percent body fat (OR=1.64, p=.039 and OR=1.83, p=.035 respectively). The presence of these relationships regardless of adjustment for baseline BMI or body fat suggests that these relationships were not significant only because girls with these family characteristics began the study with higher BMIs and percent body fat.

5.3.2. Effect Modification of the New Moves intervention by family environment factors

There were no statistically significant interactions of the New Moves intervention effect by family environment factors on the outcome behaviors of physical activity, television use, and soft drink and fruit and vegetable intake (Table 5-5) or percent body fat (Table 5-6). Similar null associations for the outcome of FV intake were observed when intake was assessed by a single 24-hour dietary recall (data not shown). The only statistically significant effect was that the number of televisions in girls’ home modified the effect of the intervention on girls’ change in BMI (Interaction term estimate = -0.39, p=.042). In order to fully explore these relationships, the continuous variable representing number of televisions in the home was divided into categories of 2 or fewer TVs (n=94), 3 TVs (n=68), and 4 or more TVs (n=86) in the home. First, girls’ unadjusted baseline and follow-up mean BMI were calculated by intervention condition for those with 2 or fewer TVs, 3 TVs, and 4 or more TVs. Figure 5-1 demonstrates that the mean BMI of girls with 2 or fewer, and 3 TVs at home increased regardless of study condition. The mean BMI of girls in the control condition with 4 or more TVs at home increased by .55 units, which is comparable to the increase in BMI among girls with fewer televisions at home.

Meanwhile, the mean BMI of girls in the intervention condition with 4 or more TVs at home decreased by .13 units. Next, separate regression models for girls with 2 or fewer
TVs, 3 TVs, and 4 or more TVs in the home were developed to obtain the baseline-adjusted follow-up mean BMI for each intervention condition. As shown in Figure 5-2, among girls with 2 or fewer TVs and 3 TVs at home those in the intervention condition had a slightly higher baseline-adjusted BMI at follow-up as compared to girls in the control condition. Among girls with 4 or more TVs at home, girls in the intervention condition had a lower baseline-adjusted BMI at follow-up as compared to girls in the control condition. This difference in BMI at follow-up by condition among girls with 4 or more TVs in the home was marginally statistically significant (p from intervention condition estimate in stratified model =.052).

5.4. Discussion
The purpose of these analyses were to explore the role of the family environment in girls’ change in weight-related behavior, BMI, and body composition during the New Moves intervention with the goal of understanding whether adolescents have the potential to succeed in school-based obesity prevention efforts regardless of support from their families. The first aim was to identify associations between a wide range of factors in girls’ weight-related family environments and girls’ successes in improving physical activity, sedentary behavior, dietary intake, weight, and body composition over the course of New Moves. The majority of family environment factors were not associated with girls’ improvement in the behavioral outcomes. However, lower family support for physical activity and higher availability of soft drinks in the home were associated with higher odds of girls successfully improving their MVPA and soft drink intake respectively. Additionally, while few family environment factors were associated with girls’ improvement of BMI and percent body fat, girls with more TVs in the home had a greater odds of successfully decreasing their BMI, and girls with more media resources had a greater odds of successfully decreasing their percent body fat. While the lack of significant associations demonstrates that the high school-age girls who participated in New Moves were able to successfully improve their behavior, weight, and body composition independent of their family environment, the few significant relationships suggest that girls from unsupportive family environments may be more successful than
girls from supportive family environments at modifying their behavior, weight, and body composition during a school-based intervention.

The second aim of the study was to examine whether factors in girls’ family environments modified the effect of the New Moves intervention on girls’ behavior, BMI, and percent body fat. This was an exploratory analysis as investigating the relationship between girls’ family environments and the effect of the intervention was not a primary aim of New Moves and an examination of effect modification was underpowered. None of the family environment factors modified the effect of New Moves on girls’ physical activity, TV use, soft drink intake, FV intake, or percent body fat. One significant interaction was observed when examining differences in the effect of New Moves on girls’ BMI by the number of TVs in girls’ homes. Among girls with 4 or more televisions in their home, girls in the intervention condition had a lower BMI at follow-up compared to girls in the control condition. This difference was marginally statistically significant indicating that New Moves may have contributed to a BMI reduction among girls with 4 or more televisions in their home. When considering these findings it is important to consider that while there was a trend toward New Moves improving girls’ total physical activity, New Moves did not significantly impact the other behavioral and body composition outcomes examined in the current study. Despite this limitation, findings of both study aims indicate that while few differences were seen in girls’ outcomes by family environment factors, girls from less supportive family environments may have benefitted more from the school-based intervention.

These findings, along with those of Martens et al\textsuperscript{181} who similarly found that adolescents’ change in fruit and vegetable and high-fat snack intake over the course of a school-based intervention were unrelated to factors in the family environment, give hope for interventions to promote successful behavior and weight change among all adolescents, not only those whose families are supportive of healthful behavior. In light of the poor outcomes seen in many school-based interventions,\textsuperscript{154-158} additional research is needed to determine effective methods to prevent and reduce obesity among adolescents.
Interventions that have worked to modify multiple components of the school environment including classroom lessons, physical education classes, and cafeteria and non-competitive food offerings as well as improve community resources have shown great promise. Newly emerging research has also identified that weight status tends to cluster within peer networks; therefore, working to modify the dietary behavior and physical activity norms of groups of friends within the context of school-based group randomized trials may be a successful intervention strategy.

Following recommendations to engage families in obesity prevention programs for youth, many school-based interventions incorporated family components to help families provide a supportive environment for their adolescents and/or help parents change their behavior in coordination with their children. Several recent meta-analyses have determined that school-based interventions that aimed to engage the families of youth either did not show a greater effect on participants’ weight compared to studies that did not reach out to families, or were only marginally more successful. There are a number of reasons why parental involvement may not have contributed to better intervention outcomes including lack of an intensive enough intervention for families, or low parental participation in intervention activities. Unfortunately, many school-based programs have found that often parents are unwilling or unable to participate in intervention activities and/or make significant modifications to their family environment. Many families, particularly those of lower SES, have limited time and financial resources and often have competing responsibilities in the evenings and on weekends. Additionally, parents report that they have chosen not to participate in school-based health programming because intervention activities were boring and time consuming, there were too many materials to read, they didn’t feel the topic was a priority for their children, they felt the topic was a private matter, they feared being judged or stigmatized, and that schools could be threatening locations. Findings from other studies, in conjunction with findings from the current study, suggest that in choosing how to spend scarce resources on interventions aimed at improving the weight-
related behavior of adolescents it may be best to invest in adolescent-focused activities rather than on trying to engage the family.

Strengths of the current analyses include the use of a longitudinal study design, which allowed for an examination of the temporality of relationships between the family environment and girls’ behavior, as well as an experimental study design in which randomization precludes any investigator selection bias and tends in a finite sample to balance the intervention and control populations. Additionally, the study population was racially/ethnically and socioeconomically diverse, and girls were either currently overweight or obese, or at high risk for obesity due to a sedentary lifestyle. Understanding how to design interventions to improve the physical activity habits and dietary intake of girls such as these is essential. A study limitation is that the family environment was assessed at baseline, and families could have differentially improved their family environment during their daughter’s participation in the intervention. In light of the minimal parent outreach during New Moves, and previous school-based studies’ limited success in modifying adolescents’ family environments,\textsuperscript{167} it is unlikely that families that were unsupportive of healthful behavior at baseline became significantly more supportive over the period of the study. Additionally, as exploration of potential effect modification by family environment characteristics was not a primary aim of the New Moves intervention, this analysis was underpowered which decreased the ability to detect a significant interaction effect if one existed. Therefore, while the current exploratory study suggests that participants’ family environments did not consistently modify the effect of New Moves, further research examining predictors of adolescents’ success in school-based interventions would further clarify the role of the family environment in school-based interventions.

Physical inactivity, poor dietary intake, and overweight and obesity among adolescent girls are significant public health concerns.\textsuperscript{234} Thus far, few interventions have found success at improving healthful behavior and reducing the prevalence of obesity among this population.\textsuperscript{154} Identifying approaches that have the greatest potential to affect these
girls is important to make the best use of limited resources. Results from the current study provide evidence that adolescent girls are capable of improving their behavior and weight independent of their family environment, and that interventions that access these adolescents via school have the potential to provide the resources and support that girls may not have received from their families to help them reduce their risk of obesity.
Table 5-1: Distribution of change among girls in the intervention condition (n=135) who were successful\(^1\) at improving weight-related behaviors, BMI, and/or percent body fat

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N</th>
<th>Mean (SD) change</th>
<th>Range of change (min, max)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total PA (blocks/day)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>53</td>
<td>4.59 (2.68)</td>
<td>1.67, 13.33</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>53</td>
<td>-4.43 (2.43)</td>
<td>-1.33, -11.67</td>
</tr>
<tr>
<td><strong>MVPA (blocks/day)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>54</td>
<td>2.76 (2.30)</td>
<td>0.33, 12.67</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>53</td>
<td>-3.37 (2.05)</td>
<td>-1.00, -9.00</td>
</tr>
<tr>
<td><strong>TV use (blocks/day)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>54</td>
<td>-3.07 (2.81)</td>
<td>-12.33, -0.33</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>53</td>
<td>2.41 (2.10)</td>
<td>0.33, 12.67</td>
</tr>
<tr>
<td><strong>Soft drink intake (times/day)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>55</td>
<td>-1.02 (1.29)</td>
<td>-5.29, -0.11</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>70</td>
<td>0.38 (0.84)</td>
<td>0.00, 5.00</td>
</tr>
<tr>
<td><strong>FV intake (servings/day)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>60</td>
<td>3.48 (1.44)</td>
<td>2.00, 9.50</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>54</td>
<td>-1.83 (2.21)</td>
<td>-8.00, 0.50</td>
</tr>
<tr>
<td><strong>BMI (units)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>52</td>
<td>-0.96 (1.03)</td>
<td>-3.55, 0.11</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>52</td>
<td>1.51 (0.83)</td>
<td>0.52, 4.58</td>
</tr>
<tr>
<td><strong>Percent body fat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful participants</td>
<td>45</td>
<td>-2.33 (1.94)</td>
<td>-10.11, -0.29</td>
</tr>
<tr>
<td>Unsuccessful participants</td>
<td>45</td>
<td>2.87 (1.94)</td>
<td>1.07, 8.05</td>
</tr>
</tbody>
</table>

Abbreviation: PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=Television, FV=Fruit and vegetables, BMI = Body Mass Index

\(^1\) Success was determined by calculating girls’ baseline to follow-up change for each outcome and dividing this change score into quintiles. For the outcomes of total PA, MVPA and FV intake, girls were categorized as successful if their change score was in the upper two quintiles (greatest increase). For the outcomes of TV use, soft drink intake, BMI and percent body fat, girls were categorized as successful if their change score was in the lower two quintiles (greatest decrease).
Table 5-2: Associations between sociodemographic characteristics and prevalence of success at improving physical activity, dietary intake, BMI, and body composition during the New Moves intervention

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>N</th>
<th>PA</th>
<th>MVPA</th>
<th>TV</th>
<th>Soft drink</th>
<th>FV</th>
<th>BMI</th>
<th>% body fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>44</td>
<td>29.5</td>
<td>34.1</td>
<td>38.6</td>
<td>34.1</td>
<td>45.5</td>
<td>39.5</td>
<td>36.8</td>
</tr>
<tr>
<td>AA/black</td>
<td>37</td>
<td>44.4</td>
<td>50.0</td>
<td>50.0</td>
<td>51.4</td>
<td>52.8</td>
<td>40.0</td>
<td>41.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>15</td>
<td>46.7</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>33.3</td>
<td>50.0</td>
<td>36.3</td>
</tr>
<tr>
<td>Asian</td>
<td>23</td>
<td>43.5</td>
<td>34.8</td>
<td>30.4</td>
<td>43.5</td>
<td>43.5</td>
<td>34.8</td>
<td>40.0</td>
</tr>
<tr>
<td>Mixed/other</td>
<td>16</td>
<td>50.0</td>
<td>42.9</td>
<td>21.4</td>
<td>33.3</td>
<td>33.3</td>
<td>40.0</td>
<td>50.0</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>.523</td>
<td>.664</td>
<td>.147</td>
<td>.589</td>
<td>.647</td>
<td>.935</td>
<td>.946</td>
</tr>
<tr>
<td>Parent education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; HS</td>
<td>35</td>
<td>47.1</td>
<td>44.1</td>
<td>55.8</td>
<td>44.1</td>
<td>41.2</td>
<td>36.4</td>
<td>41.4</td>
</tr>
<tr>
<td>HS diploma</td>
<td>30</td>
<td>51.7</td>
<td>44.8</td>
<td>27.6</td>
<td>40.0</td>
<td>46.7</td>
<td>33.3</td>
<td>26.1</td>
</tr>
<tr>
<td>Some college</td>
<td>41</td>
<td>26.8</td>
<td>39.0</td>
<td>41.5</td>
<td>47.5</td>
<td>43.9</td>
<td>55.0</td>
<td>41.7</td>
</tr>
<tr>
<td>Completed college</td>
<td>28</td>
<td>39.3</td>
<td>32.1</td>
<td>32.1</td>
<td>28.6</td>
<td>46.4</td>
<td>29.6</td>
<td>50.0</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>.152</td>
<td>.746</td>
<td>.056</td>
<td>.459</td>
<td>.969</td>
<td>.129</td>
<td>.414</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 14 years</td>
<td>36</td>
<td>32.4</td>
<td>29.4</td>
<td>47.1</td>
<td>42.9</td>
<td>45.7ab</td>
<td>48.6</td>
<td>37.9</td>
</tr>
<tr>
<td>15 years</td>
<td>65</td>
<td>43.1</td>
<td>41.5</td>
<td>36.9</td>
<td>40.6</td>
<td>32.3a</td>
<td>32.8</td>
<td>40.0</td>
</tr>
<tr>
<td>16 years</td>
<td>17</td>
<td>43.8</td>
<td>43.8</td>
<td>50.0</td>
<td>18.8</td>
<td>75.0c</td>
<td>43.8</td>
<td>40.0</td>
</tr>
<tr>
<td>&gt;=17 years</td>
<td>17</td>
<td>41.2</td>
<td>52.9</td>
<td>35.3</td>
<td>58.8</td>
<td>58.8bc</td>
<td>46.7</td>
<td>46.2</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>.763</td>
<td>.410</td>
<td>.639</td>
<td>.137</td>
<td>.009</td>
<td>.428</td>
<td>.970</td>
</tr>
<tr>
<td>Weight Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>71</td>
<td>37.7</td>
<td>40.6</td>
<td>39.1</td>
<td>43.5</td>
<td>49.3</td>
<td>28.8ab</td>
<td>35.6</td>
</tr>
<tr>
<td>Overweight</td>
<td>21</td>
<td>33.3</td>
<td>33.3</td>
<td>42.9</td>
<td>47.6</td>
<td>47.6</td>
<td>61.9b</td>
<td>50.0</td>
</tr>
<tr>
<td>Obese</td>
<td>43</td>
<td>47.6</td>
<td>42.9</td>
<td>42.9</td>
<td>33.3</td>
<td>34.9</td>
<td>46.5ab</td>
<td>42.4</td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td>.465</td>
<td>.768</td>
<td>.912</td>
<td>.461</td>
<td>.317</td>
<td>.014</td>
<td>.507</td>
</tr>
</tbody>
</table>

Abbreviation: PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=television, FV=Fruit and vegetables, BMI=Body Mass Index

1 See footnote from Table 1
2 p-value obtained from ANOVA comparing differences in prevalence of success across levels of each sociodemographic characteristic. Prevalences with different superscripts are pairwise statistically different at p<.05.
Table 5-3: Univariate associations between family environment factors and girls’ odds of successful behavior change during the New Moves intervention.

<table>
<thead>
<tr>
<th>Outcome: Girls’ successful increase in total PA</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>1.16</td>
<td>0.69, 1.97</td>
<td>.568</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>0.93</td>
<td>0.61, 1.41</td>
<td>.726</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>0.76</td>
<td>0.48, 1.21</td>
<td>.240</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ successful increase in MVPA</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>1.26</td>
<td>0.77, 2.06</td>
<td>.362</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>0.97</td>
<td>0.64, 1.48</td>
<td>.893</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>0.62</td>
<td>0.39, 0.98</td>
<td>.042</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ successful decrease in TV use</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media resources</td>
<td>1.26</td>
<td>0.82, 1.92</td>
<td>.291</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>1.24</td>
<td>0.81, 1.90</td>
<td>.312</td>
</tr>
<tr>
<td>TV in bedroom</td>
<td>0.79</td>
<td>0.51, 1.21</td>
<td>.267</td>
</tr>
<tr>
<td>Parental TV use</td>
<td>0.81</td>
<td>0.53, 1.23</td>
<td>.319</td>
</tr>
<tr>
<td>Familial encouragement to limit TV use</td>
<td>0.89</td>
<td>0.60, 1.34</td>
<td>.577</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ successful decrease in soft drink intake</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy food available at home</td>
<td>1.01</td>
<td>0.67, 1.53</td>
<td>.963</td>
</tr>
<tr>
<td>Home soft drink availability</td>
<td>1.99</td>
<td>1.24, 3.19</td>
<td>.005</td>
</tr>
<tr>
<td>Parental soft drink intake</td>
<td>1.31</td>
<td>0.88, 1.95</td>
<td>.184</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy foods</td>
<td>1.31</td>
<td>0.88, 1.95</td>
<td>.184</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>1.08</td>
<td>0.73, 1.60</td>
<td>.690</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>0.95</td>
<td>0.68, 1.34</td>
<td>.783</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ successful increase in FV intake</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home availability of FV</td>
<td>1.05</td>
<td>0.68, 1.62</td>
<td>.823</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>0.84</td>
<td>0.53, 1.33</td>
<td>.451</td>
</tr>
<tr>
<td>Parental FV intake</td>
<td>0.94</td>
<td>0.63, 1.38</td>
<td>.734</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy food</td>
<td>1.05</td>
<td>0.70, 1.58</td>
<td>.807</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>1.22</td>
<td>0.81, 1.84</td>
<td>.343</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>1.12</td>
<td>0.78, 1.60</td>
<td>.535</td>
</tr>
</tbody>
</table>

Abbreviation: PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=television, FV=Frut and vegetables

1 Girls’ age, race/ethnicity, and parental education included as covariates in regression models. School included as random effect.
Table 5-4: Univariate associations between family environment factors and girls’ odds of successful BMI and body composition change during the New Moves intervention

