EXAMINING THE INDIVIDUAL, FAMILIAL, AND ENVIRONMENTAL FACTORS ASSOCIATED WITH PRESCHOOLER NUTRITION AND PHYSICAL ACTIVITY: FINDINGS FROM A MIXED METHODS APPROACH

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Examining the Individual, Familial, and Environmental Factors Associated with Preschooler Nutrition and Physical Activity: Findings from a Mixed Methods Approach

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science, Nutrition at George Mason University

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This is for you, Dad. Thank you for being my constant.
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LIST OF ABBREVIATIONS

ADA, American Dietetics Association
AND, Academy of Nutrition and Dietetics
AR, Adiposity Rebound
BMI, Body Mass Index
CACFP, Child and Adult Care Food Program
CBPR, Community Based Participatory Research
CDC, Child Development Center
DGA, Dietary Guidelines for Americans
EPAO, Environment and Policy Assessment and Observation
FITS, Nestle Feeding Infants & Toddlers Study
GMU, George Mason University
HAES, Habitual Activity Estimation Scale
HAZ, Height-for-Age z-score
HKS, ‘Healthy Kids’ Study
HOPSCOTCH, Health Opportunities for Pre-School Children to Optimize Their Cardiovascular Health
IRB, Institutional Review Board
IOM, Institute of Medicine
NAEYC, National Association for the Education of Young Children
NAP SACC, Nutrition and Physical Activity Self-Assessment for Child Care
NASPE, National Association for Sport and Physical Education
NHANES, National Health and Nutrition Examination Survey
NC, North Carolina
NutriSTEP, Nutrition Screening Tool for Every Preschooler
PA, Physical Activity
RD, Registered Dietitian
RDA, Recommended Dietary Allowance
SES, Socio-economic Status
U.S., United States
USDA, United States Department of Agriculture
WAZ, Weight-for-age z-score
WC, Waist Circumference
WIC, Special Supplemental Nutrition Program for Women, Infants, and Children
Y, years-old
zBMI, BMI-for-age z-score
EXAMINING THE INDIVIDUAL, FAMILIAL AND ENVIRONMENTAL FACTORS ASSOCIATED WITH PRESCHOOLER NUTRITION AND PHYSICAL ACTIVITY: FINDINGS FROM A MIXED METHODS APPROACH

Ashley Shaw, MS
George Mason University, 2015
Thesis Director: Dr. Sina Gallo

Childhood obesity has become a public health crisis. Nine percent of children globally are expected to be overweight or obese by 2020. In the U.S., 1/3 of children are overweight or obese. Early childhood is a critical period for obesity prevention intervention as the preschool child is easily influenced and new behaviors can still be learned. As 80% of preschoolers now spend a good portion of their day in childcare, parents now share the responsibility of developing healthy behaviors with childcare providers. The purpose of this thesis is to inform an intervention for early childhood obesity prevention by assessing the relationships between predictors of obesity (demographics, environment, habits) with children’s anthropometrics. This mixed methods study consisted of a cross sectional assessment of a sample of 49, 2-5 y children enrolled in two child development centers in Fairfax, VA, environmental evaluations, and parent centered focus groups. The two centers were significantly different with regards to
parent education, income, and ethnicity (p<0.05) but there was no significant difference in children’s risk for obesity between centers. Higher waist circumference in children was related to the number of children in the household (p=0.024), and males were at a higher risk for obesity than females (p=0.016). Evaluation scores were significantly different between the centers (p=0.036). All parents felt CDC support and consistency necessary to combat time constraints and societal judgment in promoting healthy habits at home. The results of the current study inform and encourage continued efforts to advance the health of preschool children through the collaborations between parents and childcare providers.
CHAPTER 1

Literature Review

Childhood Obesity

Prevalence

The most common pediatric chronic disease is obesity (defined as sex specific, BMI-for-age above the 95\textsuperscript{th} percentile), with more than 1/3 of US preschoolers overweight or obese, a number that has more than doubled since 1980.\textsuperscript{1,2} According to the National Health and Nutrition Examination Survey (NHANES) 2009-2010 data, 26.7\% 2-5 year olds were overweight or obese; 12.1\% were obese, falling at or above the 95\textsuperscript{th} percentile for zBMI (BMI-for-age z-score).\textsuperscript{3,4} This translates to 1 in 4 US children under 5 being overweight or obese, and these children are 5 times more likely to be overweight adolescents and 4 times more likely to be obese adults.\textsuperscript{1} The prevalence of overweight in 2-5 year olds (y) increased from 7\% in 1994 to 10\% in 2000 to 14\% in 2004.\textsuperscript{5} There was actually a decrease in obesity prevalence from 14\% in 2003-2004 compared to 8.4\% in 2011-2012, reported among low-income preschool aged children participating in federal nutrition programs in 18 states and the US Virgin Islands.\textsuperscript{4} However, the research shows that while rates may have plateaued, especially for non-Hispanic white and higher socio-economic status (SES) children, overall rates remain high and racial/ethnic/SES disparities are widening.\textsuperscript{3}
Children of ethnic/racial minorities have a higher prevalence of modifiable risk factors for overweight and obesity, specifically greater rates of having a TV in the room where the child sleeps, and higher intake of sugar sweetened beverages, when compared to their white counterparts. Overweight is more prevalent among minorities as they often have limited food choices, lower access to affordable and quality foods, fewer family meals eaten together, and cultural preferences for foods higher in saturated fat and salt. Since 1999, the odds of being obese have become significantly higher for non-Hispanic and Mexican American children compared to non-Hispanic white, black, and Asian children (Table 1.1).