<table>
<thead>
<tr>
<th>PA-related Family Environment</th>
<th>Outcome: Girls’ successful decrease in BMI</th>
<th>Outcome: Girls’ successful decrease in percent body fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Home PA Resources</td>
<td>1.22</td>
<td>0.74, 2.03</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>1.27</td>
<td>0.83, 1.94</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>1.15</td>
<td>0.76, 1.76</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>1.36</td>
<td>0.84, 2.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TV-related Family Environment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Media resources</td>
<td>1.22</td>
<td>0.78, 1.92</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>1.65</td>
<td>1.04, 2.63</td>
</tr>
<tr>
<td>Television in bedroom</td>
<td>1.33</td>
<td>0.85, 2.09</td>
</tr>
<tr>
<td>Parental television use</td>
<td>1.41</td>
<td>0.90, 2.18</td>
</tr>
<tr>
<td>Familial encouragement to limit television use</td>
<td>1.06</td>
<td>0.70, 1.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dietary intake-related Family Environment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy food available at home</td>
<td>1.02</td>
<td>0.63, 1.65</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>1.17</td>
<td>0.69, 1.97</td>
</tr>
<tr>
<td>Home soft drink availability</td>
<td>1.29</td>
<td>0.78, 2.14</td>
</tr>
<tr>
<td>Parental soft drink intake</td>
<td>1.13</td>
<td>0.73, 1.75</td>
</tr>
<tr>
<td>Parental FV intake</td>
<td>1.35</td>
<td>0.87, 2.09</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy food</td>
<td>1.10</td>
<td>0.70, 1.74</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>0.80</td>
<td>0.52, 1.25</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>0.79</td>
<td>0.53, 1.18</td>
</tr>
</tbody>
</table>

Abbreviation: BMI=Body Mass Index, PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=television, FV=Fruit and vegetables

1 Girls’ age, race/ethnicity, and parental education included as covariates in regression models. School included as random effect.
Table 5-5: Modification of the effect of New Moves on physical activity, television use, and soft drink and fruit and vegetable intake by family environment factors

<table>
<thead>
<tr>
<th>Outcome: Girls’ total PA</th>
<th>Standardized regression coefficient for interaction term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>0.24 (0.54)</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>0.12 (0.68)</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>0.11 (0.47)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ MVPA</th>
<th>Standardized regression coefficient for interaction term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>0.11 (0.42)</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>-0.39 (0.53)</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>-0.12 (0.35)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ TV use</th>
<th>Standardized regression coefficient for interaction term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media resources</td>
<td>-0.35 (0.32)</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>-0.27 (0.37)</td>
</tr>
<tr>
<td>TV in bedroom</td>
<td>0.37 (0.34)</td>
</tr>
<tr>
<td>Parental TV use</td>
<td>-0.25 (0.43)</td>
</tr>
<tr>
<td>Familial encouragement to decrease TV use</td>
<td>0.43 (0.39)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ soft drink intake</th>
<th>Standardized regression coefficient for interaction term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy food available at home</td>
<td>-0.01 (0.11)</td>
</tr>
<tr>
<td>Home soft drink availability</td>
<td>0.21 (0.12)</td>
</tr>
<tr>
<td>Parental soft drink intake</td>
<td>0.14 (0.12)</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy foods</td>
<td>-0.08 (0.11)</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>-0.10 (0.13)</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>0.18 (0.11)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome: Girls’ FV intake</th>
<th>Standardized regression coefficient for interaction term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home availability of FV</td>
<td>-0.45 (0.44)</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>-0.05 (0.34)</td>
</tr>
<tr>
<td>Parental FV intake</td>
<td>-0.07 (0.36)</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy food</td>
<td>-0.40 (0.37)</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>-0.10 (0.32)</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>0.04 (0.33)</td>
</tr>
</tbody>
</table>

Abbreviation: PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=Television, FV=Fruit and vegetables
Table 5-6: Modification of the effect New Moves on BMI and body fat percentage by family environment factors

<table>
<thead>
<tr>
<th>PA-related Family Environment</th>
<th>Outcome: BMI Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
<th>Outcome: Percent body fat Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home PA Resources</td>
<td>-0.16 (0.23)</td>
<td>.512</td>
<td>0.07 (0.57)</td>
<td>.911</td>
</tr>
<tr>
<td>Parental Total PA</td>
<td>-0.05 (0.22)</td>
<td>.810</td>
<td>0.37 (0.42)</td>
<td>.388</td>
</tr>
<tr>
<td>Parental MVPA</td>
<td>-0.02 (0.22)</td>
<td>.926</td>
<td>0.35 (0.40)</td>
<td>.394</td>
</tr>
<tr>
<td>Family Support for PA</td>
<td>-0.14 (0.17)</td>
<td>.433</td>
<td>0.13 (0.46)</td>
<td>.772</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TV-related Family Environment</th>
<th>Outcome: BMI Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
<th>Outcome: Percent body fat Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media resources</td>
<td>-0.13 (0.18)</td>
<td>.477</td>
<td>-0.13 (0.42)</td>
<td>.773</td>
</tr>
<tr>
<td>Number of TVs in home</td>
<td>-0.39 (0.17)</td>
<td>.042</td>
<td>0.66 (0.43)</td>
<td>.157</td>
</tr>
<tr>
<td>Television in bedroom</td>
<td>-0.15 (0.18)</td>
<td>.422</td>
<td>0.42 (0.44)</td>
<td>.358</td>
</tr>
<tr>
<td>Parental television use</td>
<td>-0.28 (0.17)</td>
<td>.134</td>
<td>0.25 (0.52)</td>
<td>.646</td>
</tr>
<tr>
<td>Familial encouragement to limit television use</td>
<td>-0.10 (0.17)</td>
<td>.578</td>
<td>0.18 (0.42)</td>
<td>.680</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dietary intake-related Family Environment</th>
<th>Outcome: BMI Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
<th>Outcome: Percent body fat Standardized regression coefficient for interaction term (SE)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy food available at home</td>
<td>-0.13 (0.17)</td>
<td>.448</td>
<td>-0.24 (0.43)</td>
<td>.598</td>
</tr>
<tr>
<td>Home availability of unhealthy food</td>
<td>-0.03 (0.17)</td>
<td>.878</td>
<td>-0.03 (0.41)</td>
<td>.994</td>
</tr>
<tr>
<td>Home soft drink availability</td>
<td>-0.16 (0.17)</td>
<td>.361</td>
<td>-0.06 (0.42)</td>
<td>.894</td>
</tr>
<tr>
<td>Parental soft drink intake</td>
<td>-0.12 (0.19)</td>
<td>.538</td>
<td>-0.03 (0.42)</td>
<td>.995</td>
</tr>
<tr>
<td>Parental F&amp;V intake</td>
<td>0.27 (0.17)</td>
<td>.146</td>
<td>0.04 (0.43)</td>
<td>.922</td>
</tr>
<tr>
<td>Familial encouragement to eat healthy food</td>
<td>-0.22 (0.22)</td>
<td>.344</td>
<td>0.92 (0.68)</td>
<td>.211</td>
</tr>
<tr>
<td>Family meal frequency</td>
<td>-0.09 (0.17)</td>
<td>.601</td>
<td>-0.10 (0.42)</td>
<td>.819</td>
</tr>
<tr>
<td>Fast food family meal frequency</td>
<td>-0.33 (0.18)</td>
<td>.091</td>
<td>-0.69 (0.42)</td>
<td>.133</td>
</tr>
</tbody>
</table>

Abbreviation: BMI= Body Mass Index, PA=Physical Activity, MVPA=Moderate-to-vigorous physical activity, TV=Television, FV=Fruit and vegetables
Figure 5-1: Unadjusted mean baseline (BL) and follow-up (FU) BMI by number of TVs in the home and intervention condition

Figure 5-2: BMI at follow-up, adjusted for baseline, race/ethnicity, age, and parental education, by number of TVs in the home and intervention condition
Chapter 6: Conclusions and Implications for Future Research

In the United States, adolescent girls, especially those from racial and ethnic minority groups and low SES families, are disproportionately burdened by high rates of overweight and obesity. Many of these girls also have highly sedentary lifestyles, participate in little physical activity, and have poor dietary intake. While a growing body of literature has identified ways in which the family environment is associated with youths’ physical activity, sedentary behavior, and food choices, additional research is needed to determine how families can best help their adolescent daughters engage in healthful activity and dietary behaviors, and develop and maintain a healthy weight. The New Moves Parent Project was developed as an ancillary study to New Moves, a school-based physical activity and nutrition intervention for high school aged girls, to gain further insight into the role of the family in adolescent girls’ weight and participation in weight-related behaviors as well as the relationship between the family environment and the success of school-based obesity prevention programs.

This dissertation addressed the following specific aims:

**Specific Aim 1**: Explore sociodemographic differences in the weight-related family environment of the racially, ethnically, and socioeconomically diverse population of adolescent girls participating in New Moves, a school-based physical activity and nutrition intervention.

**Specific Aim 2**: Test cross-sectional baseline associations between girls’ weight-related family environment and girls’ BMI, percent body fat, and behaviors including total PA, MVPA, TV use, soft drink intake, and FV intake, among all New Moves participants.

**Specific Aim 3**:
1) Among girls participating in the intervention condition of New Moves, test whether the baseline weight-related family environment is associated with successful change in
girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat, over the course of the intervention.

2) Conduct an exploratory analysis using data from girls both in the intervention and control conditions of New Moves to assess whether girls’ baseline weight-related family environment modifies the effect of the New Moves intervention on girls’ total PA, MVPA, TV use, soft drink intake, FV intake, BMI, and percent body fat.

6.1. Summary of main findings (Table 6-1)

Specific Aim 1: When examining the associations between race/ethnicity and the family environment, adjusted for parental education and girls’ US nativity, parents of Asian girls most consistently reported providing a family environment that is supportive of healthful behavior with Asian girls being the least likely to have a television in their bedroom and having the unhealthy food available in their home least often. Additionally, Asian parents reported drinking soft drinks the least frequently, watching the least number of hours of TV, and eating the most servings of fruits and vegetables. These family characteristics prevalent among Asian families may contribute to the low hours of television use observed among Asian American adolescents as well as high fruit and vegetable intake by Asian American adolescents and the perceived importance of healthful dietary intake including high intake of fruits and vegetables reported specifically by Hmong adolescents. For family environment factors where differences were observed by girls’ race/ethnicity, Hispanic parents, parents of girls of mixed or an other race, and to a lesser extent the parents of African American/black girls reported having the least healthful family environments with such families having the lowest number of physical activity resources in the home, many of the girls having a television in their bedrooms, and parents reporting the most television use and soft drink intake. These differences in the family environments of Hispanic and African American/black adolescent girls may contribute to the poor dietary intake, low levels of physical activity, and high prevalence of overweight and obesity among these racial/ethnic minority groups.
Family environments also differed in many ways by parents’ educational attainment after adjustment for race/ethnicity and girls’ US nativity. Parents with higher levels of education reported having more physical activity resources in the home, engaging in more moderate-to-vigorous physical activity themselves, providing more support for physical activity for their daughters, drinking fewer soft drinks, encouraging their daughters to eat healthier food more often, and having more frequent family meals. Similar patterns have been observed in other studies with parents’ higher educational attainment and higher family SES associated with more frequent family meals\textsuperscript{116} and greater availability of healthy and unhealthy foods.\textsuperscript{130} However, unlike in previous studies,\textsuperscript{102,129} in the current analyses the prevalence of girls having a television in their bedroom was lowest among both those families whose parents had the lowest level of educational attainment as well as the highest level.

Finally, after adjustment for girls’ race/ethnicity and parental education, the families of girls born outside the United States reported providing a number of health-promoting qualities including having fewer televisions in the home, parents watching less television themselves, and having more frequent family meals and less frequent fast food for family meals. These family characteristics may contribute to the lower television use and more healthful dietary intake observed in other studies among adolescents born outside the United States.\textsuperscript{133,210} In the current study, families of foreign-born girls were less likely than parents of US-born girls to report providing support or encouragement for their daughters’ physical activity and healthy dietary intake. To our knowledge, no studies have examined differences in similar components of the family environment by adolescents’ US nativity, so it is difficult to draw conclusions on why this pattern of findings may be. Hypotheses as to why these families reported several positive components of the weight-related family environment but less emotional and logistic support for their daughters physical activity and healthy eating include cultural differences – perhaps outward displays of encouragement as measured by the survey questions aren’t encouraged among certain cultures, or economic or time limitations – parents are not able to provide transportation for their daughters or participate in physical

\textsuperscript{126}
activities with them, or perhaps in the countries where these families originate there are not as many barriers to being active and eating well so it was not as necessary for parents to purposefully encourage children to engage in these behaviors.

Overall these findings highlight a number of areas in which families are excelling, as well as provide insight into areas where public health efforts can help parents improve the weight-related environment of their family. Working with families, especially those of Hispanic girls and girls of mixed or an other race/ethnicity and those with parents of lower educational attainment, to promote a family environment that is supportive of physical activity and healthy dietary intake may be particularly important. Specific aspects of the family environment which these parents can work to modify include removing televisions from children’s bedrooms, having fruits and vegetables regularly available, modeling regular physical activity and reducing time spent watching television, and having frequent family meals. Further research is needed to identify methods to best help families who may experience many economic barriers and resistance to changing the family environment from children and other family members.\textsuperscript{236,237}

Specific Aim 2: For the second specific aim, the cross-sectional associations between the family environment factors and girls’ physical activity, television use, soft drink and fruit and vegetable consumption, BMI, and percent body fat were examined. While there are a number of previous studies that have examined the associations between many of these family environment factors and youths’ behavior, few studies utilized an adolescent population that was racially and ethnically diverse and either currently overweight or obesity or at high risk of becoming overweight.\textsuperscript{2} Additionally, only a small minority of studies collected data on parents’ perception of the family environment.\textsuperscript{136} Parental report has been found to be discrepant from adolescents’ report and in some cases it may be a more valid measure of resources within the home.\textsuperscript{137-142}

In these analyses, parental modeling of behavior was consistently associated with adolescents’ PA, TV, and dietary behaviors in both the univariate and mutually-adjusted
models. Family and parental support were associated with girls’ physical activity and fruit and vegetable intake. Additionally, family meal frequency was associated with higher intake of fruits and vegetables. Many of these findings mirror what have been found previously in the literature among other populations of children and adolescents. Home food availability including soft drink and fruit and vegetable availability was associated with intake of those foods, and the presence of PA resources was marginally associated with girls’ PA. However, resources for television and media use in the home were not associated with girls’ television use. These findings depart from those of previous studies of predictors of television use among youth, many of which observed higher TV use among youth who had many media resources in their homes or a television in their bedroom, though one other study has also did not observe an association between family environment factors such as having a television in the bedroom and TV use among girls. In the current analyses the number of media resources in the home was positively associated with girls’ BMI and body composition, and number of TVs in the home were positively associated with girls’ BMI, which suggests a relationship between a family environment which promotes sedentary behavior and adolescents’ weight status. Further research utilizing highly valid measures of television and other media use, as well as exploring other potential mediators of the relationship between the media and television resources in the home and adolescents’ weight, is needed to understand the mechanisms through which this relationship occurs.

The cross-sectional analyses provide a snapshot in time of what factors in the family environment are associated with adolescent girls’ behavior, weight and body composition. Findings support the hypothesis that there are multiple mechanisms through which families may have the potential to influence youths’ participation in weight-related behaviors, specifically adding evidence to the importance of taking into account parental behavior when aiming to improve youths’ behavior. Additionally, the family food environment including food availability and frequency of family meals appears to be an important predictor of adolescents’ intake, and a prime area for interventions with families. However, due to the cross-sectional nature of these analyses, the temporality of
the relationships between the family and adolescents’ behavior and weight remains unknown.

Specific Aim 3: In the final specific aim of this dissertation, associations between family environment factors and girls’ success in modifying their PA, TV use, soft drink intake, FV intake, BMI, and percent body fat were examined among girls who participated in the active intervention arm of New Moves. Successful change was defined by calculating a baseline to follow-up change score for each outcome and dividing girls into quintiles based on their score. For the outcomes of total PA, MVPA, and FV intake, those girls who were in the upper two quintiles of change (greatest increase) were defined as being successful, while for the outcomes of TV use, soft drink intake, BMI, and percent body fat, those girls whose change scores were in the bottom two quintiles (greatest decrease) were defined as being successful. Similar dichotomies were also made at specific cut points of behavior, BMI, and body fat change to confirm findings. Logistic regression was then used to determine if any of the family environment factors assessed in this study predicted a significantly significant increase or decrease in odds of being successful in each of the outcomes. Overall, few family environment factors were associated with girls’ successful behavior, weight, or body composition change in the intervention. However, the pattern of significant findings suggests that girls from unsupportive family environments may have benefited more from participating in the school-based intervention than girls who received support, healthy behavior modeling, and resources from their families. For example over the course of New Moves, girls with less familial support for PA were more likely to successfully increase their PA and girls with more televisions in the home were more likely to successfully decrease their percent body fat. These findings were contrary to the hypothesis proposed at the beginning of this dissertation that stated that girls with more supportive families would be more likely to successfully improve their weight-related behaviors, weight, and body composition during New Moves.
In addition to exploring familial predictors of successful behavior, BMI and body composition change, in the final chapter of this dissertation the role of the family environment as a moderator of the effect of New Moves was explored. None of the family environment factors assessed in this study modified the effect of New Moves on girls’ PA, TV use, soft drink intake, FV intake, or body composition. The number of TVs in girls’ homes was found to moderate the effect of New Moves on girls’ BMI, with no effect of New Moves observed among girls with 3 or fewer TVs in their home, while among those with 4 or more TVs, those in the intervention group had a lower baseline-adjusted BMI at follow-up than girls in the control group. These findings align with what was found by examining familial predictors of girls’ successful behavior and weight change to add additional evidence to the suggestion that girls with less supportive family environment may have benefited more from New Moves.

The findings of the final specific aim contribute to the literature by expanding previous cross-sectional findings in this study and others that found associations between the family environment and adolescent girls’ weight-related behaviors and weight status. Analyses in the current study, which utilized both longitudinal data and data from a group randomized trial, found few associations between the family environment and girls’ weight and behavior change over the course of a school year. These lack of associations are understandable from a developmental perspective as high-school aged girls are likely increasingly independent from their family, may rely more on their peer group for support and guidance, and often have financial and other resources to implement behavior change independent of their family. These findings suggest that school-based interventions have the potential to improve the weight status of all adolescents, not only those with supportive family environments, and may have the greatest potential to effect change among girls who have not received support for healthful behavior from their family. As African American and Hispanic girls and girls of low SES are at the greatest risk for obesity, and their families may be the least likely to be able to provide support and resources to help them improve their weight status, these findings give hope for the ability to help these adolescents modify their weight trajectory. Additionally, as
many studies have documented the difficulties in engaging parents of adolescents and the barriers to families participating in school-based interventions, these findings suggest that activities that aim to improve adolescents’ family environments may not need to be a priority and devoting resources to other intervention components may result in greater behavior and weight change among participants.
## Table 6-1: Summary of main findings

**Sociodemographic differences in girls’ family environments**
- Several differences were observed in girls’ family environments by race/ethnicity:
  - Parents of white girls provided the most physical activity resources for their daughters.
  - Asian girls were least likely to have a television in their bedroom (14.1%), girls of mixed/other race were most likely to have a television in their bedrooms (79.3%).
  - Parents of Asian girls had unhealthy food available in the home the least often, and the highest intake of fruits and vegetables (6.1 servings/day), and least frequent soft drink intake (1 serving/week).
- Higher parental education was associated with a number of health-promoting family environment factors:
  - Higher parental education was associated with more physical activity resources in the home, more parental MVPA, and less parental soft drink intake.
  - Parents who had completed high school or had some college were most likely to have a TV in their daughter’s bedroom.
- Parents of girls born outside the United States were less likely to have a TV in their daughter’s bedroom, watched less TV themselves, had more frequent family meals, and had fast food for family meals less frequently. These parents also reported providing less frequent encouragement for physical activity and healthy eating.