Health and Social Effects

Children who are overweight or obese are at a higher risk for chronic diseases later in life; in a population-based sample of 5-17 year olds, 70% of obese children had at least one risk factor for cardiovascular disease. The U.S. survey, the Early Childhood Longitudinal Study, showed that children who were overweight when entering kindergarten (age 4-5 y) had a 4-fold risk for obesity by the eighth grade (age 12-14 y). Even with a short history of overweight, metabolic abnormalities related to obesity were present from an early age in a large proportion of overweight and obese children. One study found that 50% of overweight children 5-10 y had a cardiovascular risk factor such as high blood pressure, dyslipidemia, and elevated insulin levels. Additionally, risk factors related to metabolic syndrome were also prevalent to this group.

Health related quality of life can be negatively impacted when children experience frequent or increasing symptomatic episodes of chronic or recurrent health
problems, when they are unable to participate in age appropriate activities, and when their self-esteem or self-worth is lowered.\textsuperscript{6} Participating in exercise and feeling confident in one’s abilities to engage in physical activity have associated psychological benefits.\textsuperscript{6}

\textit{Role of Early Childhood}

Early childhood is crucial to the development and prevention of obesity with short and long term risk factors including rapid infant weight gain, poor feeding practices, too much screen time, and short sleep duration. In the first year of life, children have a rapid increase in BMI, which then slowly declines until it reaches a minimum, usually between the age of 5 and 6 y.\textsuperscript{11} Then there is a gradual increase throughout adolescence and adulthood.\textsuperscript{11} That minimal BMI is also the point of maximal leanness, and is known as the adiposity rebound (AR).\textsuperscript{11} The timing of AR may be critical in the development of obesity; the earlier the age of AR, the greater the association with a higher BMI in adolescence and adulthood.\textsuperscript{11} An early AR is classified as less than 4.8 years of age, and children who have an AR earlier than this are at greater risk.\textsuperscript{11} Most research conducted is focused on children 8 and older, when the AR has already been reached.\textsuperscript{12}

Early childhood is a pivotal time for nutrition education and interventions, when dietary habits and behaviors are very easily influenced.\textsuperscript{13} Failure rates for individual interventions to treat excessive weight gain are so high that prevention incorporating environmental change is thought to be the only cure.\textsuperscript{14} At the early childhood age behaviors are modifiable and physiologic characteristics are malleable, making it an ideal time to begin obesity prevention.\textsuperscript{15} Habits and tastes are developing at this time as well so
it is critical to establish good habits, such as tastes for a variety of foods, encouragement of active play, and proper sleep patterns.\textsuperscript{15}

Children participating in high quality early intervention programs appear to have more positive well-being and to be better care takers of their own health, especially in relation to making decisions about healthy behaviors; and these children are more cost effective for health, education, and public assistance services.\textsuperscript{16}

\textit{Obesity Prevention: Recommendations and Current Habits}

Obesity needs to be recognized as a chronic disease with complex, multifactorial etiologies and prevention should include interventions that involve actively engaging the child and their health gate keepers in adopting healthy eating habits and physical activity and reducing sedentary behaviors.\textsuperscript{17} In terms of obesity prevention of pre-school aged children, the recommendation is rarely to restrict calories.\textsuperscript{18} Rather the goal is to promote growth and development while preventing excessive weight gain.\textsuperscript{18} The Dietary Guidelines for Americans (DGA) recommendation for young children includes more than half their grains be whole grains, low fat or fat free dairy, ample fruits and vegetables and fat intake limited to less than 35\% of total calories; all sufficient enough to provide energy and nutrients to promote normal growth and development so the children may achieve and maintain a healthy weight and attain immediate and long term health benefits.\textsuperscript{18}

The diet of the average American preschooler does not meet dietary guidelines, diets tend to be high in total fat, saturated fat, sodium and sugar (specifically sweetened beverages), while low in fruits, vegetables, calcium rich foods and fiber.\textsuperscript{5} This is
detrimental to the growth, development, and emotional well-being of these young children as well as the establishment of healthful lifestyles that prevent childhood overweight.\textsuperscript{5}

The 2008 Feeding Infants and Toddlers Study (FITS) revealed that preschoolers’ diets fell within the AMDR for percentage of energy from protein and carbohydrate but not fat, as 47\% of diets were below the fat AMDR.\textsuperscript{19} However, the fat that was consumed lead to 76\% of these children to have a greater intake of saturated fat than recommended.\textsuperscript{19} Vitamin E and potassium fell below the recommendations, while synthetic folate, preformed Vitamin A, zinc, sodium exceeded the UL of preschoolers diets (from food, beverages, and supplements).\textsuperscript{19}

Reducing consumption of sweetened beverages should occur in both the childcare setting and at home; NHANES data showed a positive link between the consumption of these beverages and overweight in all age groups, including 2-5 year olds.\textsuperscript{18} Childhood consumption of fruit and vegetables may be predictive of adolescent and adulthood patterns as it has been shown that increased fruit and vegetable intake is vital in the prevention of these chronic illnesses; however the majority of Americans consume very low amounts of fruits and vegetables on a daily basis, much lower than that which is recommended.\textsuperscript{13,20}

Physical activity is an important part of obesity prevention and energy balance in children.\textsuperscript{15} The physical activity levels of most 2-5 year olds have been declining.\textsuperscript{5} Early childhood recommendations for physical activity are to engage in at least 60 minutes per day of unstructured physical activity and not be sedentary for more than 60 minutes at a
time unless sleeping; preschool aged children should have at least 2 hours of exercise a day, half in structured physical activity and half in unstructured free play settings. Screen time (the use of TV, radio, computer, video games in a non-educational way) is often included as a factor to be limited in obesity prevention. According to the American Academy of Pediatrics, children should have no more than 2 hours of quality screen time per day.

The Child Care Setting

Time Spent in Child Care

Nearly 75% of children under 5 y now spend at least part of their day in childcare, and because of this the childcare environment has been identified as critical for promoting behaviors that prevent childhood obesity. Approximately 3.9 million children are cared for in organized facilities, about 40% of children aged 3-4 whose mothers are employed spend more than 35 hours per week in non-parental care, and over 60% of preschool children spend an average of 30 hours per week in childcare programs. Parents and child care providers now share the responsibility of many children at a developmentally important period of life. Only 18% of children spend no time in child care; Hispanic children are more likely to be cared for by parents only and less likely to receive center based child care, while the inverse is true for black and non-Hispanic white children. Children of low-income families and those of racial/ethnic minorities are both more likely to spend time in child care and are at greater risk of
chronic disease morbidity and mortality. The majority of working parents enroll their children in center based care arrangements, only 10% enroll in family child-care homes.

**Child Care Guidelines**

In the Healthy People 2020 goals nutrition and weight status were identified as a major objective to promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weight. The Institute of Medicine (IOM) Report on Health and Safety Policies for Childcare Programs and Caring for our Children: National Health and Safety Performance Standards: Guidelines for Early Care and Education Programs were drafted to provide childcare providers with guidance to help reach these goals.

The Child and Adult Care Food Program (CACFP) provides federal funds for meals and snacks served to children in licensed childcare programs that follow specific dietary guidelines, but not nutrient based guidelines. The established meal pattern requirements are modeled on the food-based menu planning guidelines in the National School Lunch School Breakfast programs. The program was administered by the Department of Agriculture Food and Nutrition service through grants to the states; piloted in 1968 and made permanent in 1978. As of 2013, CACFP reached more 3.3 million children a day in childcare centers. It is important to note that the regulations of CACFP do not prevent providers from offering additional foods that may be high calorie or low nutrition.

Head Start is a federal preschool program created in 1965, now with more than 19,000 sites in the United States (U.S.). The objective of this program is to link all
children to some ongoing source of health care, with continual height and weight monitoring as well as guidance for the parents.\textsuperscript{18} Head Start centers participate in CACFP and all menus are reviewed by a registered dietitian (RD).\textsuperscript{18,24} Head Start is also required to provide opportunities for in-door and outdoor active play, but amount, frequency, and type is not specified.\textsuperscript{18,24} The national reach of the Head Start program could be used to strengthen and expand obesity prevention interventions.\textsuperscript{18}

In 2010, the Healthy, Hunger Free Kids Act was passed by Congress as part of the Child Nutrition Reauthorization Bill to authorize federal funding for school meal and child nutrition programs and increase access to health foods for low-income children.\textsuperscript{26} This act gave the U.S. Department of Agriculture (USDA) authority to set nutritional standards (the 2010 DGA) and builds on USDA work to improve nutritional quality of commodity foods served.\textsuperscript{26} In January of 2015, CACFP proposed its first set of revised rules since 1968, better aligning meal pattern requirements with the goals of the Healthy, Hunger Free Kids Act of 2010 and the 2010 DGA.\textsuperscript{27}

There is no national nutrition policy for all childcare settings.\textsuperscript{28} All childcare facilities except Head Start and those that participate in CACFP are regulated by the state, with different minimum health, safety, and nutrition standards that providers must meet to operate legally; usually regulated through licensure, registration, and certification.\textsuperscript{18,24,29}

It is the position of the Academy of Nutrition and Dietetics (AND), previously known as the American Dietetic Association (ADA), that childcare programs should achieve recommended benchmarks for meeting children’s needs in a safe, sanitary, and
supportive environment that promotes optimal growth and development. These benchmarks are set for nutritional quality of foods and beverages served; menus, meal patterns, and portion sizes; food preparation and service; physical and social eating environment; nutrition training; nutrition consultation; physical activity and active play; and working with families.

Licensing and accreditation requirements and best practice guidelines for the child care setting recommend that services implement a number of policies and practices to support healthy eating and physical activity; without adequate implementation the potential public health benefits of interventions to prevent childhood overweight and obesity in childcare services will not be realized. Only Michigan and West Virginia require meals and snacks served follow the DGA. Most states specify that programs should promote physical development through large and small muscle activity, inside and outside play, active and quite activity, individual and group activity. In terms of screen time, 22 states have some regulations for TV, computer, video, video games, radio, and electronic game use. Only 9 specify limits; 5 at a maximum of two hours a day. Most states lack strong regulations related to healthy eating and physical activity; child care centers tend to be the most heavily regulated to healthy eating and physical activity, followed then by large family and group child care homes, and then the smaller family childcare homes tends to have the least and most general regulations.

The Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) was launched in North Carolina (NC) in 2003 by the Centers for Disease Control and the NC Department of Health and Human services. NAP SACC aims to improve
provider knowledge, improve center policies, and decrease BMI in children enrolled in the child care setting.\textsuperscript{3,32} Their tool, the Environment and Policy Assessment and Observation (EPAO) examines the feasibility of using local health professionals to help childcare centers assess and improve their nutrition and physical activity (PA) environments by assessing child care center’s environment, policies, and practices.\textsuperscript{18,32} The EPAO is based on regulations and performance standards from Caring for Our Children: National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care, the Head Start program, the National Association for the Education of Young Children (NAEYC), and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).\textsuperscript{33}

\textit{Child Care Role in Obesity Prevention}

During the preschool years, it is easier to establish new behaviors than change existing ones, and the childcare setting offers a potentially powerful opportunity to implement such efforts.\textsuperscript{1} Communication between childcare providers and parents is important in preventing obesity and promoting healthy weight in preschool age children attending childcare; however only a few studies have been conducted looking at parent perceptions and behaviors relevant to the nutrition and physical activity environment in the childcare settings (Table 1.2).\textsuperscript{24} Obesity interventions need to address behaviors relating to both energy intake and energy expenditure to have the greatest influence.\textsuperscript{24}