### Cross-sectional associations between family environment factors and girls’ weight-related behaviors, BMI, and body composition
- In univariate models, parental PA and family support for PA were positively associated with girls’ PA. Number of PA resources in the home was marginally associated with girls’ total PA and MVPA.
- Parental TV use was the only family environment factor associated with girls’ TV use.
- Home availability of soft drinks, parental soft drink intake, and parental encouragement to eat healthy food were all positively associated with girls’ soft drink intake in both univariate and mutually-adjusted models.
- Home availability of FV, parental FV intake, parental encouragement to eat healthy food, and frequency of family meals were all positively associated with girls’ FV intake. Parental intake remained significant in the mutually-adjusted model.
- While few family environment factors were associated with girls’ BMI and percent body fat, the number of media resources in the home was positively associated with girls’ BMI and percent body fat and the number of televisions in the home was positively associated with girls’ BMI.
- Girls whose families had more frequent family meals had a lower BMI.

### Family environment predictors of girls’ successful behavior, weight and body composition change
- Overall girls successfully improved their PA, TV use, soft drink intake, and FV intake independent of their family environment.
- The few differences observed suggest that girls from less supportive families were more likely to successfully improve their weight-related behavior, weight and body composition.

### The family environment as a moderator of the New Moves intervention effect
- The effect of New Moves on PA, TV use, soft drink, FV intake, and body composition did not differ by girls’ family environment.
- Number of TVs in the home moderated the effect of New Moves on girls’ BMI. Among girls with few TVs in their homes, there was no difference in girls’ baseline-adjusted BMI at follow-up by intervention condition. Among girls with four or more televisions in their homes, those in the intervention condition had a lower baseline-adjusted BMI at follow-up as compared to girls in the control condition.
6.2. Strengths and limitations

6.2.1. Strengths and limitations of the study population

Unlike many previous studies of youths’ weight-related family environments, this dissertation examined familial predictors of weight and weight change among a racially/ethnically and socioeconomically diverse population of adolescent girls. Almost half of these girls were either overweight or obese and were recruited to participate in New Moves because they were not regularly physically active and did not enjoy traditional physical education classes. As African American, Hispanic, and low SES adolescent girls are at a high risk for overweight and obesity, it is essential to find ways to help these girls improve their activity habits and dietary intake. Almost a quarter of the girls in New Moves were also first generation immigrants to the United States, a population that may be at increased risk for weight gain over time due to assimilation to American dietary habits as well as low levels of physical activity. Little is known about the families of girls who were born outside the United States nor about how to best reach recent immigrant families to encourage the maintenance of health promoting qualities of their native cultures and combat the development of poor health habits which foreign-born adolescents often experience with acculturation.

Overall, the majority of parents of girls in New Moves were willing to participate in the study as evidenced by the high response rate. However, parents with less education, from racial and ethnic minority groups, and who are immigrants to the United States were less likely to respond to recruitment efforts, limiting our ability to understand their family environments. This differential response rate reduces the ability to generalize the findings of this dissertation to the larger population of girls who participated in New Moves. Additional work is needed to identify how to develop relationships with families who are less inclined or unable to participate in research. Examples of potentially successful methods to engage families who may be less comfortable with participating in a research study include providing translation services for all of the languages spoken by families and having stronger relationships with school or community-based groups who may have
pre-existing relationships with these families in order to gain credibility in these communities.

6.2.2. **Strengths and limitations of study design and measures**

The use of parental report of the family environment was a unique contribution to the literature. While parental report, adolescent report, and objective assessment of the family environment all provide meaningful information, obtaining parents’ perspectives of their own behavior and the support they aim to provide to their child, as well as the resources available in the home, allows for a unique understanding of parents’ views of their home. Very few studies of predictors of overweight and obesity have utilized parental report of the home environment, despite the belief that it offers a more objective understanding of the family as compared to adolescents’ report. While studies that assess parental perspectives of the family environment and the relationship between these family characteristics and adolescents’ behavior and weight status fill a gap in the obesity prevention literature, future studies should also aim to understand the complex relationship between the objective family environment (i.e. what food, activity, and sedentary resources are actually available), parent perceptions of their behavior, and children’s perception of their parents’ behavior, to identify critical intervention points. Interventions with families may find that working to improve resources in the home, parental behavior, the way in which parents support their children, and children’s interpretation of their parents’ behavior may produce a greater improvement in behavior than working with any of those factors in isolation of the others.

The New Moves Parent Project also aimed to obtain a comprehensive assessment of the family environment and sought to assess factors related to several aspects of the energy balance equation – physical activity, sedentary behavior, and dietary intake. Additionally, unlike previous studies that aimed to understand only specific components of the family environment such as parental support for behavior, the current study addressed multiple potential mechanisms of influence in the family environment. However, a limitation of
the assessment of the family environment was while there was great breadth in constructs measured, in order to keep the survey at a reasonable length to ensure parent participation in-depth assessment of some of the family components was sacrificed. Specifically, the lack of multi-item scales to assess some factors in the family environment, such as family support for healthy eating, is particularly limiting in studies such as this one which had a relatively small sample size. Having single-item measures coupled with a small study sample often results in large deviation around the mean, which may contribute to an inability to identify significant relationships when they do exist.

Another limitation of the family environment measures may have been their lack of applicability to families of sedentary adolescents as well as sociodemographically diverse families. While many of the family environment measures had been used in other studies and had strong psychometric qualities, the measures selected may not have been as relevant to the current study population. For example, the measures of family support for physical activity asked parents to report on how often they watched their daughters be active or provided transportation to a location where their daughter could be active. For girls who do not participate in team or individual sports, and whose primary physical activity may be taking a walk around their neighborhood or playing with children in their household, these questions may not be very relevant. Additionally some measures, such as familial encouragement to decrease television use, might not have been relevant for high-school aged adolescents for whom parents do not supervise their television time as much as they would for younger children. While studies of younger populations have highlighted the importance of parental rules and restrictions around television use,\textsuperscript{98,99} no equivalent behaviors for parents of adolescents have been identified. Additionally, there were a limited number of survey questions to assess families’ sociodemographic information including socioeconomic status and amount of acculturation into US society. Measurement of these factors may have further clarified ways in which families are similar or differ, and assisted with the targeting of efforts to help parents improve their family environments. Future studies of similar study populations may want to conduct
extensive formative research to determine what are the most salient and relevant factors for girls’ activity and dietary intake among these families and work to develop new valid and reliable measurement tools to help understand how these family environments are affecting adolescents’ behavior.

Many of the measures to assess study outcomes were highly valid and reliable, including the use of DXA to assess girls’ percent body fat, which is considered the gold standard for the assessment of body composition and the objective measurement of girls’ height and weight. The use of these measures allowed for non-biased determination of girls’ baseline BMI and percent body fat, as well as change over time. In comparison, all of girls’ behavioral outcomes were assessed by self-report measures, which may have introduced bias into the study and contributed to the lack of relationships between girls’ behavior and BMI and body composition, and the relationships between the family environment and girls’ behavior, some of which had been consistently observed in previous studies. Specifically, although some factors in family environment related to media use were associated with BMI and percent body fat, family characteristics such as the presence of a television in girls’ bedroom were not associated with girls’ television use, and no relationship was observed between television use and girls’ BMI or body composition. The 3DPAR was used as the primary assessment of TV use in New Moves. While the 3DPAR has been validated against accelerometry to assess moderate and vigorous physical activity, it has not been validated for use in the assessment of sedentary behavior. The 3DPAR may not accurately reflect total time spent watching television because it asks participants to recall the primary activity they engaged in during each 30-minute block of the day. Frequently when adolescents watch television they are participating in multiple activities such as using the computer, talking on the phone, or “hanging out” with friends; 68% of 7th through 12th graders report this type of media multitasking “at least some of the time.” This lack of definition of television use as a primary activity, coupled with a lack of ability to accurately recall all of their bouts of television use up to three days ago, may lead to an underreporting of television use.
This is dissimilar to physical activity where it is more likely that individuals are only engaging in one activity at a time (i.e. running, biking, swimming) and can perhaps more clearly remember when they purposefully engaged in physical activity. If underreporting of TV use was non-differential and all girls underreported their TV use, it would not bias study findings. However, it is possible that some girls, for example those that are heavier, were more likely to underreport their television use due to perceived social desirability.

In addition to potential differential reporting of television, this dissertation also highlighted the need for greater understanding of how families influence the television and media behaviors of older adolescents. Television use has emerged as a key contributor to youths’ weight status, as well as a useful point of intervention for obesity prevention programs. As technology such as televisions, computer and video games, and cell phones with texting capabilities is becoming ubiquitous in adolescents’ lives, and with this access to technology often comes both sedentary behavior and exposure to advertising promoting unhealthy dietary intake, understanding how to prevent excess use is critical. In the current study, only parental television use was associated with girls’ television use, while number of TVs and other media resources in the home, TVs in girls’ bedrooms, and parental encouragement to decrease television were not, despite commonly being found as predictors of television use in other studies. Additional research is needed not only to more accurately measure adolescents’ TV and other media use, but also to better identify factors in the family environment that promote or dissuade adolescents, especially those that are already sedentary and overweight or obese, from engaging in excess technology-related sedentary time.

6.3. Implications for future research and intervention (Table 6-2)

This dissertation identified sociodemographic differences in adolescent girls’ family environments as well as cross-sectional associations between girls’ family environments and girls’ weight-related outcomes, although overall the family environment did not play a role in girls’ behavior, weight, and body composition change during the course of New
Moves. This progression of analyses has demonstrated that cross-sectionally girls’ family environments play a role in their participation in various weight-related behaviors as well as in their weight and body composition. The disparities observed among family environments by girls’ race/ethnicity, US nativity, and parents’ educational attainment reflected the disparities in girls’ physical activity, sedentary behavior and dietary intake observed in other studies. These findings suggest that families do matter for the establishment of the behavioral patterns and weight status of youth. Specifically, there may be critical periods in youths’ lives when working with families has the greatest potential to effect change in children’s behavior. In light of the patterns of low support, lack of positive behavior modeling, and lack of resources among low SES, Hispanic, and African American families, as well as the high rates of obesity among children from these groups, efforts are especially needed to understand how to engage families in a culturally appropriate manner and help parents provide a home environment that supports physical activity and healthy dietary intake.

The lack of cross-sectional relationships between physical activity, sedentary activity, dietary activity, and weight observed among girls who participated in New Moves raises questions about the role these behaviors play in the development of obesity. While some studies have found significant relationships between these behaviors and weight, others have found similar null associations to what was observed in New Moves. These lack of associations make it difficult to identify the best behavioral targets for weight-loss and obesity prevention interventions. Two potential explanations for the null associations observed are reporting bias on self-report measures, as well as the complexity of the relationship between energy intake and expenditure and weight. While Food Frequency Questionnaires (FFQ) and physical activity recalls are commonly used measures due to their ease of use by study participants as well as moderate validity and reliability, little is known about the extent to which social desirability bias occurs among adolescents utilizing these measures. Studies which have aimed to quantify this bias have found that adolescents and adults who are heavier or have a lower education level are more likely to
under-report energy intake on an FFQ. Although the 1-day and 3-day physical activity recall instruments have demonstrated high validity as compared to accelerometry among high school-aged adolescents, very little is known regarding the extent to which bias is introduced into the measurement. Among the adolescent girls who participated in the Trial of Activity for Adolescent Girls (TAAG), those who participated in the intervention condition of the study were more likely to over-report their PA on a 3DPAR than girls in the control condition, suggesting that the instrument is subject to reporting bias. The introduction of bias based on individuals’ weight status as well as activity and eating habits in these self-report measures is likely partially responsible for the null relationships observed in some studies. Novel valid and reliable techniques to assess adolescents’ activity and intake habits are needed to elucidate the contribution of behavior to weight, and accurately help determine whether interventions were effective in changing adolescents’ behavior.

Another possible explanation for the null associations observed between activity, intake and weight is that an individual’s weight, as well weight loss and gain, is the product of a complex relationship between behavioral and biological factors, and assessing a single behavior in isolation of other factors may not provide evidence of the association between that behavior and weight. Additionally, interventions that aim to affect small changes in behavior, such as selecting lower calorie options when eating fast food, may not cause a large enough calorie deficit to produce significant changes in body weight over a short period of time. A recent article by Katan and Ludwig addressed the commonly held belief that an excess of a small number of calories among many individuals led to the high prevalence of obesity observed today, and that to reverse the trend of obesity, individuals’ merely need to reduce their intake slightly or increase their physical activity slightly. The authors contested that due to physiological processes that ensure the body remains in homeostasis, if an individual adjusts their calorie balance slightly, the body will compensate and resist weight change. Similarly, if individuals are able to modify their energy balance enough to lose weight, continuing to lose weight or
even maintaining that new lower weight is more difficult as the individual now needs less net to maintain their metabolism at this lower weight. In order to better understand the factors that contribute to weight, studies may need to measure multiple behaviors and use statistical techniques to understand the relationships between these behaviors, and the joint effect of these behaviors on weight. Additionally, interventions may need to be more intensive, and help participants make significant changes to multiple activity and intake habits in order to modify their weight status. In order to aid individuals in making these large changes in both the calories they consume and the frequency with which they are active, interventions may need to focus on modifying multiple ecological levels including neighborhoods, schools, and workplaces in order to have the healthy decision be the easy decision.

As evidenced by the final specific aim of this dissertation, by late adolescence girls who are motivated to become more active, eat better, and lose weight are able to make changes independent of the support and resources they receive from their family. Additionally, girls who do not have a supportive family environment may be more likely to improve over the course of a school-based intervention, suggesting that providing a supportive school environment may be able to make up for lack of support at home. In light of the non-significant effects by the New Moves intervention on many of the behavioral and weight outcomes targeted, questions remain as to how population-based interventions can decrease the incidence of overweight among adolescents and whether non-clinical interventions can help overweight and obese adolescents adopt healthier habits and lose weight as they enter young adulthood. Evidence suggests that school-based interventions that work to modify multiple components of the school environment including classroom lessons, physical education classes, and cafeteria and non-competitive food offerings have had better success in modifying students’ behavior than those that focus on only one of these areas. Additionally, as more is being learned about the role of community resources on youths’ dietary intake and activity patterns, such as the presence of corner stores that primarily sell snack food of low
nutrition value, working to improve these neighborhood factors in combination with modifying the school environment has potential to prevent and reduce the prevalence of obesity among adolescents. Newly emerging research has also identified the role of peer networks in adolescents’ risk of overweight, therefore, working to modify the norms of groups of friends may be a successful intervention strategy.

Despite the fact that almost all school-based interventions are designed to be universal or targeted primary prevention programs, due to the high prevalence of overweight and obesity in the general population there is a high probability that many intervention participants will already be overweight or obese. It may be that programs that promote small changes to the daily habits of adolescents are not intensive enough to help students that are already overweight or obese make significant enough behavior change to attain a healthy weight. In addition to modifying the behavioral targets believed to contribute to contribute to excess weight, some youth may need greater behavioral and environmental modifications than school-based primary prevention programs can provide. The AAP’s Expert Committee on the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity has recommended that if youth whose BMI percentile is greater than or equal to the 85th percentile are not able to improve their BMI percentile after 3 to 6 months of attempting to make behavioral modifications, more intensive treatment including families and children working together with professional staff such as dietitians, pediatric nurses and physician assistants is needed. Future research is needed to determine whether school-based programs can be efficacious enough to not only influence behaviors such that incident obesity is prevented, but also if youth who are currently overweight or obese can attain a healthy BMI. This type of intervention may entail making modifications to the school environment for the benefit of all children, and specifically targeting overweight and obese children for family and clinic-based treatment.
Although in the current study adolescent girls’ behavior and weight change was either unrelated to their family environment or girls from less supportive family environments were more likely to improve, the family may still play a role in obesity prevention and treatment efforts among adolescents. As New Moves followed adolescents for 9 to 12 months, there is no information on how the family environment may be associated with adolescents’ long-term behavior or weight modifications. Adolescents may be able to make short-term changes regardless of their family environment, but in order to continue engaging in these healthful behaviors support from their family is essential. Additionally, since this dissertation examined the role of the baseline family environment in a school-based intervention and did not address whether parental engagement in the intervention was associated with girls’ success, it remains unclear whether increases in support from families and improvements to the family environment could aid adolescents’ behavior change efforts. However, in light of the difficulties in engaging families of high school-aged adolescents, especially those of lower SES who may have more limited time as well as many obligations due to childcare and employment, rather than devoting resources to engage families of older adolescents, obesity prevention interventions may find the greatest benefit from developing and implementing intervention components to educate and empower youth directly, as well as working to modify the nutrition and physical activity opportunities in their environments.
Table 6-2: Summary of suggestions for future research

<table>
<thead>
<tr>
<th>Methodological and statistical issues in the study of obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Work to develop objective and unobtrusive measures of physical activity, sedentary behavior, and dietary intake, including utilizing innovative technology including accelerometers with GPS capability and smart phones.</td>
</tr>
<tr>
<td>• Explore the role of bias and methods to reduce bias and increase reliability and validity of measures when collecting self-report data on weight and weight-related behaviors.</td>
</tr>
<tr>
<td>• Assess and model the combined influence of multiple weight-related behaviors on weight and weight gain in order to understand their joint and independent contributions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The role of the family environment in youths’ obesity risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identify methods to involve and engage families that may be hesitant or unable to participate in research.</td>
</tr>
<tr>
<td>• Conduct qualitative and quantitative research to elucidate the barriers that African American/black, Hispanic, and low SES families have to providing a family environment supportive of healthy weight maintenance.</td>
</tr>
<tr>
<td>• Explore the role of acculturation among the families of foreign-born youth and identify factors that contribute to the development/maintenance of healthful weight-related behavior among recent immigrants.</td>
</tr>
<tr>
<td>• Conduct longitudinal research with young children and their families to identify critical periods during which the family environment contributes to physical activity and nutrition habits, as well as points of intervention.</td>
</tr>
<tr>
<td>• Develop and test measures to assess novel factors in the family environment that are relevant to girls who are not regularly physically active.</td>
</tr>
<tr>
<td>• Conduct research to identify family environment factors that are associated with older adolescent girls’ TV use and use of technology.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obesity prevention among adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop and test multi-level interventions that effect school policies and practices as well as modify neighborhood factors such as food availability at adolescents’ schools and homes.</td>
</tr>
<tr>
<td>• Explore the long-term relationships between the family environment and adolescents’ behavior and weight change efforts to determine if the family plays a role in behavior maintenance.</td>
</tr>
<tr>
<td>• For adolescents that are currently overweight or obese, provide access to family- and clinic-based treatment programs that have been proven to promote weight loss.</td>
</tr>
</tbody>
</table>
Bibliography


201. Schneider M, Dunton GF, Cooper DM. Media use and obesity in adolescent females. *Obesity (Silver Spring).* 2007;15(9):2328-2335.