Childcare services have been identified as a key setting to create environments supportive of child healthy eating and physical activity and an ideal place for overall health promotion.\textsuperscript{22,31} Studies have found the child care center to be a strong determinant
of children’s physical activity, showing how the childcare setting and providers play an important role in offering and modeling of physical activity programming and motor skill development.\textsuperscript{5} Recent studies suggest that children who attend childcare are more likely to be obese than children cared for at home, and younger children are at a higher risk.\textsuperscript{32} Interviews with directors provide an understanding that children are not likely to resist changes to foods served or amounts of physical activity when appropriately engaged.\textsuperscript{2} The research has indicated that the best way to engage children of this age is through experiential learning, for example, exposure to new foods in non-threatening forms such as healthy snack activities.\textsuperscript{2}

Basic child care nutrition is often based on the assumption that parents are preparing meals and snacks for their children when they are not at child care, and that parents reinforce the healthy food choices modeled in the child care setting.\textsuperscript{23} Many parents rely on child-care to provide the majority of their child’s nutrition needs including meals, snacks, and also learning about and practicing healthful food choices.\textsuperscript{23} A stronger partnership between parents and care providers; workshops and educational materials can be used to help parents plan meals and snacks that complement the food provided when they are away from home and also to reinforce the healthy behaviors modeled at the child care center.\textsuperscript{23} The engagement of parents in their child’s health is a principal concern for many childcare providers, as parental engagement is considered critical to the sustainability of center wellness policies.\textsuperscript{2} One study found that communication between providers and parents appears to be an effective way to engage
parents in healthful practices occurring in child care centers, and providers view parent-teacher meetings and family events as the best way to connect.34

Obesity prevention programs to address nutrition and physical activity in the childcare setting are lacking.5 Studies conducted on nutrition and physical activity in childcare centers have shown that the majority of centers did not have written policies on nutrition and physical activity and those that did were not meeting national recommendations.3,29 The children attending these centers did not consume recommended amounts of whole grains, fruits, or vegetables, and exceeded recommended intake of saturated fat and sugar.3

Recent assessments of the child care nutrition and physical activity environment show need for improvement regarding the nutritional quality of foods provided, amount of time children are engaged in physical activity, caregiver behaviors that may discourage healthy behaviors, and missed opportunities for education.24 Additional research is needed to determine the long-term feasibility of institutionalizing interventions and to test whether interventions found to be effective in one population will reproduce similar results in another group.24 Little is known about the activity levels of children in childcare.18 Many child care providers use informal activities rather than a structured curriculum to provide physical activity.5 There are no studies that have assessed children’s TV or video viewing and computer use in the child care setting; it has been reported that children get more screen time in child care homes compared to child care settings.18
Story et al. have established four goals for researchers in the childcare setting to achieve a more healthful food and physical activity environment for young children: (1) To develop, implement, evaluate innovative intervention programs to prevent obesity, especially those serving low-income populations; (2) to conduct descriptive environmental studies in various childcare settings to assess the food and physical activity environment; (3) to conduct a national study of child care programs on the dietary quality of meals and snacks and how they compare to the national recommendations; and (4) to evaluate methods to increase parental involvement, to transform parent behavior, and to modify the home environment through childcare based interventions.18

The Role of the Parent

It is important to understand the role of the parent in nutrition education for children; parents are the primary mediators of change for children so family based interventions are appropriate for obesity prevention.17,35 The family environment plays an important role in the development of children’s health behaviors; several studies have evidenced a positive relationship between parental physical activity and their children’s physical activity, and parents strongly agree that they are a significant contributor to their children’s activity habits.5 Beliefs about what is healthful or unhealthy are communicated to children through the family conversations as well as actions and choices enacted by individual family members; family meals as a regular event can become an important time when parents communicate about family culture/traditions/values.6 The family
provides the resources to support health and make decisions about what they believe to be health promoting actions. To affect real lifestyle change in at risk children, it is imperative that family based approaches be implemented.\textsuperscript{6} Parents cannot be positive dietary models for their children if they themselves do not have accessibility to or knowledge of the foods that will help in the prevention of childhood obesity.\textsuperscript{36}

Including parents in interventions has been evidenced to be effective in child obesity prevention; research has provided much support for a critical link between parent’s attitudes, knowledge, and behavior and their children’s dietary habits.\textsuperscript{35} Since parental influence can impact the physical activity habits of young children, parents attitudes, opinions, interests and current behaviors around physical activity need to be ascertained when designing an activity program to reach preschoolers.\textsuperscript{5} Interventions should be designed to engage children’s families as their first and best teachers.\textsuperscript{16} Each family unit varies and the needs of family members are varied, so the challenge lies in finding effective interventions that can be generalized across different populations.\textsuperscript{17} Parents can often participate in menu planning and serve as persuasive advocates for change at childcare facilities to promote healthy eating and physical activity.\textsuperscript{24} A family-centered approach targeting parents-only was more effective in reducing weight in obese children than a child-centered approach; interventions targeting parent-child versus child-only or no specific family member were more effective in long-term weight loss and maintenance.\textsuperscript{6,36}

Especially in young children, parents control the availability of food and so they must be utilized as agents of change in childhood obesity prevention.\textsuperscript{35,36} Parent feeding
practices may promote the expression of both early obesity and early AR, especially in children predisposed to obesity.\textsuperscript{11,17} In 3-5 year olds, greater maternal control over feeding is associated with poorer ability of these children to regulate energy intake, which is thus associated with higher BMI.\textsuperscript{11} The optimal situation for children is one where the parents provide healthy choices and the child is allowed to decide how much they consume, via the authoritative feeding style.\textsuperscript{17} Obesity related behaviors of overweight or obese parents could influence early life behaviors and in utero/early childhood physiologic programming leading to unhealthy weight trajectories; so interventions are needed to interrupt the cycle of obesity in families.\textsuperscript{15} A considerable proportion of parents of normal weight children perceive their child to be underweight and most parents are unlikely to recognize their preschool aged child as obese.\textsuperscript{24}

**Theoretical Framework**

In targeting parents, childcare providers, or both, all obesity focused interventions must have a solid foundation of theory in order to guide program design and implementation effectively. Programs developed without the guidance of conceptual or theoretical frameworks can limit their potential effectiveness.\textsuperscript{31}

Theory, in an applied context, can be understood as interrelated ideas about various patterns, concepts, processes, relationships or events.\textsuperscript{37} In social sciences, theory is usually defined as a system of logical statements or propositions that explains the relationship between two or more objects, concepts, phenomena, or characteristics of
humans (i.e. variables). Theory provides the basis of models, which represent a framework for design and investigation.

**Obesity Prevention**

Three theoretical models that have been highlighted as the most effective in affecting positive change in obesity prevention are the Cognitive Behavioral Theory, the Social Learning Theory, and the Ecological Theory. In many interventions, these models are often integrated and simplified depending on the target population. Cognitive Behavioral therapy provides methodology to systematically modify eating, exercise, or other behaviors that are thought to contribute to or maintain obesity. This is done through use of self-monitoring and goal setting, stimulus control and modification of eating style and habits, cognitive restructuring strategies that focus on challenging and modifying unrealistic or maladaptive thoughts or expectations, stress reduction/management strategies, and the use of social support.

Social Learning theory involves operant conditioning (reinforcement and punishment) during the maintenance and shaping of new behaviors, and behavioral modeling (engaging in behavior which was observed) in establishing new behaviors. Children are most likely to learn behavioral patterns of those individuals who control the majority of the rewards and punishments and establish the social contexts in which behaviors are learned and established. Differential reinforcement (different responses for different behaviors) and behavioral modeling are believed to lead to the development of definitions that provide a script for behavior.
Ecological Theory suggests that the child exists within the center of its universe surrounded by its immediate environment (micro-environment), which in turn is surrounded by the environment at large (macro-environment). The micro- and macro-environment effect a child’s eating behaviors, growth, and development.

The importance of building interventions on theoretically based strategies is evident; however, the challenge lies in making complex interventions simple and successful. Recently, there has been a growing recognition of the importance of socio-ecological models of change in prevention initiatives, recognizing the powerful influence of individual, social, and environmental factors on long term behavior change.

Prevention efforts focused on obesity in youth are often based on physiological and behavioral models, including the socio-cognitive theory. Predictors of child success include self-monitoring, changes in eating behaviors, praise of child, change in parent percent overweight; more success was associated with supportive, interactive families demonstrating parental skills to develop responsibility and a positive self-image. Parents need to develop skills to facilitate healthy attitudes and interactions around eating and activity to help increase success of the intervention.

Social Determinants of Health

Social determinants of health are the cumulative effects of current, or even a lifetime of exposure to conditions of living that combine to influence health status. This would include a combination of our genetic predisposition, the actions we do or do not do as individuals and groups, and a wide range of social and environmental factors that influence health status and quality of life.
Singh et al. (2010) hypothesize that certain socio-demographic, behavioral, and environmental characteristics make up social determinants of health that affect obesity primarily through their effects on behavioral factor such as diet, physical activity, and sedentary behaviors. Understanding determinants of health behavior and obesity risk in children can provide insight into the complex network of factors and how researchers can intervene. At the individual level, considerable differences exist in child obesity and physical activity levels by socioeconomic status, race, ethnicity, and gender. At the contextual level, differences exist in the effects of parent practices, the home environment, and developmental and psychological factors on diet, obesity, and physical activity. The Social Determinants of Health and Environmental Health Promotion model describes how fundamental, intermediate, and proximate socioeconomic processes interact with the built environment to determine population health.43

Social-ecological Model

As it is understood that the causes of childhood obesity are complex and multi-faceted, transdisciplinary research is an ideal method to work collaboratively toward creative and far-reaching solutions; the Socio-ecological Model reflects this comprehensive strategy. The Socio-ecological Model is a multi-level research strategy for understanding and preventing obesity, addressing individual level influences and choices as well as complex systems occurring at interpersonal, community, and government levels that provide context for health related behaviors. The five levels of influence of the Socio-ecological Model are Intrapersonal (taste preferences, habits, nutritional knowledge/skills), Interpersonal (culture, social traditions, role expectations),
Organizational, Community, and Public Policy/Physical environment. This model provides a useful framework for achieving a better understanding of the multiple factors and barriers that impact dietary behaviors and can provide guidance for developing culturally sensitive and appropriate intervention strategies.

Family Ecological Model

According to the Family Ecological Model (FEM) parenting behaviors are shaped by the context in which the family is embedded. The FEM was developed to account for contextual and family systems factors affecting parenting specific to healthy lifestyles, emphasizing the family, rather than the individual, and the focal point of the model and the intervention target. The inner circle of the FEM summarizes the processes by which parents influence children (parent knowledge, behaviors, beliefs, modeling, and creating opportunities); while the outer circle of the FEM represents contextual factors such as demographics, child characteristics, organizational and community characteristics, and media and policy factors.

The aforementioned theories and models have all been utilized in planning successful obesity prevention interventions.