Appendix A: Human Subjects Approval
December 20, 2006

Research Subjects’ Protection Programs
MMC 820
420 Delaware St. SE
Minneapolis, MN 55455-0392

To: Research Subjects’ Protection Programs

Enclosed please find our application for IRB approval for Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention. This study is being conducted as part of my doctoral dissertation work and is an ancillary study to New Moves II: Obesity Prevention among Adolescent Girls (Human Subjects Code: 0309SS51763).

I am submitting the original application including appropriate appendices and one copy for expedited review.

Some study materials are currently in development and will be sent to your office for review as soon as they are completed.

Please do not hesitate to contact me with any questions.

Sincerely,

Katherine W. Bauer, MS
1. Project Identification and Signatures

1.1 Project Title (Project title must match grant title. If different, also provide grant title):

Assessing the Influence of the Family Environment on Girls in a School-based Obesity Prevention Intervention

1.2 Person preparing this document

Name: Katherine W. Bauer
Email: Bauer_K@epi.umn.edu
Phone number: 612-624-8223
Fax: 612-626-7103

1.3 Principal Investigator (PI)

Name (Last name, First name MI):
Bauer, Katherine W

Mailing Address:
West Bank Office Building
1300 S. 2nd Street
Suite 300
Minneapolis, MN 55454

U of M Employee/Student ID:
3415941

U of M x.500 ID (ex. smith001):
bauer223

Highest Earned Degree:
MS

Phone Number:
612-624-8223

Pager or Cell Phone Number:
612-803-6989

Fax:
612-626-7103

Email:
Bauer_K@epi.umn.edu

University Department (if applicable):
Epidemiology

Occupational Position:
X Faculty X Staff X Student** X Fairview Researcher X Gillette Researcher X Other

**Students are required to submit Appendix J

Indicate the training and education completed in the protection of human subjects or human subjects records (required for all research. *Refer to training links at the end of this section.):

X CTI X FIRST X Investigator 101 X HIPAA X Other

As Principal Investigator of this study, I assure the IRB that the following statements are true:
The information provided in this form is correct. I will seek and obtain prior written approval from the IRB for any substantive modifications in the proposal, including changes in procedures, co-investigators, funding agencies, etc. I will promptly report any unexpected or otherwise significant adverse events or unanticipated problems or incidents that may occur in the course of this study. I will report in writing any significant new findings which develop during the course of this study which may affect the risks and benefits to participation. I will not begin my research until I have received written notification of final IRB approval. I will comply with all IRB requests to report on the status of the study. I will maintain records of this research according to IRB guidelines. The grant that I have submitted to my funding agency which is submitted with this IRB submission accurately and completely reflects what is contained in this application. If these conditions are not met, I understand that approval of this research could be suspended or terminated.

Research Assistant

Date 12/9/06

Original Signature of PI

Title of PI

Social & Behavioral Sciences Application Form
1.4 Co-Investigator(s)

Co-Investigators responsible for, or working on this project should be listed below. Include any individual who will have responsibility for the consent process, direct data collection from subjects, or follow-up.

<table>
<thead>
<tr>
<th>Name (Last name, First name MI):</th>
<th>Highest Earned Degree:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neumark-Sztainer, Dianne R</td>
<td>PhD</td>
</tr>
</tbody>
</table>

Mailing Address:
West Bank Office Building
1300 South 2nd Street
Suite 300
Minneapolis, MN 55454

U of M Employee/Student ID: 2102204
U of M x.500 ID (ex. smith001): neuma001

Occupational Position: Faculty  Staff  Student  Fairview Researcher  Gillette Researcher  Other:

Email: Neumark@epi.umn.edu
University Department (if applicable): Epidemiology

Original Signature of Co-Investigator: 
Title of Co-Investigator: Professor  Date: Dec 19, 2006

Social & Behavioral Sciences Application Form
### UNIVERSITY OF MINNESOTA

**INSTITUTIONAL REVIEW BOARD**

<table>
<thead>
<tr>
<th>Original Signature of Co-Investigator</th>
<th>Title of Co-Investigator</th>
<th>Date</th>
</tr>
</thead>
</table>

**Name (Last name, First name MI):**

**Mailing Address:**

**U of M Employee/Student ID:**

**U of M E.500 ID (ex. smith001):**

**Occupational Position:**
- [x] Faculty
- [ ] Staff
- [x] Student
- [x] Fairview Researcher
- [ ] Gillette Researcher
- [ ] Other

- **Highest Earned Degree:**
- **Phone Number:**
- **Pager or Cell Phone Number:**
- **Fax:**
- **Email:**
- **University Department (if applicable):**

*Indicate the training and education completed in the protection of human subjects or human subjects records (required for all research. *Refer to training links at the end of this section.)*:
- [ ] CITI
- [x] FIRST
- [x] Investigator 101
- [ ] NIH
- [ ] HIPAA
- [ ] Other

*Training Links*
- CITI - [https://www.citiprogram.org/default.asp](https://www.citiprogram.org/default.asp)
- FIRST - [http://www.research.umn.edu/first/HumanSubjects.htm](http://www.research.umn.edu/first/HumanSubjects.htm) *(formerly RCR)*
- NIH - [http://www.research.umn.edu/first/HumanSubjects.htm](http://www.research.umn.edu/first/HumanSubjects.htm)
- HIPAA - [http://www.research.umn.edu/first/AddiionalCourses.htm](http://www.research.umn.edu/first/AddiionalCourses.htm)

#### 1.5 Research Staff

*Personnel you wish to be included in correspondence related to this study e.g. study coordinators*

<table>
<thead>
<tr>
<th>Name (Last name, First name MI):</th>
<th>Highest Earned Degree:</th>
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<tbody>
<tr>
<td><strong>Friend, Sarah</strong></td>
<td><strong>MPH</strong></td>
</tr>
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</table>

**Mailing Address:**

**U of M Employee/Student ID:**

**U of M E.500 ID (ex. smith001):**

**Occupational Position:**
- [x] Faculty
- [x] Staff
- [x] Student
- [ ] Fairview Researcher
- [ ] Gillette Researcher
- [ ] Other

- **Phone Number:** 612-626-8372
- **Pager or Cell Phone Number:**
- **Fax:** 612-626-7103
- **Email:** Friend@zepi.umn.edu
- **University Department (if applicable):** Epidemiology

---

Social & Behavioral Sciences Application Form
1.6 Student Research

If the PI of this research is a student, include Appendix J filled out by the advisor with this application form and include the advisor's signature below.

<table>
<thead>
<tr>
<th>Advisor Name (Last name, First name Mi):</th>
<th>University Department:</th>
</tr>
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<tbody>
<tr>
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<td>Epidemiology</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mailing Address:</th>
<th>Phone Number:</th>
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</thead>
<tbody>
<tr>
<td>West Bank Office Building</td>
<td>612-624-0880</td>
</tr>
<tr>
<td>1300 S. 2nd Street, Suite 300</td>
<td></td>
</tr>
<tr>
<td>Minneapolis, MN 55454</td>
<td>Email: <a href="mailto:Neumark@epi.umn.edu">Neumark@epi.umn.edu</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U of M Employee ID:</th>
<th>U of M x.500 ID (ex. smith001):</th>
</tr>
</thead>
<tbody>
<tr>
<td>2102204</td>
<td>neum001</td>
</tr>
</tbody>
</table>

Indicate the training and education completed in the protection of human subjects or human subjects records (required for all research. Refer to training links at the end of the previous section.):

<table>
<thead>
<tr>
<th>Training Link</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ CITI □ FIRST □ Investigator 101 □ NIH □ HIPAA □ Other</td>
<td>Dec 19, 2006</td>
</tr>
</tbody>
</table>

2. Funding

2.1 Is this research funded by an internal or external agency?

☐ Yes. Include Appendix A
☐ No. Explain how costs of research will be covered:
### UNIVERSITY OF MINNESOTA

**INSTITUTIONAL REVIEW BOARD**

<table>
<thead>
<tr>
<th>Name (Last name, First name MI):</th>
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</tbody>
</table>

**Occupational Position:**
- [ ] Faculty
- [ ] Staff
- [ ] Student
- [ ] Fairview Researcher
- [ ] Gillette Researcher
- [ ] Other

Need more space for Co-Investigators and Staff? Download an extra personnel sheet and include it with your application.

### 1.6 Student Research

If the PI of this research is a student, include Appendix I filled out by the advisor with this application form and include the advisor's signature below.

<table>
<thead>
<tr>
<th>Advisor Name (Last name, First name MI):</th>
<th>University Department:</th>
</tr>
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Minneapolis, MN 55454

**U of M Employee ID:**

2102204

**Phone Number:**

612-624-0880

**Email:**

Neumark@epi.umn.edu

**U of M x.500 ID (ex. smith001):**

neuma001

**Indicate the training and education completed in the protection of human subjects or human subjects records (required for all research. Refer to training links at the end of the previous section.):**

- [ ] CITI
- [ ] FIRST
- [ ] Investigator 101
- [ ] NIH
- [ ] HIPAA
- [ ] Other

**Original Signature of Advisor:**

[Signature]

**Date:**

Dec 19, 2006

### 2. Funding

2.1 Is this research funded by an internal or external agency?

- [X] Yes. Include Appendix A
- [ ] No. Explain how costs of research will be covered:

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Social & Behavioral Sciences Application Form

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166
3. Institutional Oversight

3.1 Is this research proposal being reviewed by any other institution or peer review committee?

☐ Yes. Attach copy of materials submitted for peer review.
☒ No.

If yes, Please select which other committee approvals are required for this research and provide documentation of their approval:

☐ Cancer Protocol Review Committee (CPRC)
☐ Cancer Protocol Review Committee/Non-Therapeutic Interventional Trials Review (CPRC/NTI)
☐ Conflict Management Review Committee (CMRC)
☐ University Research Opportunity Program (UROP)
☐ Nursing Research Council
☐ Grant-in-Aid of Research, Artistry, and Scholarship Program (GIA)
☐ Other IRB, please specify: ______
☐ Other, please specify: ______

Peer review Web sites:

• Cancer Protocol Review Committee (CPRC)
• Cancer Protocol Review Committee/Non-Therapeutic Interventional Trials Review (CPRC/NTI)
• University Research Opportunity Program (UROP)
• Grant-in-Aid of Research, Artistry, and Scholarship Program (GIA)

3.2 Is this research funded by the National Cancer Institute (NCI) or cancer related?

☐ Yes.
☒ No.

4. Conflict of Interest

Federal Guidelines emphasize the importance of assuring there are no conflicts of interest in research projects that could affect the welfare of human subjects. If this study involves or presents a potential conflict of interest, additional information will need to be provided to the IRB. Examples of potential conflicts of interest may include, but are not limited to:

• A researcher or family member participating in research on a technology, process or product owned by a business in which the faculty member holds a financial interest
• A researcher participating in research on a technology, process or product developed by that researcher
• A researcher or family member assuming an executive position in a business engaged in commercial or research activities related to the researchers' university responsibilities
• A researcher or family member serving on the Board of Directors of a business from which that member receives University-supervised sponsored research support
• A researcher receiving $10,000 or more in consulting income from a business that funds his or her research

University of Minnesota Researchers, please refer to:
http://www1.umn.edu/regents/policies/academic/ConflictOfInterest.html

Fairview Health System Researchers, please refer to:
http://www.fairview.org/profresearch
http://www.gillesighthouse.org/

Social & Behavioral Sciences Application Form
4.1 Do any of the Investigators or personnel listed on this research have a potential conflict of interest associated with this study?

☐ No. Skip to section 5.
☐ Yes.

If yes, identify the individual(s):

4.2 Has this potential conflict of interest been disclosed and managed?

☐ No.
If you are a University of Minnesota researcher, please disclose your potential conflict of interest online for review by your Department Head and Dean via the Report of External Professional Activities (REPA) at https://egms.umn.edu/REPA/
If you are a Fairview Health System researcher, please complete the Fairview Health Services Conflict of Interest Disclosure forms (http://www.fairview.org/prof/research/research_forms.asp) and submit the completed forms to the Fairview Office of Research.
If you are a Gillette Children's Specialty Healthcare researcher, please contact the Director of Research Administration, at 651-229-1745.

☐ Yes.
The IRB will verify that a management plan is in place with the Conflict Management Committee (CMC). If the CMC does not have an approved management plan for this research, the CMC will contact the individual(s) listed in question 4.1 for additional information.

Final IRB approval cannot be granted until all potential conflict matters are settled. The IRB requires a recommendation from the CMC regarding disclosure to subjects and management of the conflict. The full IRB committee determines what disclosure language should be in the consent form.

5. Compensation

5.1 Will you give subjects gifts, payments, compensation, reimbursement, services without charge or extra credit?

☐ Yes.
☐ No.

If yes, please explain:
Subjects will be given a $10 gift card to Target as compensation for completing the study survey. They will have the opportunity to complete two surveys, at baseline and follow-up, for a total of 2 $10 gift cards.

6. Summary of Activities

Use lay language, do not refer to grant or abstract.

6.1 Describe the objective(s) of the proposed research including purpose, research question, hypothesis and relevant background information etc.

The purpose of the proposed research is to determine how elements of the family environment influence the outcomes of a school-based obesity prevention intervention.

Social & Behavioral Sciences Application Form
This is an ancillary study to the intervention study New Moves II: Obesity Prevention Among Adolescent Girls (Human Subjects Code: 0309551763). This study will recruit a parent of each of the high school-aged girls participating in New Moves II and survey them to obtain information on the family environment with emphasis on nutrition and physical activity opportunities in the home. The data obtained from this survey will be analyzed along with data obtained in New Moves II to test this study’s hypotheses.

The specific aims of this study are:

• Among girls participating in New Moves II, determine the relationship between their family environment and changes in behavioral and weight-related outcomes after the New Moves II intervention.
• Determine the impact of New Moves II on the family environment of participants.
• Determine how changes in the family environment mediate the relationship between New Moves II and intervention outcomes.
6.2 Which methods will this study include? (check all that apply)

[ ] Descriptive
[ ] Ethnographic
[ ] Experimental/Control Design
[ ] Field work (If checked, please include Appendix L)
[ ] Formative
[ ] Longitudinal
[ ] Oral history
[ ] Phenomenological
[ ] Qualitative
[ ] Quantitative
[ ] Other, specify: 

6.3 Describe the research study design.

This study will collect quantitative, longitudinal data from the parent of each girl participating in New Moves II. Data will be obtained at baseline, at the same time girls in New Moves II are completing a baseline assessment, and one year later, also when the girls will be completing a follow-up assessment, after completion of the New Moves II intervention.

6.4 Describe the tasks subjects will be asked to perform. Attach surveys, instruments, interview questions, focus group questions etc. Describe the frequency and duration of procedures, psychological tests, educational tests, and experiments; including screening, intervention, follow-up etc. (If you intend to pilot a process before recruiting for the main study please explain.)

Subjects will be asked to complete a paper and pencil survey that will take about 15 minutes to complete twice, once at baseline and again one year later. The survey will have questions about availability of various foods in their home, their support for their daughter's nutritious eating and physical activity, their own physical activity levels, their dieting histories, etc. If subjects do not either return one of the two surveys that will be mailed to them over a two month period, or return a signed statement that they do not wish to participate in the study, study staff will call the subject at home and give them the opportunity to enroll in the study and complete the survey over the phone. Subjects may also refuse to participate in the study over the phone.

The survey is currently under development and will be submitted to the IRB for approval before subject recruitment.

6.5 How many months do you anticipate this research study will last from the time final approval is granted?

The study will last 30 months from subject recruitment to final data analysis.

7. Participant Population

7.1 Expected number of participants: 360

50 # of Male

310 # of Female

7.2 Expected Age Range

Check all that apply:

Social & Behavioral Sciences Application Form
☐ 0-7 (Include parental consent form)
☐ 8-17 (Include child's assent form and parental consent form)
☒ 18-65
☐ 65 and older

Exact ages to be included: 30-65
7.3 Inclusion/Exclusion of Children in this Research

If this study proposes to include children, this inclusion must meet one of the following criteria for risk/benefit assessment according to the federal regulations (45 CFR 46, subpart D).

Check the one appropriate box:

☐ (404) Minimal Risk
☐ (405) Greater than minimal risk, but holds prospect of direct benefit to subjects
☐ (406) Greater than minimal risk, no prospect of direct benefit to subjects, but likely to yield generalizable knowledge about the subject’s disorder or condition.

Explain how this criterion is met for this study:

If this study would exclude children, NIH guidelines advise that the exclusion be justified, so that potential for benefit is not unduly denied. Indicate whether there is potential for direct benefit to subjects in this study and if so, provide justification for excluding children. Note that if inclusion of children is justified, but children are not seen in the PI’s practice, the sponsor must address plans to include children in the future or at other institutions.

☒ No direct benefit established (exclusion of children permissible)
☐ Potential for direct benefit exists.

Provide justification for exclusion of children:

This study aims to assess the family environment from the perspective of the parent and therefore including children in its study population is not applicable. Data from this study will be combined with data collected in New Moves II for analysis.

7.4 Other Protected Populations to be Targeted or Included in this Research. Check all that apply:

Protected by Federal Regulations
☐ Pregnant Woman/Infants/IVF (Include Appendix B)
☐ Prisoners (Include Appendix C)

(Refer to 45 CFR 46 subpart B and 45 CFR 46 subpart C on the populations protected by Federal Regulations)

Protected by Federal Guidelines
☐ Mentally/Emotionally/Developmentally Disabled Persons (Include Appendix I)
☒ Minority Group(s) and Non-English Speakers (Include Appendix I)
☐ Elderly Subjects – 65+ (Include Appendix I)
☒ Gender Imbalance—all or more of one gender (Include Appendix I)

7.5 Inclusion and Exclusion of Subjects in this Research Study

Describe criteria for inclusion and exclusion of subjects in this study

Inclusion Criteria:

The inclusion criterion is that the subject has a daughter who is participating in New Moves II.

Exclusion Criteria:

There are no exclusion criteria as all those who will be recruited will have already met the inclusion criteria.
7.6 Location of subjects during research activity or location of records to be accessed for research:

Check all that apply:

- [ ] Fairview University Medical Center
- [ ] Fairview Southdale Hospital
- [ ] Fairview Ridges Hospital
- [ ] Other Fairview Facility, specify:
- [ ] Gillette Children’s Hospital
- [ ] Other Hospitals, specify:
- [ ] Community Clinic, specify:
- [ ] Elementary/Secondary Schools (Include Appendix M), specify:
- [ ] Community Center, specify:
- [ ] University Campus (non-clinical), specify:
- [ ] Prisons/Halfway houses (Include Appendix C), specify:
- [ ] Nursing Home(s), specify:
- [ ] Subject’s Home, specify:
- [ ] International Location: (Include Appendix K)
- [ ] Other special institutions, specify:

7.7 Describe the rationale for using each location checked above. Attach copies of IRB approvals or letters of cooperation from other agencies or sites, if applicable.

The surveys will initially be mailed to the subject’s (parent’s) home to be completed. If subjects do not respond to two surveys mailed to them, along with two postcards reminding them of the study, the subject will be called at home to be recruited into the study and have the opportunity to either refuse participation or complete the survey with an study staff member over the phone.

8. Recruitment

8.1 Describe the recruitment process to be used for each group of subjects:

Attach a copy of any and all recruitment materials to be used e.g. advertisements, bulletin board notices, e-mails, letters, phone scripts, or URLs.

Subjects (parents) will be recruited as their daughters are enrolled in New Moves II. Subjects’ addresses and phone numbers will be obtained from the parental consent form they submit to enroll their daughter in New Moves II. Potential subjects will receive a mailing containing a letter of introduction to the study. This letter, which has been submitted with this application, will include information notifying them that by completing and returning the survey they are consenting to participate in the study in addition to a space for subjects to sign if they wish to not participate in the study. Participants will also receive a page of information about the study, the study survey, and a stamped, self-addressed envelope so they can return either the survey or the signed sheet saying they do not wish to participate in the study. If the potential subject does not return the survey, or the signed sheet saying they do not wish to participate within 2 weeks, they will receive a postcard reminding them that they are eligible to participate in this study and if they wish to, to return the survey. If after 2 more weeks they have not returned either the survey or the signed sheet saying they do not wish to participate, they will receive another mailing identical to the first. Again, if after two weeks they have not returned anything, they will receive a final reminder postcard. If two weeks after this they have not returned anything, study staff will call their home and inform them of their ability to enroll in the study and allow them to complete the study survey over the phone. A reasonable number of phone calls will be made to their home to ensure as high a participation...
rate as possible, without being intrusive.
A recruitment script for these telephone calls will be submitted to the IRB before the beginning of this study.

8.2 Explain who will approach potential subjects to take part in the research study and what will be done to protect individuals' privacy in this process:
Initial contact of subjects identified through records search must be made by the official holder of the record, i.e. primary physician, therapist, public school official.

The PI of this study will be mailing out the information and survey packets, the reminder postcards, and making phone calls to subjects as necessary. Addresses and phone numbers will be obtained from New Moves II parental consent forms that the subjects completed for their daughter to enroll in New Moves II. Both the girls in New Moves II and their parents in this study will be identified by identification numbers and paperwork linking identification numbers with personal information will remain under the control of study staff and will be stored in a secure location.
8.3 Are subjects chosen from records?

☑ Yes. Who gave approval for use of the records: Dianne Neumark-Sztainer, PI of New Moves II

☐ No.

If yes, are records "private" medical or student records?

☐ Yes. Provide the protocol, consent forms, letters, etc. for securing consent of the subjects of the records. Written documentation for the cooperation/permission from the holder or custodian of the records should be attached.

☑ No.

8.4 University of Minnesota policy prohibits researchers from accepting gifts for research activities. Is the study sponsor offering any incentive connected with subject enrollment or completion of the research study (i.e. finders fees, recruitment bonus, etc.) that will be paid directly to the research staff?

☑ Yes.

☐ No.

If yes above, please affirm that you have declined acceptance of gifts in the box below.


9. Risks and Benefits

9.1 Does the research involve any of these possible risks or harms to subjects?

Check all that apply:

☐ Use of a deceptive technique. (Include Appendix N)

☐ Use of private records (educational or medical records)

☐ Manipulation of psychological or social variables such as sensory deprivation, social isolation, psychological stresses

☑ Any probing for personal or sensitive information in surveys or interviews

☐ Presentation of materials which subjects might consider sensitive, offensive, threatening or degrading

☐ Possible invasion of privacy of subject or family

☐ Social or economic risk

☐ Other risks, specify: ______

9.2 Describe the nature and degree of the risk or harm checked above. The described risks/harms must be disclosed in the consent form.

Survey questions about the family or home environment may be perceived as sensitive or personal by study subjects.

9.3 Explain what steps will be taken to minimize risks or harms and to protect subjects' welfare. If the research will include protected populations (see question 7.4) please identify each group and answer this question for each group.

Before completing the survey, subjects will be notified that some of the survey questions may be sensitive or personal. They will be notified that they have the right not to complete the survey, to skip any
9.4 Describe the anticipated benefits of this research for individual subjects in each subject group. If none, state “None.”

(Hint: For instance, if the intervention proves effective, subjects in active arms will benefit but controls will not.)

| Subjects who complete and return the study survey will receive a $10 gift card. They have the opportunity to receive 2 $10 gift cards if they complete and return both the baseline and follow-up survey. |

9.5 Describe the anticipated benefits of this research for society, and explain how the benefits outweigh the risks.

| Family environments are known to impact adolescents’ diet, physical activity levels, and weight status. This study will help illuminate how family environments impact adolescents’ weight loss efforts via a school-based obesity prevention intervention. From the results of this study, interventions aimed both at schools and families can better target behavior change that will aid adolescent’s weight loss efforts, therefore reducing their risk of physical and mental health problems attributable to overweight and obesity both currently and throughout their lifetime. We anticipate very minimal risk from participating in this study and believe that the information gained from parents of girls participating in a school-based obesity prevention intervention will be very informative and lead to improved public health efforts to combat childhood obesity. |

10. Confidentiality of Data

See Protecting Private Data Guideline from the Office of Information Technology (OIT) for information about protecting the privacy of research data.

10.1 Will you record any direct identifiers, names, social security numbers, addresses, telephone numbers, etc?

☑ Yes.
☐ No.

If yes, explain why it is necessary to record findings using these identifiers. Describe the coding system you will use to protect against disclosure of these identifiers.

| This study will link data collected from each subject (a parent) to the data collected in New Moves II from their daughter. Additionally, it is necessary to link the baseline data collected from parents and daughters, to the follow-up data collected a year later from both. In New Moves II, arbitrary ID numbers will be used to identify the daughter’s data and a computer file linking the ID number and name will be made separate from all substantive data files. Subjects in this study will be assigned an ID number that is linked to their daughter’s ID number to ensure continuity of data. Only members of the research team will have access to the file linking the subjects’ names and ID numbers. |

10.2 Will you retain a link between study code numbers and direct identifiers after the data collection is complete?

☑ Yes.
☐ No.

If yes, explain why this is necessary and state how long you will keep this link.

| Once the linking data file has been entered onto the computer, identifiers will be stripped from the surveys. |

Social & Behavioral Sciences Application Form
10.3 Will you provide the link or identifier to anyone outside the research team?

☐ Yes.
☒ No.

If yes, explain why and to whom:

10.4 Where, how long, and in what format (such as paper, digital or electronic media, video, audio, or photographic) will data be kept? In addition, describe what security provisions will be taken to protect this data (password protection, encryption, etc.).

The data in paper form will be kept at the Division of Epidemiology and Community Health for an indefinite period of time. Data will be kept in a locked file, and only members of the research team will have access to it. Data regarding the study will be stored on a Division of Epidemiology and Community Health secure server and will be password protected.
10.5 Will you place a copy of the consent form or other research study information in the subjects' record such as medical, personal or educational record? (This information should be explained on the consent form.)

☐ Yes.
☒ No.

If yes, explain why this is necessary:

10.6 Federal Certificates of Confidentiality

If the data collected contains information about illegal behavior, visit the NIH Certificates of Confidentiality Kiosk (http://grants.nih.gov/grants/policy/coo/) for information about obtaining a Federal Certificate of Confidentiality.

Will you obtain a Federal Certificate of Confidentiality for this research?

☐ Yes. Submit documentation of application (and a copy of the Certificate of Confidentiality award if granted) with this application form.
☒ No.

11. Use of Protected Health Information (PHI): HIPAA Requirements

11.1 As part of this study, do you:

a. Collect protected health information (PHI)* from subjects in the course of providing treatment/experimental care; or

b. Have access to PHI* in the subjects’ records?

Please read the definition of PHI below before answering.

*PHI is defined under HIPAA as health information transmitted or maintained in any form or medium that:

1. Identifies or could be used to identify an individual;

2. Is created or received by a healthcare provider, health plan, employer or healthcare clearinghouse; and

3. Relates to the past, present or future physical or mental health or condition of an individual; the provision of health care to an individual; or the past, present or future payment for the provision of healthcare to an individual.

The following records ARE EXEMPTED from the definition of PHI even though they may contain health-related information: student records maintained by an educational institution and employment records maintained by an employer related to employment status. If your study uses these kinds of records, it is not subject to HIPAA. However, existing IRB rules on informed consent and confidentiality still apply.

Health-related information is considered PHI if (any of the following are true):

1. The researcher obtains it directly from a provider, health plan, health clearinghouse or employer (other than records relating solely to employment status);

2. The records were created by any of the entities in “1” and the researcher obtains the records from an intermediate source which is NOT a school record or an employer record related solely to employment status; OR

3. The researcher obtains it directly from the study subject in the course of providing treatment to the subject.

Health-related information is not considered PHI if the researcher obtains it from:

1. Student records maintained by a school;
2. employee records maintained by an employer related to employment status; OR
3. the research subject directly, if the research does NOT involve treatment.

☐ Yes. If yes to a or b above, complete Appendix H to show how you will satisfy HIPAA requirements for authorization to use PHI in research.

☒ No. If no, continue to section 12.

12. Expedited Review

If you would like this application to be considered by the IRB for expedited review, fill out this section. If not, continue to section 13.

Federal criteria for risk assessment make some studies eligible for Expedited Review (see 45 CFR 46.110 and 21 CFR 56.110).

Expedited review categories can be found at http://www.irb.umn.edu/applying/revcategories.cfm

12.1 What is the level of risk to subjects in this research study?

☒ Not greater than minimal risk. Indicate which expedited review category 1-9 for this research.
  
  Category #: 2

☐ Greater than minimal risk.

13. Informed Consent Process

13.1 Recognizing that consent itself is a process of communication, build on your responses to questions 8.1 and 8.2 and describe what will be said to the subjects to introduce the research. Do not say "see consent form". Write the explanation in lay language. If you are using telephone surveys, telephone scripts are required.

Potential subjects will be introduced to the study in a letter sent to their homes. They will have already signed a consent form for their daughter to participate in New Moves II, so they would have had previous contact with the research team. In the letter, subjects will be reminded that their daughter is enrolled in New Moves II, and a description of this study will be provided. Subjects will be provided with ways to contact the PI of this study and of New Moves II if they have any questions or concerns. Subjects will also be notified that they can either complete the study survey as a means of consenting to and enrolling in the study, or sign and return the statement that they do not wish to participate in this study. If they do not return either two months after initial contact, subjects will be called at home and given the opportunity to refuse participation or consent to and participate in the study over the phone while speaking with study staff.

13.2 In relation to the actual data gathering, when will consent be discussed and documentation obtained? (e.g., mailing out materials, delivery of consent form, meetings) Be specific.

Consent will be discussed and documentation obtained simultaneously to subject enrollment which will be in either spring 2007 or spring 2008, depending on when their daughter is enrolled in New Moves II. Potential subjects may call the PI to discuss the consent process prior to consenting to participating in the study.
13.3 Will the investigator(s) be securing all of the informed consent?

X Yes.
No.

If no, please name the specific individuals who will obtain informed consent and include their job
title/credentials and a brief description of your plans to train these individuals to obtain informed consent
and answer subjects' questions.

Subject Comprehension

It is the responsibility of the investigator to assess comprehension of the consent process and only enroll
subjects who can demonstrate informed understanding of the research study (45 CFR 46.116)

The federal regulations require that consent be in language understandable to the subject. If subjects do not
comprehend English, translated consent forms are required or the use of short forms with an oral explanation
can be accepted. (see the Consent Process & Forms section of our Web site)

13.4 What questions will you ask to assess the subjects' understanding of the risks and benefits of
participation? (Questions should be open-ended and go beyond requiring only a yes/no
response.)

This study utilizes a mailed self-administered questionnaire that will be sent along with information
about the risks and benefits of participation. This information will be written in simple language. There
is no way to know in advance the subjects' level of comprehension of English. However, subjects can
call the PI with any questions they may have and if needed, someone fluent in the subjects' spoken
language can be identified to facilitate communication between the PI and the subject. If the subject
does not return the mailed survey, and is contacted via telephone, the recruitment script will include
open-ended questions to assess the subject's understanding of the risks and benefits of participation.

Documentation of Consent

13.5 Prepare and attach a consent form for IRB review.

Please see the sample consent form and follow it carefully. Do not submit sponsor prepared forms without
editing the form to include University of Minnesota IRB standard language and all essential elements of
informed consent.

Under specific conditions, when justifiable, documentation of informed consent can be waived or altered. These
limited conditions are described in 45 CFR 46.116 and 45 CFR 46.117. If you believe that this research
qualifies according to the regulations, include Appendix IV.

Resources for preparing informed consent forms:


Social & Behavioral Sciences Application Form
You have reached the end of this form. Please make sure that you have responded to every question on this application (even if your response is "not applicable").
Appendix A
Sponsored Projects

If you are applying for funding, please answer all of the following questions. If you are receiving funding from multiple sources, please fill out this appendix for each of your sources.

1. This project [ ] has been ☑ will be submitted to the following funding agency:
   Name of Sponsor: J.B. Hawley Student Research Award
   Address: Division of Epidemiology, 1300 South Second Street, Suite 300, Minneapolis, MN 55454
   Contact Person: Dr. Lisa Harnack

2. The funding decision:
   ☑ is pending
   ☑ has been awarded, Grant Number: ________ (if assigned)

3. Type of funding source:
   ☑ Internal/University departmental funds
   ☑ Corporate Sponsor (grant or contract)
   ☑ Foundation (including MMF)
   ☑ Federal grant. Include copy of the grant with your IRB application

For Multifaceted Projects Only

4. This study is part of a:
   ☑ program project
   ☑ center grant
   ☑ other, specify: ________

5. Please provide the following information:
   Principal Investigator of program project/center grant: ________
   IRB assigned study code number of program project/center grant: ________
   Title of Program Project/Center Grant: ________

If you would like certification of approval sent to the funding agency, please provide the following information:

Name of Funding Agency Contact: _____________________________
Phone: _____________________________
Fax: _____________________________
E-mail: _____________________________
Address: _____________________________

Updated May 2006

[Signature] 12/19/06

Print PD Name: _____________________________
Date: _____________________________
Sponsored Projects - Appendix A

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Appendix I
Targeting/Inclusion of Vulnerable Populations

Though not specifically referenced in the federal regulations, the targeting or inclusion of potentially vulnerable populations (other than children, pregnant women/fetuses and prisoners) in research requires special considerations. Provide information on the following populations, if applicable, in this research:

Mentally/Emotionally/Developmentally Disabled

[ ] Targeted  [ ] Included
Provide justification:

Explain how competency to provide consent will be determined and plan for obtaining surrogate consent:

Minority Group(s)/Non-English Speakers

[ ] Targeted  [ ] Included
Provide justification:

Subjects will be parents of girls participating in New Moves II. New Moves II will be enrolling subjects from schools in the Twin Cities metropolitan area that have large racial and ethnic minority populations. Therefore, it is likely that a significant percentage of the subjects of this study will identify with a minority racial or ethnic group.

Provide plan for obtaining consent:

Subjects will be recruited and consented primarily through a mailed survey which will be at an appropriate reading level and subjects will be able to contact the PI with any questions they may have.

Elderly (65+)

[ ] Targeted  [ ] Included
Provide justification:

If competency to provide consent may be an issue, describe how competency will be determined and plan for obtaining consent:

Katherine W Bauer  12/19/06

Updated May 2006
Gender Imbalance

If all or more of one gender are targeted, provide justification for this:

In previous research using mailed surveys to the homes of parents, it is more common that mothers consent to be involved in the study. It is likely that this study will produce a similar gender imbalance.
Appendix J
Student as Principal Investigator Worksheet

Use this worksheet in collaboration with your academic advisor to demonstrate research preparedness of the Student investigator.

To be completed by the Academic Advisor

1. Student academic level: (check all that apply)
   - [ ] Undergraduate
   - [x] Graduate: Masters candidate, PhD. candidate

2. Explain how the scope of the proposed project, including anticipated risks and benefits, is appropriate to student research:
   This study involves an appropriate amount of study development, subject recruitment, and data collection and analysis for doctoral thesis research. This study involves minimal risk for the subjects and the PI will work closely with her advisor to ensure that appropriate human subjects considerations are accounted for.

3. Explain what experience, training or special preparation, the student researcher brings to the project from relevant coursework or professional exposure:
   The student researcher has worked in public health for 7 years including being a research assistant on many community-based projects, working for federal and local health agencies and taking masters and doctoral level coursework in epidemiology and other areas of public health. She has had extensive training on survey development and administration, human subjects, and protecting private data.

As Academic or project advisor for the named student investigator, I assume the roles and responsibilities required to oversee the conduct of this research, prevent harms to subjects and foster benefits to the subjects. I will report any changes in the project, adverse events, or incidents to the IRB which may affect the conduct of this project.

Dianne Neumark-Sztainer
Name of Academic Advisor (Printed)

Academic Advisor Signature

Date

Updated May 2006

[Signature]

Print PI Name

Date

Student as Principal Investigator Worksheet – Appendix J

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Advisors shoulder the responsibility for students engaged in independent research.
Study ID: __________

Date

Dear Parent/Guardian:

This fall your daughter will be participating in New Moves, a girls-only physical education class promoting physical activity and healthy eating. As part of the study, we would like to better understand aspects of your family and home that may help your daughter be successful in New Moves. In order to do this, we would like you to complete the attached survey.

Like most people these days, you are likely very busy, so we have tried to keep the survey fairly short. It should take only about 15 minutes to complete. Please return the survey in the stamped envelope we’ve included with this letter. To thank you for your participation, we will mail you a gift card to Target worth $10 when we receive your completed survey. We will also be contacting you again next spring when your daughter completes New Moves and you will have the opportunity to complete a second survey similar to this one and receive another $10 gift card to Target.