Relevant Interventions

There is a paucity of data on obesity prevention interventions for pre-school aged children. The limited research targeting childcare providers demonstrates that assessing nutrition and physical activity policies and practices and training providers positively impacts nutrition and physical activity (Table 1.3). Similarly, in parent-centered
interventions, when parents reinforced school lessons on nutrition and physical activity as well as when parents modeled these behaviors to children, the children were more likely to have a lower BMI and a higher rate of activity compared to children whose parents did not partake in these practices (Table 1.3). Strategies that involve both childcare providers and parents are now emerging as significant in lowering child BMI and improving knowledge across the system (Table 1.3).
<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Overweight(^1)</th>
<th>Obese(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic Asian</td>
<td>9.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>20.9%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>21.9%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>29.8%</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

\(^1\)Defined as falling between the 85\(^{th}\) - 95\(^{th}\) percentile for BMI-for-age  
\(^2\)Defined as at or above the 95\(^{th}\) percentile for BMI-for-age
Table 1.2 Parent Perceptions and Behaviors Relevant to the Nutrition and Physical Activity Environment in Childcare Settings, Review of Previous Studies

<table>
<thead>
<tr>
<th>Reference</th>
<th>Subjects</th>
<th>Location</th>
<th>Intervention</th>
<th>Results &amp; Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benjamin et al.,</td>
<td>508 parents of children</td>
<td>North Carolina,</td>
<td>Parents completed a brief close-ended question survey of perceived quality</td>
<td>The majority of parents reported quality of meals and snacks at the center as either</td>
</tr>
<tr>
<td>2008</td>
<td>enrolled 91 licensed childcare</td>
<td>U.S.</td>
<td>of meals, snacks, and physical activity at their centers</td>
<td>excellent (30% meals, 27% snacks) or good (42% meals, 46% snacks). The main</td>
</tr>
<tr>
<td></td>
<td>centers</td>
<td></td>
<td></td>
<td>recommendations for improving meals and snacks were to increase fruits and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>vegetables and provide a variety of healthful foods. The majority of parents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>categorized the quality of physical activity at the center as excellent (36%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or good (46%), and suggested more structured, outdoor activities for children.</td>
</tr>
<tr>
<td>Sweitzer et al.,</td>
<td>74 Children (3-5 y) enrolled</td>
<td>Texas, U.S.</td>
<td>3 days of sack lunches prepared at home for children attending licensed child-</td>
<td>More than 50% of the 3-day means for sack lunch nutrients provided less than 33%</td>
</tr>
<tr>
<td>2009</td>
<td>in a licensed childcare center,</td>
<td></td>
<td>care centers were evaluated to determine whether the lunches provided a</td>
<td>of the DRIs for energy, carbohydrate, vitamin A, calcium, iron, and zinc. 96% of</td>
</tr>
<tr>
<td></td>
<td>which requires parents to send</td>
<td></td>
<td>minimum of 33% of the DRI. Energy, carbohydrates, protein, dietary fiber,</td>
<td>children received less than 33% of the DRI for dietary fiber, but sodium was</td>
</tr>
<tr>
<td></td>
<td>lunch</td>
<td></td>
<td>thiamin, riboflavin, niacin, vitamin C, vitamin A, calcium, iron, zinc, and</td>
<td>114% of the DRI. The observed lunches did not meet the CACFP standards for</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sodium were evaluated. Food items were summarized and compared with CACFP</td>
<td>servings of fruits and vegetables or for servings of milk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>standards.</td>
<td></td>
</tr>
<tr>
<td>Taveras et al.,</td>
<td>45 directors of childcare</td>
<td>Boston, MA (U.S.)</td>
<td>6 Focus Groups were conducted to identify potentially successful strategies,</td>
<td>Some providers expressed frustration towards parents’ attitudes about child</td>
</tr>
<tr>
<td>2006</td>
<td>facilities</td>
<td></td>
<td>barriers, and facilitators for health</td>
<td>safety and health.</td>
</tr>
<tr>
<td>Study (year)</td>
<td>Participants</td>
<td>Setting</td>
<td>Interventions</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
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</table>

Parents wanted in-person group discussions to provide health education information.

Parents targeted focus groups to learn more about barriers low-income, minority families face to healthy living and where they turn for health related information.

Results indicate that low-income minority families face many barriers to eating healthily: while families do eat some healthy foods, they also eat many unhealthy foods; they rely primarily on family members for their nutrition information; they have some desire to change their own health habits (but generally not those of their children); and they have inadequate nutritional knowledge. Future intervention programs should be increasing parent’s knowledge regarding healthy foods, proper portion sizes, and healthy preparation methods; how to evaluate the healthfulness of foods and seek out accurate nutrition information; how to incorporate these strategies into their daily lives.
**Table 1.3 Interventions Indirectly Targeting Children in Obesity Prevention**