On the blue sheet included with this letter, you will find more detailed information about the New Moves Parent Study and your participation in it. This study is being conducted by Katherine Bauer, a graduate student from the Division of Epidemiology and Community Health at the University of Minnesota in Minneapolis, Minnesota. If you have any questions please call Katherine at (612) 624-8223 or email Bauer_K@epi.umn.edu.

If you do not wish to complete the survey, and would like us to not contact you to follow-up, please complete the bottom portion of this letter and return it to us in the included envelope.

Sincerely,

Dianne Neumark-Sztainer
New Moves Principal Investigator

I do not wish to participate in the New Moves Parent Study.

Name ______________________________________

Address ____________________________________

__________________________________________

Date ________________________________________
Study ID: __________

**Background Information:**
The purpose of this study is to collect information on aspects of New Moves participant’s family environment in order to determine how the family environment can impact various outcomes of a school-based program.

**Procedures:**
If you agree to be in this study, we ask that you fill out the survey included with this letter and mail it back in the included stamped, addressed envelope. If you do not return the survey and do not return the signed form stating that you do not wish to be contacted, a study staff member will call your home to follow-up and provide you the opportunity to participate in the study over the phone. If you do not return the form stating that you do not wish to be contacted, you will have the opportunity to complete a second survey next year.

**Risks and Benefits of Being in the Study:**
The study has no direct benefits. There are minimal risks related to study participation. Some of the survey questions might make you feel uncomfortable, but you don’t have to answer any questions with which you are uncomfortable.

**Compensation:**
If you complete and return this survey we will mail you a $10.00 gift card to Target. If you complete and return the second survey that will be sent to you in one year, you will receive another $10.00 gift card to Target. No other compensation is available from the University of Minnesota.

**Confidentiality:**
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a participant. Research records will be kept in a locked file; only researchers will have access to the records. Your name will not be used to identify your survey; it will be identified only by number. The master list associating names and ID numbers will be kept in a locked file.

**Voluntary Nature of the Study:**
Your decision whether or not to participate will not affect your current or future relationship with anyone at the University of Minnesota nor your daughter’s participation in New Moves.

**Contacts and Questions:**
The researcher conducting this study is Katherine Bauer. If you have any questions, you may contact Katherine Bauer at 612-624-8223 or email Bauer_K@epi.umn.edu. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), contact the Research Subjects’ Advocate line, D328 Mayo, 420 Delaware Street Southeast, Minneapolis, Minnesota 55455; telephone 612.625.1650.

**Statement of Consent**
If you wish to participate in this study, simply fill out the survey and return it in the stamped and addressed envelope. By returning the survey, you are indicating your consent to participate in this study.
From: hr@umn.edu  
Subject: stipulation letter  
Date: January 23, 2007 4:07:41 PM CST  
To: bauer223@umn.edu

01/23/2007  
Katherine W Bauer  
Epidemiology  
300 WBOC  
Minneapolis Campus

Please note that responses must be submitted to the IRB in paper form.

RE: “Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention”  
IRB Code Number: 0612P999957

Dear Ms. Bauer

Notification of IRB Expedited Review Action

Expedited Review Date: January 17, 2007  
Item Under Review: New Application  
Expedited Review Action: Stipulations must be met before final approval can be granted  
Additional Requirements Pending Approval:

a. In section 1.6 of the application, specify what human subjects protection training (other than HIPAA) has been completed for the advisor

b. State on the consent form the link between New Moves data and the proposed study data

c. Submit recruitment material.

We cannot record final approval for this study, and the study may not be initiated, until the stipulations have been satisfied. If your response is not received within 60 days, the study will be filed as inactive and a new application required for further consideration. If you have questions concerning this specific correspondence, contact Emily at 612-626-5746.

Sincerely,

Cynthia McGill, CIP  
Research Compliance Supervisor  
CMilek

CC: Sarah Friend, Dianne Neuman-Sztainer

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February 6, 2007

Cynthia McGill, CIP
Research Compliance Supervisor
Research Subjects' Protection Programs
MMC 820
420 Delaware St. SE
Minneapolis, MN 55455-0392

Dear Ms. McGill:

Thank you for your review of my application, “Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention” (IRB Code Number: 0612P98667). I have addressed the stipulations in the following ways:

a. In section 1.6 of the application, specify what human subjects protection training (other than HIPAA) has been completed for the advisor

Dr. Dianne Neumark-Sztainer has also completed the NIH training.

b. State on the consent form the link between New Moves data and the proposed study data

The following sentence has been added to the confidentiality section of the consent letter. I have attached the revised consent letter with this inserted sentence in bold.

The information you provide on this survey will be linked to the information obtained from your daughter by New Moves so they can be analyzed together.

c. Submit recruitment material

The recruitment letter is attached.

Please do not hesitate to contact me with any questions.

Sincerely,

Katherine W. Bauer, MS
RE: "Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention"
IRB Code Number: 0612P98667

Dear Ms. Bauer

The Institutional Review Board (IRB) received your response to its stipulations. Since this information satisfies the federal criteria for approval at 45CFR46.111 and the requirements set by the IRB, final approval for the project is noted in our files. Upon receipt of this letter, you may begin your research.

IRB approval of this study includes the consent form and recruitment materials received February 7, 2007.

The IRB would like to stress that subjects who go through the consent process are considered enrolled participants and are counted toward the total number of subjects, even if they have no further participation in the study. Please keep this in mind when calculating the number of subjects you request. This study is currently approved for 360 subjects. If you desire an increase in the number of approved subjects, you will need to make a formal request to the IRB.

For your records and for grant certification purposes, the approval date for the referenced project is January 17, 2007 and the Assurance of Compliance number is FWA00000312 (Fairview Health Systems Research FWA0000325, Gillette Children's Specialty Healthcare FWA00004003). Research projects are subject to continuing review and renewal; approval will expire one year from that date. You will receive a report form two months before the expiration date. If you would like us to send certification of approval to a funding agency, please tell us the name and address of your contact person at the agency.

As Principal Investigator of this project, you are required by federal regulations to inform the IRB of any proposed changes in your research that will affect human subjects. Changes should not be initiated until written IRB approval is received. Unanticipated problems or serious unexpected adverse events should be reported to the IRB as they occur.

The IRB wishes you success with this research. If you have questions, please call the IRB office at (612) 626-5654.

Sincerely,

Cynthia McGill, CIP
Research Compliance Supervisor
CM/egk
CC: Sarah Friend, Dianne Neumark-Sztainer
March 12, 2007

Cynthia McGill, CIP
Research Compliance Supervisor
Research Subjects' Protection Programs
Box 820 D528 Mayo
420 Delaware Street SE
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention
IRB Code Number: 0612P98667

Dear Ms. McGill,

I am writing to request approval for the attached survey we plan to use in our study. This survey will be sent to parents of girls participating in the obesity prevention intervention, New Moves II (IRB Code Number: 0309851763) to assess their family environment and its relationship to their daughter's weight-related behavior change. We would like to begin surveying parents in the beginning of April.

Many of the questions in this survey have been previously used among parents of children participating in obesity prevention interventions and have been validated. This survey will be sent to parents along with the recruitment and informed consent materials previously approved by the IRB for this study.

If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at Bauer_K@epi.umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student
March 30, 2007

Cynthia McGill  
Executive Assistant  
IRB: Human Subjects Committee  
Box 820 D528 Mayo  
420 Delaware Street SE  
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention  
IRB Code Number: 0612P98667

Dear Ms. McGill,

I am writing to request a change in protocol and to submit supporting documents for our study. In our study we will be surveying parents of girls participating New Moves II (IRB Code Number: 0309S51763) to assess their family environment and its relationship to their daughter’s weight-related behavior change.

The changes and additions requested are as follows:

**Modification to the surveying timeline and protocol**
In our original IRB application we described a recruitment protocol that involved 2 mailed surveys and 2 mailed reminder postcards, followed by a reasonable number of phone calls to their home. We would like to slightly modify this protocol by eliminating the reminder postcards and instead, send a flyer home from school with their daughter as a reminder. This flyer is attached for approval.

**Addition to Recruitment Letter**
In order to offer participants as many opportunities as possible to participate in this study, we have added the following emboldened information to the cover letter that will be sent out with our study survey. This will encourage parents to call us to complete the survey, if that method is easiest for them. The complete letter is attached.

If you have any questions, or would like to complete this survey over the phone, please call Kate at (612) 624-8223 or email Bauer_K@epi.umn.edu.

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Telephone Script
As mentioned in our original application, we have developed a script to follow when recruiting parents over the phone. This script has been adapted from another study that involved parents of children participating in a school-based health promotion program. Please see attached script.

If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at Bauer_K@epi.umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student

Approved
Administratively

IRB 41007 CLM
April 17, 2007

Cynthia McGill
Executive Assistant
IRB: Human Subjects Committee
Box 820 D528 Mayo
420 Delaware Street SE
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention
IRB Code Number: 0612P98667

Dear Ms. McGill,

Attached please find a modified Appendix A for the study, Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention. This Appendix now reflects the funding awarded to this project.

If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at Bauer_K@epi.umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student

Congratulations!
August 8, 2007

Cynthia McGill
Executive Assistant
IRB: Human Subjects Committee
Box 820 D528 Mayo
420 Delaware Street SE
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention
IRB Code Number: 0612P98667

Dear Ms. McGill,

I am writing to inform you of a small change we would like to make to the recruitment materials for this study.

Currently, parents of girls participating in the New Moves intervention are recruited into this study via a letter sent to their homes. If parents wish to participate, they are asked to complete a survey and return it. If parents do not wish to complete the survey and do not want to be contacted again, they are asked to complete the refusal form and send it back to us (see attached letter).

Thus far, 4 parents out of the 52 that have responded have returned the completed survey to us, therefore consenting to participate in the study, while also returning a completed refusal form. We have since realized that the language of this form is confusing. We believe that it was not clear enough that only those wishing to not be contacted should complete the form. Many of the parents being recruited are non-native English speakers and this may be contributing to the confusion.

I have spoken with Michael Oakes regarding steps to rectify this situation. We have decided that study staff will contact the parents who filled out both the survey and the refusal form and determine whether they do or do not wish to participate in the study in the future. If the parents are not reachable via phone, we will assume that they do not want to participate and we will not contact them again.

In order to clarify our process going forward, we have modified the letter being sent to the parents in the recruitment stage. Enclosed please find the modified letter. We believe we have made it clearer to parents how to refuse participation in the study.

Driven to Discover
If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at Bauer_K@epi.umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student
October 25, 2007

Cynthia McGill
Executive Assistant
IRB: Human Subjects Committee
Box 820 D528 Mayo
420 Delaware Street SE
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention
IRB Code Number: 0612P98667

Dear Ms. McGill,

I am writing to request a change in protocol. In our study are surveying parents of girls participating in New Moves II (IRB Code Number: 0309S51763) to assess their family environment and its relationship to their daughter’s weight-related behavior change.

Currently, in order to recruit parents into the study up to two study information packets are sent to their home, followed by a series of phone calls if they do not respond via mail. For those parents who were originally contacted in the spring previous to their daughter’s enrollment in the intervention and did not respond, we would like to send one additional mailing in the fall. We believe that many parents will respond to an additional mailing now that their daughters are actively enrolled in New Moves II. This mailing will place little burden on the participants and reduce the burden of conducting the study survey via phone.

If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at Bauer_K@epi.umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student

Approved Administratively

[Signature]

IAB 11-7-07 CLM

Driven to Discover®
March 26, 2008

Cynthia McGill
Executive Assistant
IRB: Human Subjects Committee
Box 820 D528 Mayo
420 Delaware Street SE
Minneapolis, MN 55455

Re: Assessing the Influence of the Family Environment on Girls in a School-Based Obesity Prevention Intervention
IRB Code Number: 0612P98667

Dear Ms. McGill,

I am writing to submit supporting documents for our study. These documents relate to our surveying of parents of girls who participated in the New Moves II intervention (IRB Code Number: 0309S51763) this school year. The surveys serve to assess their family environment and its relationship to their daughter’s weight-related behavior change.

The attached documents are as follows:

1. **Cover letter, refusal form and consent information for follow-up survey**
   These documents will be sent to parents who responded to the study’s baseline survey last year. We are requesting that parents complete a follow-up survey to assess changes in the home and family environment over the past year while their daughter has been enrolled in New Moves II.

2. **Follow-up survey including parent process evaluation**
   This survey, to be sent to those parents that responded to the baseline survey, is very similar to the baseline survey and will serve to assess changes in the home and family over the past year. The last two pages of questions are new and will be sent to parents of girls who participated in the active arm of the New Moves intervention, to assess their satisfaction with the intervention. Parents of girls in the control arm will not receive the last two pages of questions.

3. **Cover letter, refusal form, consent information and process evaluation survey**
   Parents of girls in the intervention arm of New Moves, who had not previously refused participation in the current study but did not complete a baseline survey, will receive a short process evaluation survey to complete to assess their satisfaction with the intervention. This survey contains a few questions regarding their demographic information in order to assess differences between those parents who participated at baseline and those who only chose to complete the follow-up process evaluation.
If you have any questions, or concerns, please feel free to contact me. I can be reached by phone at (612) 624-8223, by mail at the above address or by email at bauer223@umn.edu.

Thank you very much.

Sincerely,

Katherine W. Bauer, MS
Principal Investigator and Doctoral Student
Appendix B: New Moves Baseline and Follow-up Survey
Thank you for agreeing to complete this New Moves survey!

The questions you are about to complete are very important. Please answer every question carefully. If something is unclear or you have a question, please ask one of the New Moves staff. Your help with this project is greatly appreciated.

This is not a test, your name will not be on the survey, so no one will know who you are. Please be as honest as you can with your responses.

• Please use a blue or black pen to complete the survey
• Place a check in the box for your answer
• If you make a mistake, place an x through the incorrect answer and check the correct box

Thanks For Your Time!
Decide whether you are more like the teenager described on the **LEFT** or the **RIGHT** side of each statement. Then, for that side only, indicate whether that statement is **really true** or just **sort of true** for you. **Please check only one box for each question.**

<table>
<thead>
<tr>
<th>Really true for me</th>
<th>Sort of true for me</th>
<th>BUT</th>
<th>Other teenagers would rather go to sports events</th>
<th>Sort of true for me</th>
<th>Really true for me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers like to go to the movies in their spare time</td>
<td>🟢</td>
<td>Other teenagers don’t feel that they are very good when it comes to sports</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>2. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers do very well at all kinds of sports</td>
<td>🟢</td>
<td>Other teenagers are happy with the way they look</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>3. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers are not happy with the way they look</td>
<td>🟢</td>
<td>Other teenagers are pretty pleased with themselves</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>4. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers are often disappointed with themselves</td>
<td>🟢</td>
<td>Other teenagers are afraid they might not do well at a new athletic activity</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>5. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers think they could do well at just about any new athletic activity</td>
<td>🟢</td>
<td>Other teenagers like their body the way it is</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>6. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers wish their body was different</td>
<td>🟢</td>
<td>Other teenagers do like the way they are leading their lives</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>7. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers feel that they are better than others their age at sports</td>
<td>🟢</td>
<td>Other teenagers don’t feel they can play as well</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>8. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers wish their physical appearance was different</td>
<td>🟢</td>
<td>Other teenagers like their physical appearance the way that it is</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>9. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers are happy with themselves most of the time</td>
<td>🟢</td>
<td>Other teenagers are often not happy with themselves</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>10. 🟢</td>
<td>2.️⃣</td>
<td>Some teenagers don’t do well at new outdoor games</td>
<td>🟢</td>
<td>Other teenagers are good at new games right away</td>
<td>3.️⃣</td>
</tr>
<tr>
<td>ID</td>
<td>Really true for me</td>
<td>Sort of true for me</td>
<td>BUT</td>
<td>Really true for me</td>
<td>Sort of true for me</td>
</tr>
<tr>
<td>---</td>
<td>-------------------</td>
<td>---------------------</td>
<td>-----</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>2</td>
<td>Some teenagers think that they are good looking</td>
<td>BUT</td>
<td>Other teenagers think that they are not very good looking</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>2</td>
<td>Some teenagers like the kind of person they are</td>
<td>BUT</td>
<td>Other teenagers often wish they were someone else</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>2</td>
<td>Some teenagers do not feel that they are very athletic</td>
<td>BUT</td>
<td>Other teenagers feel that they are very athletic</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>2</td>
<td>Some teenagers really like their looks</td>
<td>BUT</td>
<td>Other teenagers wish they looked different</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>2</td>
<td>Some teenagers are very happy being the way they are</td>
<td>BUT</td>
<td>Other teenagers wish they were different</td>
</tr>
</tbody>
</table>

Please choose the **ONE SENTENCE** for each section that best describes some of your eating and activity behaviors.

16. **Physical Activity**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am not physically active <strong>and</strong> do not intend to become active</td>
</tr>
<tr>
<td>2</td>
<td>I am not physically active, <strong>but</strong> I am thinking about starting</td>
</tr>
<tr>
<td>3</td>
<td>I am somewhat physically active, although I am not active on most days of the week</td>
</tr>
<tr>
<td>4</td>
<td>I am physically active on most days of the week, <strong>but</strong> have only been so within the past 6 months</td>
</tr>
<tr>
<td>5</td>
<td>I am physically active on most days of the week <strong>and</strong> have been for longer than 6 months</td>
</tr>
</tbody>
</table>

17. **Breakfast**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I do not eat breakfast <strong>and</strong> do not intend to start</td>
</tr>
<tr>
<td>2</td>
<td>I do not eat breakfast, <strong>but</strong> I am thinking about starting</td>
</tr>
<tr>
<td>3</td>
<td>I sometimes eat breakfast, although on most days of the week I do not eat breakfast</td>
</tr>
<tr>
<td>4</td>
<td>I eat breakfast everyday, <strong>but</strong> have only been doing so within the past 6 months</td>
</tr>
<tr>
<td>5</td>
<td>I eat breakfast everyday <strong>and</strong> have been doing so for longer than 6 months</td>
</tr>
</tbody>
</table>
18. Fruits and Vegetables

1. I do not eat 5 or more servings of fruits and vegetables per day and do not intend to start
   OR
2. I do not eat 5 or more servings of fruits and vegetables per day, but I am thinking about starting
   OR
3. I sometimes eat 5 or more servings of fruits and vegetables per day, although on most days of the week I eat less
   OR
4. I eat at least 5 or more servings of fruits and vegetables per day, but have only been eating this much within the past 6 months
   OR
5. I eat at least 5 or more servings of fruits and vegetables per day and have been doing so for longer than 6 months

19. Television/Video/DVD

1. I watch more than 1 hour of TV/Videos/DVD each day and do not intend to watch less
   OR
2. I watch more than 1 hour of TV/Videos/DVD each day, but I am thinking about watching less
   OR
3. I watch 1 hour or less of TV/Videos/DVD on some days, although on most days of the week I watch more
   OR
4. I watch 1 hour or less of TV/Videos/DVD on most days, but have only been doing so within the past 6 months
   OR
5. I watch 1 hour or less of TV/Videos/DVD on most days and have been doing so for longer than 6 months

20. Portion Sizes

1. I do not pay attention to the portion sizes of the food I eat and do not intend to start
   OR
2. I do not pay attention to the portion sizes of the food I eat, but I am thinking about starting
   OR
3. I sometimes pay attention to the portion sizes of the food I eat, although not on most days of the week
   OR
4. I pay attention to the portion sizes of the food I eat, but have only been doing so within the past 6 months
   OR
5. I pay attention to the portion sizes of the food I eat and have been doing so for longer than 6 months
21. In the past week (7 days), how many HOURS did you spend doing the following activities?
   a. Strenuous exercise (heart beats rapidly) Examples: biking fast, aerobic dancing, running, jogging, swimming laps, rollerblading, skating, tennis, cross-country skiing, soccer, basketball
      01. None
      02. Less than ½ hour
      03. ½ - 1 hour
      04. 1 ½ - 2 hours
      05. 2 ½ - 3 hours
      06. 3 ½ - 4 hours
      07. 4 ½ - 5 hours
      08. 5 ½ - 6 ½ hours
      09. 7 or more hours
   b. Moderate exercise (not exhausting) Examples: walking quickly, dancing, baseball/softball, gymnastics, easy bicycling, volleyball, strength training
      01. None
      02. Less than ½ hour
      03. ½ - 1 hour
      04. 1 ½ - 2 hours
      05. 2 ½ - 3 hours
      06. 3 ½ - 4 hours
      07. 4 ½ - 5 hours
      08. 5 ½ - 6 ½ hours
      09. 7 or more hours
   c. Mild Exercise (little effort) Examples: walking slowly, bowling, yoga, stretching muscles, household chores
      01. None
      02. Less than ½ hour
      03. ½ - 1 hour
      04. 1 ½ - 2 hours
      05. 2 ½ - 3 hours
      06. 3 ½ - 4 hours
      07. 4 ½ - 5 hours
      08. 5 ½ - 6 ½ hours
      09. 7 or more hours
22. If you wanted to, how sure are you that you could...?

<table>
<thead>
<tr>
<th></th>
<th>Not at all sure</th>
<th>Very sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Exercise when you feel bad about your body</td>
<td>1 2 3 4 5</td>
<td>56</td>
</tr>
<tr>
<td>b. Participate in a physical activity you’ve never tried before</td>
<td>1 2 3 4 5</td>
<td>57</td>
</tr>
<tr>
<td>c. Be active when you are stressed</td>
<td>1 2 3 4 5</td>
<td>58</td>
</tr>
<tr>
<td>d. Participate in a vigorous physical activity (e.g. running, aerobics)</td>
<td>1 2 3 4 5</td>
<td>59</td>
</tr>
<tr>
<td>e. Participate in a physical activity that you don’t think you are good at</td>
<td>1 2 3 4 5</td>
<td>60</td>
</tr>
<tr>
<td>f. Exercise when you are in a bad mood</td>
<td>1 2 3 4 5</td>
<td>61</td>
</tr>
</tbody>
</table>

23. In your free time, on an average WEEK DAY (Monday – Friday) how many hours do you spend...?

<table>
<thead>
<tr>
<th>Hours Per Average WEEK DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>a. Watching TV/Videos/DVDs</td>
</tr>
<tr>
<td>b. Reading or doing homework</td>
</tr>
<tr>
<td>c. Using a computer (not for homework)</td>
</tr>
</tbody>
</table>

24. In your free time, on an average WEEKEND DAY (Saturday and Sunday) how many hours do you spend...?

<table>
<thead>
<tr>
<th>Hours Per Average WEEKEND DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>a. Watching TV/Videos/DVDs</td>
</tr>
<tr>
<td>b. Reading or doing homework</td>
</tr>
<tr>
<td>c. Using a computer (not for homework)</td>
</tr>
</tbody>
</table>

25. Do you have a television in the room where you sleep?

1 Yes
2 No

New Moves II Survey 101 Version 2 2/07
26. Check the answer that best describes you.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I set goals to do physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>69</td>
</tr>
<tr>
<td>b. I set aside a special time to do physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>c. I ask a friend to do physical activities with me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>71</td>
</tr>
<tr>
<td>d. I ask a parent or other adult to do physical activities with me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>e. I plan ahead to do physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>73</td>
</tr>
</tbody>
</table>

27. How strongly do you agree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Regular strength training (weight lifting) helps me to be physically fit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>74</td>
</tr>
<tr>
<td>b. It is hard for me to find time to fit physical activity into my schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>c. There are playgrounds, parks, or gyms close to my home or that I can get to easily</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>d. I have more energy when I participate in regular physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>77</td>
</tr>
<tr>
<td>e. Being physically active helps me deal with stress in my life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>f. I get embarrassed if other kids see me being physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>79</td>
</tr>
<tr>
<td>g. Physical activity takes too much time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>h. I usually feel comfortable in physical education class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>81</td>
</tr>
<tr>
<td>i. I don’t like to go to the gym because I don’t want people to watch me being physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>j. I can find time to be physically active at least 3 times during the week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>83</td>
</tr>
<tr>
<td>k. Physical activity is fun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>84</td>
</tr>
<tr>
<td>l. I avoid being physically active because I don’t want others to see me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>85</td>
</tr>
</tbody>
</table>
28. How strongly do you agree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>I enjoy physical education class</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b</td>
<td>I feel better about myself when I am physically active on a regular basis</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c</td>
<td>My days are so busy that I can’t fit in physical activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d</td>
<td>I enjoy being physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e</td>
<td>I get embarrassed about how my body looks when I am exercising</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f</td>
<td>At home, there are enough supplies and pieces of equipment (like balls, bicycles, skates…) to use for physical activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g</td>
<td>Regular physical activity helps me avoid weight gain</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h</td>
<td>It is safe to walk or jog in my neighborhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>i</td>
<td>There is a lot of crime in my neighborhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

29. During a typical week, how often has a member of your household … (for example, your father, mother, brothers, sisters, grandparents, or other relative)?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Once</th>
<th>Sometimes</th>
<th>Most times</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>encouraged you to do physical activities or play sports</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b</td>
<td>done a physical activity or played sports with you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c</td>
<td>provided transportation to a place where you can do physical activities or play sports</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d</td>
<td>watched you participate in physical activities or sports</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e</td>
<td>told you that you are doing well in physical activities or sports</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
30. Many of my friends...

<table>
<thead>
<tr>
<th>Option</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. help me to be physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. are physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. help me eat healthy food</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. make healthy food choices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. diet to lose weight or keep from gaining weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

31. During the **PAST WEEK**, how many **DAYS** did you eat BREAKFAST?

- 0 days
- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7 days

32. In the **PAST WEEK** how often did you eat something from a **FAST FOOD** restaurant (like McDonald's, Burger King, etc)?

- 0 times
- 1 time
- 2 times
- 3 times
- 4-5 times
- 6-7 times
- More than 7 times
33. Thinking back over the PAST WEEK, how many servings of FRUIT did you USUALLY eat on a typical day? A serving would be a medium piece of fruit or ½ cup of fruit.
   DO NOT INCLUDE FRUIT JUICE.
   1 □ None
   2 □ Less than 1 serving
   3 □ 1 serving
   4 □ 2 servings
   5 □ 3 servings
   6 □ 4 servings
   7 □ 5 or more servings

34. Thinking back over the PAST WEEK, how many servings of VEGETABLES did you USUALLY eat on a typical day? A serving would be a ½ cup of cooked vegetables or 1 cup of raw vegetables.
   DO NOT INCLUDE POTATOES OR FRENCH FRIES.
   1 □ None
   2 □ Less than 1 serving
   3 □ 1 serving
   4 □ 2 servings
   5 □ 3 servings
   6 □ 4 servings
   7 □ 5 or more servings

35. In the PAST WEEK ...

<table>
<thead>
<tr>
<th>Option</th>
<th>Never</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Vegetables were available in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>b. Vegetables were served at meals in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>c. Fruit was available in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>d. Fruit was served at meals in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>e. Regular soda pop or other sugar</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>f. Sweetened drinks were available in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>g. Regular soda pop or other sugar</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>h. Potato chips or other salty snacks were available in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>i. Candy was available in my home</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
</tbody>
</table>
36. During the **past week**, how many times did all, or most, of your family living in your house eat a meal together?

<p>| | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>□</td>
<td>0 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>□</td>
<td>1 time</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>03</td>
<td>□</td>
<td>2 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>□</td>
<td>3 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>□</td>
<td>4 times</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>□</td>
<td>5 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>□</td>
<td>6 times</td>
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</tr>
<tr>
<td>08</td>
<td>□</td>
<td>7 times</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>□</td>
<td>More than 7 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

37. Check the answer that best describes your eating behavior.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I am aware of the portion sizes that I eat</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>b. When I eat dessert, I try to eat a small portion</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>c. I eat so much at meals that I feel stuffed afterwards</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>d. I check the serving size on food and drink labels</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>e. I stop eating when I feel full</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>f. I pay attention to portion sizes</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>g. When I eat snack foods like chips or cookies, I eat so much that I feel stuffed afterwards</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
<tr>
<td>h. I eat everything that is on my plate, even if I’m not that hungry</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
</tr>
</tbody>
</table>
38. Over the past MONTH, how many times did you drink 100% fruit juice like orange, apple or grape juice?
Do not count fruit drinks like kool-aid, lemonade or Hi-C.
Include juice you drank at all mealtime and between meals.

<table>
<thead>
<tr>
<th>Times</th>
<th>Never</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>127</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than</td>
<td>once a week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>315</td>
</tr>
<tr>
<td>1-2</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>316</td>
</tr>
<tr>
<td>3-4</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>317</td>
</tr>
<tr>
<td>5-6</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>318</td>
</tr>
<tr>
<td>5 or more</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>319</td>
</tr>
</tbody>
</table>

39. Over the past MONTH, how often did you drink regular soda pop (not diet)?

<table>
<thead>
<tr>
<th>Times</th>
<th>Never</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
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<th>09</th>
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<th>129</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than</td>
<td>once a week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>320</td>
</tr>
<tr>
<td>1-2</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
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<td>□</td>
<td>□</td>
<td>321</td>
</tr>
<tr>
<td>3-4</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>322</td>
</tr>
<tr>
<td>5-6</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>323</td>
</tr>
<tr>
<td>5 or more</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>324</td>
</tr>
</tbody>
</table>

40. Over the past MONTH, how often did you drink other sweetened drinks like kool-aid, lemonade, fruit drinks or energy drinks (not diet)?
Do not include 100% fruit juice.

<table>
<thead>
<tr>
<th>Times</th>
<th>Never</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>131</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than</td>
<td>once a week</td>
<td>□</td>
<td>□</td>
<td>□</td>
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</tr>
<tr>
<td>1-2</td>
<td>times per week</td>
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<td>3-4</td>
<td>times per week</td>
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<tr>
<td>5-6</td>
<td>times per week</td>
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<td>□</td>
<td>328</td>
</tr>
<tr>
<td>5 or more</td>
<td>times per week</td>
<td>□</td>
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<td>□</td>
<td>329</td>
</tr>
</tbody>
</table>

41. Over the past MONTH, how often did you drink tap or bottled water?

<table>
<thead>
<tr>
<th>Times</th>
<th>Never</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>133</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than</td>
<td>once a week</td>
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<td>□</td>
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</tr>
<tr>
<td>1-2</td>
<td>times per week</td>
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</tr>
<tr>
<td>3-4</td>
<td>times per week</td>
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<td>332</td>
</tr>
<tr>
<td>5-6</td>
<td>times per week</td>
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<td>□</td>
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<td>□</td>
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<td>□</td>
<td>333</td>
</tr>
<tr>
<td>5 or more</td>
<td>times per week</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>334</td>
</tr>
</tbody>
</table>

42. Over the past MONTH, how often did you drink diet soda pop or other diet drinks?

<table>
<thead>
<tr>
<th>Times</th>
<th>Never</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>135</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than</td>
<td>once a week</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>336</td>
</tr>
<tr>
<td>1-2</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>337</td>
</tr>
<tr>
<td>3-4</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>338</td>
</tr>
<tr>
<td>5-6</td>
<td>times per week</td>
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<td>□</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>339</td>
</tr>
<tr>
<td>5 or more</td>
<td>times per week</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>340</td>
</tr>
</tbody>
</table>

New Moves II Survey 101 Version 2 2/07 page 11 of 20

213
43. Check the answer that best describes your eating behavior.

<table>
<thead>
<tr>
<th></th>
<th>Hardly Ever</th>
<th>Sometimes</th>
<th>Much of the Time</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I eat when I'm upset, even if I'm not really hungry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b.</td>
<td>I eat when I'm stressed, even if I'm not really hungry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c.</td>
<td>I eat when I'm bored, even if I'm not really hungry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d.</td>
<td>I eat when I'm lonely, even if I'm not really hungry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e.</td>
<td>I eat when I watch TV or a movie, even if I'm not really hungry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

44. My Mother...

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>makes healthy food choices</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b.</td>
<td>is physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c.</td>
<td>diets to lose weight or keep from gaining weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d.</td>
<td>encourages me to eat healthy foods</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e.</td>
<td>encourages me to diet</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f.</td>
<td>encourages me to be physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g.</td>
<td>talks about her weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h.</td>
<td>makes comments about other people's weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

You're doing great!
45. My Father...

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. makes healthy food choices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. is physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. diets to lose weight or keep from gaining weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. encourages me to eat healthy foods</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. encourages me to eat healthy foods</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f. encourages me to be physically active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g. talks about his weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h. makes comments about other people’s weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

46. Check the answer that best describes you.

<table>
<thead>
<tr>
<th>Task</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I set goals for making healthy food choices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. I plan ahead of time what I’ll eat for meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. I plan ahead of time what I’ll eat for snacks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. I ask my parents/guardians to purchase healthy food</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

47. How strongly do you agree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Eating regular meals helps me avoid binge eating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. I feel better about myself when I make healthy food choices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. Making healthy food choices helps me control my weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. Eating breakfast helps keep me from overeating later in the day</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. Eating fruits and vegetables in between meals helps me cut down on snacks that are high in fat and sugar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
48. How strongly do you agree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I would like my body to look like the models who appear in magazines</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>167</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I compare my body to the bodies of TV and movie stars</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>168</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I would like my body to look like the people on TV</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>169</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I compare my body to the bodies of people who appear in magazines</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remember your answers will be kept confidential so please answer honestly.

⭐️
49. Have you done any of the following things in order to lose weight or keep from gaining weight during the PAST MONTH?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Exercised</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>b. Fasted</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>c. Ate very little</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>d. Took diet pills</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>e. Made myself vomit (throw up)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>f. Used laxatives</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>g. Used diuretics (water pills)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>h. Used food substitutes (powder/special drinks)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>i. Skipped meals</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>j. Ate more fruits and vegetables</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>k. Ate fewer high-fat foods</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>l. Smoked more cigarettes</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>m. Drank less regular soda pop or sweetened drinks</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>n. Gone on a diet</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>o. Paid attention to portion sizes</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>p. Ate fewer sweets</td>
<td>☐ Yes ☐ No</td>
</tr>
</tbody>
</table>

50. In the PAST MONTH have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge eating)?

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
</tr>
<tr>
<td>☐ No (skip to question 52)</td>
</tr>
</tbody>
</table>

51. During the time when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
</tr>
<tr>
<td>☐ No</td>
</tr>
</tbody>
</table>
52. How satisfied are you with your...?

<table>
<thead>
<tr>
<th></th>
<th>Very Dissatisfied</th>
<th>Very Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Height</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Weight</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Body shape</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Waist</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>e. Hips</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>f. Thighs</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>g. Stomach</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>h. Face</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>i. Arms</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>j. Shoulders</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

53. How strongly do you agree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I find myself comparing how I look with other girls.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. When I look at other girls, I feel bad about my body.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. I compare my physical appearance to the physical appearance of others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. I feel good about my body when I compare myself to others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. When I am with other girls, I compare how they look with my looks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f. When I compare myself to other girls, I feel worse about how I look.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g. I compare my body to the bodies of other girls.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h. When I compare myself with others, I like what I see.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

You're Almost Done...
54. How often do you weigh yourself?
   1 □ Never
   2 □ About once a year or less
   3 □ Every couple of months
   4 □ Every month
   5 □ Every week
   6 □ Every day
   7 □ More than once a day

55. Within the past year, have you been teased or made fun of by family members because of your weight?
   1 □ Never
   2 □ Rarely
   3 □ Sometimes
   4 □ Often
   5 □ Very Often

56. During the PAST MONTH, how often have you been bothered or troubled by...

   a. Feeling too tired to do things  
      Not at All □ Sometimes □ Very Much □  
   b. Having trouble going to sleep or staying asleep  
      Not at All □ Sometimes □ Very Much □  
   c. Feeling unhappy, sad, or depressed  
      Not at All □ Sometimes □ Very Much □  
   d. Feeling hopeless about the future  
      Not at All □ Sometimes □ Very Much □  
   e. Feeling nervous or tense  
      Not at All □ Sometimes □ Very Much □  
   f. Worrying too much about things  
      Not at All □ Sometimes □ Very Much □

57. How strongly do you agree with the following statements?

   a. At my school, there are teachers or other school staff who encourage me to be physically active  
      Strongly Disagree □ Disagree □ Agree □ Strongly Agree □  
   b. At my school, there are teachers or other school staff who encourage me to eat healthy food  
      Strongly Disagree □ Disagree □ Agree □ Strongly Agree □
58. How old are you?
   1 □ 13 or younger
   2 □ 14
   3 □ 15
   4 □ 16
   5 □ 17
   6 □ 18
   7 □ 19

59. What grade are you in?
   1 □ 8th
   2 □ 9th
   3 □ 10th
   4 □ 11th
   5 □ 12th

60. Were you born in the United States?
   1 □ Yes
   2 □ No: In what country? ____________________________

61. Do you think of yourself as...? (you may select more than one)
   1 □ White
   2 □ Black or African American
   3 □ Asian
   4 □ Native Hawaiian or Other Pacific Islander
   5 □ American Indian or Alaskan Native
   6 □ Hispanic or Latina
   7 □ Other _____________________
62. Is your background any of the following?
   1. Hmong
   2. Cambodian
   3. Vietnamese
   4. Laotian
   5. Somali
   6. Ethiopian
   7. Other __________________________
   8. None of the above

63. How far did your mother go in school? (indicate the highest level)
   1. Did not finish high school
   2. Finished high school or got GED
   3. Did some college or training after high school
   4. Finished college
   5. Professional training beyond a four-year college degree
   6. I don’t know

64. How far did your father go in school? (indicate the highest level)
   1. Did not finish high school
   2. Finished high school or got GED
   3. Did some college or training after high school
   4. Finished college
   5. Professional training beyond a four-year college degree
   6. I don’t know
Appendix C: 3-Day Physical Activity Recall
Activity Codes

EATING
1. Eating a meal
2. Snacking
3. Cooking or preparing food

SLEEP/BATHING
4. Getting dressed
5. Getting ready (hair, makeup, etc.)
6. Showering/bathing
7. Sleep

SCHOOL
8. Sitting in class
9. Lunch/Free time/Study hall

HOMEWORK
10. Homework on the computer
11. Other homework

TRANSPORTATION - INACTIVE
12. Riding in a car or bus

AFTER SCHOOL/SPARE TIME/WORK - INACTIVE
13. Church/Religion
14. Hanging around
15. Listening to music (sitting)
16. Music lessons/playing instrument
17. Club/Student activity – inactive
   (like year book, math club...)
18. Playing video games
19. Surfing the internet, Instant Messaging, emailing, shopping online
20. Reading
21. Watching TV or movies
22. Talking on the phone
23. Working or Volunteering – inactive (like receptionist, cashier...)