<table>
<thead>
<tr>
<th>Study Reference</th>
<th>Target Population</th>
<th>Intervention</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Silva-Sanigorski et al, 2010 &amp; 2012&lt;sup&gt;39,49&lt;/sup&gt; “Romp &amp; Chomp”</td>
<td>1. 12,000 children 0-5 y old 2. The 559 CCF directors (Australia)</td>
<td>Environmental changes to increase healthy eating and active play in early-childhood care and educational settings. Followed up with impact evaluation of nutrition and physical activity related environments and practices</td>
<td>Significantly lower mean weight, BMI, and zBMI in the 3.5-y-old subsample; Significantly lower prevalence of overweight/obesity in both the 2- and 3.5-y-old subsamples; Intervention child-behavioral data showed a significantly lower intake of packaged snacks, fruit juice, and cordial than that in the comparison sample. Positive impacts on nutrition &amp; PA policies, and positive impacts on training and practices related to nutrition and PA.</td>
</tr>
<tr>
<td>Jones, et al. 2014&lt;sup&gt;44&lt;/sup&gt;</td>
<td>128 childcare services (Australia)</td>
<td>Implementing support staff and a communications strategy; Securing executive support, consensus processes, staff training, academic detailing visits, performance monitoring and feedback, tools and resources</td>
<td>Still in progress, primary outcomes measured will be prevalence of services implementing all healthy eating and physical activity policies and practices targeted by the intervention</td>
</tr>
<tr>
<td>Neelon, et al. 2013&lt;sup&gt;32&lt;/sup&gt;</td>
<td>32 Childcare Centers Boston, MA (U.S.)</td>
<td>Observers assessed center environments using the EPAO instrument (range 0–320 points) at baseline and the 6-month follow-up. Linear regression models with change in EPAO score from baseline to follow-up, controlling for potential confounders for total score, nutrition sub-score, and physical activity sub-score.</td>
<td>Fewer intervention centers had outdoor play areas on site (75 vs. 100 %) but more had indoor play space (67 vs. 25 %). At baseline, intervention centers had a mean (SD) EPAO score of 134.5 (7.0) points and controls had 146.8 (4.8) points. Compared with controls, intervention centers improved their EPAO scores at follow-up by 18.5 points (95 % CI 0.1, 37.0; p = 0.049), chiefly through greater improvement in physical activity (12.2; 95 % CI -1.6, 26.0; p = 0.075) and not nutrition (6.4; 95 % CI -7.1, 19.8; p = 0.385).</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Size</td>
<td>Intervention Details</td>
<td>Outcomes</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Fitzgibbon et al. 2005, Stolley, et al. 2003 &quot;Hip Hop to Health, Jr.&quot;</td>
<td>824 3-5 y old children enrolled in 24 Head Start programs, and 681 parents of enrolled children</td>
<td>Delivered lessons on different nutrition and physical education topics each week to intervention children; Weekly newsletter to parents mirroring the children’s curriculum; Parent assignment to reinforce what was learned</td>
<td>Intervention children had significantly lower BMI increases than the control group at the 1- and 2-year follow-up. Mean calorie intake from saturated fat was less for intervention children than control children at the 1 y follow-up.</td>
</tr>
<tr>
<td>Davison et al. 2013</td>
<td>423 2-5 y old children enrolled in 5 Head Start centers, and their parents</td>
<td>Year 1 – parents work with researchers to plan and conduct a community assessment to help inform the design of a family-centered intervention. Year 2 - parents lead the implementation of the intervention, which included reports on child BMI; campaign to raise parental awareness of children’s weight status; nutrition counseling integrated into Head Start family engagement activities; 6-week parent led program to empower healthy lifestyles.</td>
<td>Post-intervention children exhibited significant improvements in their rate of obesity, physical activity, screen-time, and dietary intake; Post-intervention parents reported greater self-efficacy to promote healthy eating in children and to support increased PA in children.</td>
</tr>
<tr>
<td>Hood, et al. 2000 &quot;The Framingham Children’s Study&quot;</td>
<td>92 children aged 3-5 y old, and their parents</td>
<td>Parents completed feeding questionnaire, anthropometrics were obtained for parents and child yearly, children’s activity was monitored multiple days per year, and food diaries were collected multiple times per year.</td>
<td>Children of active mothers were twice as likely to be active compared to children with inactive mothers; children were almost six times more likely to be active if both parents were active.</td>
</tr>
<tr>
<td>Alkon et al. 2013</td>
<td>17 licensed childcare facilities</td>
<td>The NAP SACC intervention with educational workshops for providers and parents as well as consultations from child care health consultants</td>
<td>Significant increases in both parental and provider knowledge of nutrition and physical activity pre-post workshop; Difference in mean child-level zBMI changes between intervention and control was significant;</td>
</tr>
<tr>
<td>Study</td>
<td>Region</td>
<td>Sample Size</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Natale et al, 2013¹</td>
<td>Miami-Dade County, Florida (U.S.)</td>
<td>28 childcare centers</td>
<td>Significant improvements in policy at the child care center level. Study still in progress. Main outcome measures will include pre-post changes in child BMI percentile and z-score, fruit and vegetable intake; amount of physical activity; parental knowledge, attitudes, and beliefs.</td>
</tr>
<tr>
<td>Bellows, et al. 2008²</td>
<td>Colorado (U.S.)</td>
<td>3-5 year olds enrolled in Head Start programs</td>
<td>Findings illustrate that teachers provided physical activity; however, most did not use a structured program. Teachers identified time, space and equipment as barriers to providing activity in their classroom. Focus group findings identified activities of preschoolers’, parents’ perceptions of the adequacy of activity levels, and items to help parents engage their children in more physical activity. Barriers were also identified by parents and included time, safety, inclement weather, and lack of knowledge and self-efficacy. Findings from this formative research were used to develop a marketing strategy to guide the development of a physical activity component, Food Friends Get Movin’ with Mighty Moves™, as part of a larger social marketing campaign aimed to decrease the risk for obesity in low-income preschoolers.</td>
</tr>
</tbody>
</table>

¹“Healthy Caregivers, Healthy Children” ²“Food Friends/Mighty Moves”
CHAPTER 2
Rationale, Objectives, & Hypotheses

Childhood obesity has become a public health crisis.\textsuperscript{4,53} Childhood obesity has more than doubled in children in the past thirty years, the 2009-2010 NHANES reported that 26.7\% of children 2-7 y were overweight and obese, up from 7\% in 1999.\textsuperscript{3,4,54} Nine percent of children globally are expected to be overweight or obese by 2020, and it is predicted that 1/3 of all children born today will develop type 2 diabetes mellitus in their lifetime.\textsuperscript{40,53} In a population-based sample of 5-17 year olds, 70\% of obese children had at least one risk factor for cardiovascular disease.\textsuperscript{9} Excessive intake and low physical activity impact both quality of life and life expectancy, especially among children, and for the first time in modern history children have a shorter life expectancy and are predicted to have a poorer quality of life than their parents.\textsuperscript{6,40}

Obesity is a chronic disease that tracks into adolescence and leads to a greater risk of obesity and other chronic diseases in adulthood; it needs to be recognized as a chronic disease with many confounding, intricate causes.\textsuperscript{17,55} A child’s health and risk for obesity are influenced by both contextual (race, gender, ethnicity, family health history) and dynamic (family environment, knowledge and attitudes) factors.\textsuperscript{6} Gestational diabetes, size for gestational age, weight gain in the first year, and duration of breastfeeding all are linked to higher childhood body mass index (BMI).\textsuperscript{55} Also, children of ethnic and racial
minorities have a higher prevalence of modifiable risk factors for obesity than other children. According to the Nestle Feeding Infants and Toddlers Study (FITS), the average preschooler consumes excessive amounts of sodium, saturated fat, folate, vitamin A, and zinc, and in-adequate amounts of fiber and potassium. Interestingly, while saturated fat intake is high (as a percentage of total energy), these children are not consuming enough total fat recommended for proper growth and development. In addition to diets poor in nutritional quality, the physical activity levels of pre-school aged children are declining.