AFTER SCHOOL/SPARE TIME/WORK - ACTIVE
24. Working or Volunteering – active (like waitress, babysitting...)
25. Doing house chores (like vacuuming, dusting, washing dishes...)
26. Yard work (like mowing, shoveling...)
27. Shopping
28. Club/Student activity – active (like cheerleading, marching band...)

ACTIVE TRANSPORTATION
29. Travel by walking
30. Travel by bicycling

PHYSICAL ACTIVITY
31. Aerobics, jazzercise, water aerobics
32. Basketball
33. Bicycling
34. Bowling
35. Callisthenics (like sit-ups, jumping jacks...)
36. Cheerleading, drill team, dance line
37. Dancing
38. Exercise machine
39. Football
40. Frisbee or catch
41. Golf/mini golf
42. Gymnastics/tumbling
43. Hiking
44. Hockey
45. Jumping rope
46. Kick boxing or martial arts
47. Lacrosse
48. Rollerblading, ice skating, roller skating
49. Running/jogging
50. Skateboarding
51. Skiing cross country
52. Sledding, tobogganing, bobsledding
53. Snowboarding or skiing down hill
54. Soccer
55. Softball/baseball
56. Swimming (laps)
57. Swimming (play, pool games...)
58. Tennis, racquetball, badminton
59. Trampoline
60. Track and field
61. Volleyball
62. Walking for exercise
63. Weightlifting/circuit training
64. Yoga, stretching, Pilates
65. Other

EXAMPLE

<table>
<thead>
<tr>
<th>Activity Number</th>
<th>Light</th>
<th>Moderate</th>
<th>Hard</th>
<th>Very Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-2:30</td>
<td>8 (math class)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2:30-3:00</td>
<td>30 (biking home)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3:00-3:30</td>
<td>25 (cleaning your room)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30-4:00</td>
<td>36 (dance practice)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00-4:30</td>
<td>2 (snacking)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

223
<table>
<thead>
<tr>
<th>Activity #</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00-6:30</td>
</tr>
<tr>
<td>6:30-7:00</td>
</tr>
<tr>
<td>7:00-7:30</td>
</tr>
<tr>
<td>7:30-8:00</td>
</tr>
<tr>
<td>8:00-8:30</td>
</tr>
<tr>
<td>8:30-9:00</td>
</tr>
<tr>
<td>9:00-9:30</td>
</tr>
<tr>
<td>9:30-10:00</td>
</tr>
<tr>
<td>10:00-10:30</td>
</tr>
<tr>
<td>10:30-11:00</td>
</tr>
<tr>
<td>11:00-11:30</td>
</tr>
<tr>
<td>11:30-12:00</td>
</tr>
</tbody>
</table>

**Morning**

<table>
<thead>
<tr>
<th>Activity #</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00-12:30</td>
</tr>
<tr>
<td>12:30-1:00</td>
</tr>
<tr>
<td>1:00-1:30</td>
</tr>
<tr>
<td>1:30-2:00</td>
</tr>
<tr>
<td>2:00-2:30</td>
</tr>
<tr>
<td>2:30-3:00</td>
</tr>
<tr>
<td>3:00-3:30</td>
</tr>
<tr>
<td>3:30-4:00</td>
</tr>
<tr>
<td>4:00-4:30</td>
</tr>
<tr>
<td>4:30-5:00</td>
</tr>
</tbody>
</table>

**Afternoon**

<table>
<thead>
<tr>
<th>Activity #</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00-5:30</td>
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</table>

**Evening**

Put an X to rate the intensity of each activity (24-65)
Activity Codes

**EATING**
1. Eating a meal
2. Snacking
3. Cooking or preparing food

**SLEEP/BATHING**
4. Getting dressed
5. Getting ready (hair, makeup, etc)
6. Showering/bathing
7. Sleep

**SCHOOL**
8. Sitting in class
9. Lunch/Free time/Study hall

**HOMEWORK**
10. Homework on the computer
11. Other homework

**TRANSPORTATION - INACTIVE**
12. Riding in a car or bus

**AFTER SCHOOL/SPARE TIME/WORK - INACTIVE**
13. Church/Religion
14. Hanging around
15. Listening to music (sitting)
16. Music lessons/playing instrument
17. Club/Student activity – inactive (like year book, math club...)
18. Playing video games
19. Surfing the internet, Instant Messaging, emailing, shopping online
20. Reading
21. Watching TV or movies
22. Talking on the phone
23. Working or Volunteering – inactive (like receptionist, cashier...)

**AFTER SCHOOL/SPARE TIME/WORK - ACTIVE**
24. Working or Volunteering – active (like waitress, babysitting...)
25. Doing house chores (like vacuuming, dusting, washing dishes...)
26. Yard work (like mowing, shovelling...)
27. Shopping
28. Club/Student activity – active (like cheerleading, marching band...)

**ACTIVE TRANSPORTATION**
29. Travel by walking
30. Travel by bicycling

**PHYSICAL ACTIVITY**
31. Aerobics, jazzercise, water aerobics
32. Basketball
33. Bicycling
34. Bowling
35. Callathletics (like sit-ups, jumping jacks...)
36. Cheerleading, drill team, dance line
37. Dancing
38. Exercise machine
39. Football
40. Frisbee or catch
41. Golf/mini golf
42. Gymnastics/tumbling
43. Hiking
44. Hockey
45. Jumping rope
46. Kick boxing or martial arts
47. Lacrosse
48. Rollerblading, ice skating, roller skating
49. Running/jogging
50. Skateboarding
51. Skiing cross country
52. Sledding, tobogganing, bobsledding
53. Snowboarding or skiing down hill
54. Soccer
55. Softball/baseball
56. Swimming (laps)
57. Swimming (play, pool games...)
58. Tennis, racquetball, badminton
59. Trampoline
60. Track and field
61. Volleyball
62. Walking for exercise
63. Weightlifting/circuit training
64. Yoga, stretching, Pilates
65. Other

**EXAMPLE**

<table>
<thead>
<tr>
<th>Activity Number</th>
<th>Light</th>
<th>Moderate</th>
<th>Hard</th>
<th>Very Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-2:30</td>
<td>8 (math class)</td>
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<tr>
<td>2:30-3:00</td>
<td>30 (biking home)</td>
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<td>3:00-3:30</td>
<td>25 (cleaning your room)</td>
<td>X</td>
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<td>3:30-4:00</td>
<td>36 (dance practice)</td>
<td>X</td>
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<td>4:00-4:30</td>
<td>2 (snacking)</td>
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<tr>
<td>DAY: __________</td>
<td>Put an X to rate the intensity of each activity (24-65)</td>
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227
DAY: ________  Put an X to rate the intensity of each activity (24-65)

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<th>Activity #</th>
<th>Light</th>
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Appendix D: New Moves Parent Project Baseline Survey
Parent Survey
Thank you for completing this survey about your family and home. Keep in mind that there are no right or wrong answers, and all of your information will be kept confidential.

1. Please indicate which items you have in your home, yard or apartment complex, that are available to your daughter.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
</table>
   | ☐   | ☐  | a. Stationary aerobic equipment (bicycle, treadmill, etc.)
   | ☐   | ☑  | b. Bicycle
   | ☐   | ☐  | c. A dog to walk
   | ☐   | ☐  | d. Weight lifting equipment (free weights, Nautilus, etc.)
   | ☑   | ☑  | e. Exercise workout videotapes or DVDs
   | ☐   | ☐  | f. In-line, roller or ice skates
   | ☐   | ☐  | g. Sports equipment (balls, raquetts, jump ropes, hula hoops)
   | ☐   | ☑  | h. Skis or snowboard
   | ☑   | ☐  | i. Stretching or yoga equipment

2. Please indicate which items you have in your home.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
</table>
   | ☑   | ☑  | a. Pay television (cable, satellite, etc.)
   | ☐   | ☐  | b. Video/DVD player
   | ☑   | ☑  | c. Electronic games (Nintendo, Playstatation, etc.)
   | ☑   | ☑  | d. Computer
   | ☑   | ☐  | e. Internet access
3. How many televisions do you have in your home?  

4. How strongly do you agree or disagree with the following statements?  

   | Strongly Disagree | Disagree | Agree | Strongly Agree |
---|-------------------|----------|-------|----------------|
   | 1                 | 2        | 3     | 4             |

   a. It is safe to walk or jog in our neighborhood.  

   b. There is a lot of crime in our neighborhood.  

5. In the past 7 days,  

   | Never | Sometimes | Usually | Always |
---|-------|-----------|---------|--------|
   | 1     | 2         | 3       | 4      |

   a. Vegetables were available in our home  

   b. Vegetables were served at meals in our home  

   c. Fruit was available in our home  

   d. Fruit was served at meals in our home  

   e. Regular soda pop or other sugar-sweetened drinks were available in our home  

   f. Regular soda pop or other sugar-sweetened drinks were served at meals in our home  

   g. Snack foods like potato chips were available in our home  

   h. Candy was available in our home
6. **In the past week (7 days), how many HOURS did you spend doing the following activities?**

   a. **Strenuous exercise (heart beats rapidly)** Examples: biking fast, aerobic dancing, running, jogging, swimming laps, rollerblading, skating, tennis, cross-country skiing, soccer, basketball

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<tr>
<td>08</td>
<td>□</td>
<td>5 ½ - 6 ½ hours</td>
<td></td>
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<td></td>
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<tr>
<td>09</td>
<td>□</td>
<td>7 or more hours</td>
<td></td>
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</tbody>
</table>

   b. **Moderate exercise (not exhausting)** Examples: walking quickly, dancing, baseball/softball, gymnastics, easy bicycling, volleyball, strength training

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<table>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>□</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>02</td>
<td>□</td>
<td>Less than ½ hour</td>
<td></td>
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<tr>
<td>03</td>
<td>□</td>
<td>½ - 1 hours</td>
<td></td>
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<tr>
<td>04</td>
<td>□</td>
<td>1 ½ - 2 hours</td>
<td></td>
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</tr>
<tr>
<td>05</td>
<td>□</td>
<td>2 ½ - 3 hours</td>
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<tr>
<td>06</td>
<td>□</td>
<td>3 ½ - 4 hours</td>
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<tr>
<td>07</td>
<td>□</td>
<td>4 ½ - 5 hours</td>
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</tr>
<tr>
<td>08</td>
<td>□</td>
<td>5 ½ - 6 ½ hours</td>
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</tr>
<tr>
<td>09</td>
<td>□</td>
<td>7 or more hours</td>
<td></td>
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</tbody>
</table>

   c. **Mild Exercise (little effort)** Examples: walking slowly, bowling, yoga, stretching muscles, household chores

<p>| | | | | | | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>□</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>□</td>
<td>Less than ½ hour</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>03</td>
<td>□</td>
<td>½ - 1 hours</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>04</td>
<td>□</td>
<td>1 ½ - 2 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>□</td>
<td>2 ½ - 3 hours</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>06</td>
<td>□</td>
<td>3 ½ - 4 hours</td>
<td></td>
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</tr>
<tr>
<td>07</td>
<td>□</td>
<td>4 ½ - 5 hours</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>08</td>
<td>□</td>
<td>5 ½ - 6 ½ hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>□</td>
<td>7 or more hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. In your free time, on an average WEEKDAY (Mon – Fri) how many hours do you spend

<table>
<thead>
<tr>
<th></th>
<th>0 hr</th>
<th>½ hr</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
<th>5+ hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Watching TV/Videos/DVDs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>b. Reading (at home)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>c. Using a computer (at home)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

8. In your free time, on an average WEEK END DAY (Saturday and Sunday) how many hours do you spend

<table>
<thead>
<tr>
<th></th>
<th>0 hr</th>
<th>½ hr</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
<th>5+ hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Watching TV/Videos/DVDs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>b. Reading (at home)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>c. Using a computer (at home)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

9. During a typical week, how often have you or a member of your household...

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Once</th>
<th>Sometimes</th>
<th>Most Days</th>
<th>Every Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. encouraged your daughter to do physical activities or play sports?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. done a physical activity or played sports with your daughter?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. encouraged your daughter to eat healthy foods?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. provided transportation to a place where your daughter can do physical activities or play sports?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>e. watched your daughter participate in physical activities or sports?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>f. encouraged your daughter to diet to lose or maintain her weight?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>g. told your daughter that she is doing well in physical activities or sports?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>h. encouraged your daughter to watch less TV?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
10. During the past 7 days, how many days did you eat BREAKFAST?
   - [ ] 0 days
   - [ ] 1 day
   - [ ] 2 days
   - [ ] 3 days
   - [ ] 4 days
   - [ ] 5 days
   - [ ] 6 days
   - [ ] 7 days

11. During the past 7 days, how many TIMES did all, or most, of your family living in your house eat a meal together?
   - [ ] 0 times
   - [ ] 1 time
   - [ ] 2 times
   - [ ] 3 times
   - [ ] 4 times
   - [ ] 5 times
   - [ ] 6 times
   - [ ] 7 times
   - [ ] More than 7 times

12. During the past 7 days, how many TIMES was a family meal purchased at a fast food restaurant (McDonalds, KFC, pizza, etc.) and eaten either at the restaurant or at home?
   - [ ] 0 times
   - [ ] 1 time
   - [ ] 2 times
   - [ ] 3 times
   - [ ] 4 times
   - [ ] 5 times
   - [ ] 6 times
   - [ ] 7 times
   - [ ] More than 7 times
13. During the past 7 days, how many TIMES was a family meal eaten in other types of restaurants (i.e. full-service, sit down type)?
   - 0 ☐ times
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times
   - 5 ☐ 5 times
   - 6 ☐ 6 times
   - 7 ☐ 7 times
   - 8 ☐ More than 7 times

<table>
<thead>
<tr>
<th>Almost Always</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Hardly Ever</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ☐</td>
<td>2 ☐</td>
<td>3 ☐</td>
<td>4 ☐</td>
</tr>
</tbody>
</table>

14. How often are meals in your home served family-style (food is brought to the table and people can serve themselves)?
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times

15. When cooking, how often do you use methods to reduce the amount of fat in your meal?
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times

16. How often do you choose to serve low-fat meals in your home?
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times

How strongly do you agree or disagree with the following?

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ☐</td>
<td>2 ☐</td>
<td>3 ☐</td>
<td>4 ☐</td>
<td>5 ☐</td>
</tr>
</tbody>
</table>

17. My spouse/significant other is supportive of our family eating healthy foods.
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times
   - 5 ☐ 5 times

18. My spouse/significant other is supportive of our family being physically active.
   - 1 ☐ 1 time
   - 2 ☐ 2 times
   - 3 ☐ 3 times
   - 4 ☐ 4 times
   - 5 ☐ 5 times

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22. **How often do you weigh yourself?**
   - 0 □ Never
   - 1 □ About once a year or less
   - 2 □ Every couple of months
   - 3 □ Every month
   - 4 □ Every week
   - 5 □ Every day
   - 6 □ More than once a day

23. **How often have you gone on a diet during the last year?** By “diet” we mean changing the way you eat so you can lose weight.
   - Never
   - 1 □ 1-4 times
   - 2 □ 5-10 times
   - 3 □ More than 10 times
   - 4 □ Always
   - 5 □ Dieting

24. **How satisfied are you with your weight?**
   - 1 □ Very dissatisfied
   - 2 □ Dissatisfied
   - 3 □ Neither dissatisfied or satisfied
   - 4 □ Satisfied
   - 5 □ Very satisfied

25. **Which of the following best describes your weight?**
   - 1 □ Very underweight
   - 2 □ Somewhat underweight
   - 3 □ About right
   - 4 □ Somewhat overweight
   - 5 □ Very overweight
19. Thinking back over the PAST WEEK, how often did you drink regular soda (not diet)?
- None
- Less than 1 serving
- 1 serving
- 2 servings
- 3 servings
- 4 servings
- 5 or more servings

20. Thinking back over the PAST WEEK, how many servings of FRUIT did you USUALLY eat on a typical day? A serving would be a medium piece of fruit or ½ cup of fruit.
Do not include fruit juice.
- None
- Less than 1 serving
- 1 serving
- 2 servings
- 3 servings
- 4 servings
- 5 or more servings

21. Thinking back over the PAST WEEK, how many servings of VEGETABLES did you USUALLY eat on a typical day? A serving would be a ½ cup of cooked vegetables or 1 cup of raw vegetables.
Do not include potatoes or French fries.
- None
- Less than 1 serving
- 1 serving
- 2 servings
- 3 servings
- 4 servings
- 5 or more servings
<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. How often do either you or your spouse/significant other make comments to your daughter about her weight?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. How often do you talk about your own weight, shape or size?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. How often do you make comments about other people's weight, shape or size?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

29. What is your relationship with your daughter who is participating in New Moves?

1. Mother
2. Stepmother
3. Other female guardian
4. Father
5. Stepfather
6. Other male guardian
7. Other: __________________________

30. Do you think of yourself as:

(you may select more than one)

1. White
2. Black or African American
3. Asian
4. Native Hawaiian or Other Pacific Islander
5. American Indian or Alaskan Native
6. Hispanic or Latino
7. Other: __________________________
31. **How far did you go in school? (indicate the highest level)**
   1. [ ] Did not finish high school
   2. [ ] Finished high school or got GED
   3. [ ] Did some college or training after high school
   4. [ ] Graduated from a college or university
   5. [ ] Professional training beyond a four-year college degree

32. **Please mark one box: Right now I am...**
   1. [ ] Working full time
   2. [ ] Working part-time only
   3. [ ] Not working outside the home

**Thank You! Please return this survey in the envelope provided.**