Early childhood is a pivotal time for nutrition education, when dietary habits and behaviors can be formed and easily influenced. and is therefore a critical period for the implementation of an obesity prevention intervention. At this early age the parent and child care provider are highly sensitive to children’s needs and can help establish healthful habits. Children participating in high quality early interventions have been found to have more positive well-being and can take better care of their own health later in life. Prevention interventions should involve actively engaging children and their parents in adopting healthy nutrition and physical activity habits. Also, targeting this age may have prolonged effects due to the timing of the AR, the point of maximal leanness, as early AR has been found to be a risk factor for obesity later in life.

In 1966, only 6% of children five years (y) old or younger were enrolled in childcare centers. With the changing trends in the workforce, specifically more mothers working full time positions, 82% of children aged 2-5 y are now enrolled in a child care facility. Due to this, parents and childcare providers now find themselves sharing the
responsibility of these children at a developmentally important period of life. Therefore, to reach the majority of children in this age group, strategies should be developed and implemented at the child-care level.  

Mandatory, science-based standards for policies and practices pertaining to nutrition are limited to the federal preschool program, Head Start, and those centers that are enrolled in the USDA CACFP, a program that provides federal funds for meals and snacks served to children that follow meal pattern requirements. There are no national nutrition or physical activity policies for all child care settings, requirements for most facilities are regulated by the state, and each state varies. In 2015, meal standards for the CACFP were revised to better align meal patterns with the 2010 DGA, as required by the Healthy, Hunger Free Kids Act of 2010. Additionally, a set of best practices that childcare facilities may choose to follow to further improve the nutritional quality of meals served has been added to these standards.  

In Virginia, childcare centers have standards for licensure set by the Department of Social Services. These include following the most recent, age appropriate nutritional requirements of the CACFP; and that centers should offer meals and snacks that provide a variety of nutritious foods with at least three sources of vitamins A and C each week. Virginia does not regulate child care centers to require moderate or vigorous physical activity, have policies on vending machines, have policies prohibiting or limiting foods of low nutritional value, or to ensure that meals and snacks are consistent with the DGA.  

In 2003, the NAP SACC was launched in NC by the Centers for Disease Control and the Department of Health and Human Services. Based on regulations and
performance standards from Caring for Our Children: National Health and Safety
Performance Standards: Guidelines for Out-of-Home Child Care, the Head Start program, the National Association for the Education of Young Children (NAEYC), and WIC; NAP SACC aims to improve provider knowledge, improve center policies, and decrease BMI in children enrolled in the child care setting. In a randomized control trial of 17 licensed child care facilities, the NAP SACC intervention was found to improve provider and parent knowledge, center level policies, and children’s zBMI.

The NAP SACC program developed and validated a self-assessment tool for privately owned centers to evaluate their own nutrition and physical activity environment, the EPAO. This tool gives centers that do not have federally mandated policies and practices an opportunity to assess and improve their center. To date, the use and support for self-assessment tools in the childcare setting is severely lacking.

Any setting where children spend time away from the home for a prolonged period of the day has been identified as a strong determinant of healthy eating and physical activity in young children, as child care providers offer the prospect of implementing effective obesity prevention strategies that can reach not only children but their parents. Therefore, to reach the most children an intervention would need to be applicable at the childcare level.

Parents are often the primary mediators of change for their children; at home with their family is where children learn and experience the concept of health. Research has provided much evidence that parent’s attitudes, knowledge, and behavior are linked to their children’s dietary habits. Specifically, parent eating patterns showed a direct
relationship with their children’s intake of saturated fat, cholesterol, and sodium.\textsuperscript{17}

Predominantly among children five and younger, parents control the availability and accessibility of food.\textsuperscript{36}

Parental control in feeding has been found to be a strong predictor of a child’s ability to regulate energy intake and can have a major influence on the development of children’s dietary habits.\textsuperscript{17} Therefore, childhood prevention interventions and programs should be designed to acknowledge the parent as one of the child’s primary teachers in health.\textsuperscript{16,17} Any efforts made in the classroom may be rendered useless if we do not also focus on influencing the home environment; an ambivalent parent has the potential to unknowingly undo the work of the childcare provider without guidance and ways to reinforce healthful behaviors in the home.\textsuperscript{5,6,17,18} The family provides the resources to affect real lifestyle change in at risk children, and it is imperative that family based approaches be implemented.\textsuperscript{6}

Young children’s food, beverage, and physical activity choices and patterns are influenced strongly by adults, especially their parents and childcare providers.\textsuperscript{5,40} Therefore, childhood obesity prevention efforts must encompass the entire landscape of children’s lives and the adults that influence them.\textsuperscript{40}

Little is known about how communities are tackling childhood obesity, especially whether preventative efforts have been effective or not, however past initiatives have proven that communities can change their environments to help prevent childhood obesity.\textsuperscript{14} Reaching children will require reaching the adults that influence them first;
educating parents and care providers in the community about their important role as gatekeepers should be part of the overall strategy.

To the majority of nutrition professionals, research elicits thoughts of quantitative research, i.e. data, controlled environments, clinical trials, interventions, numbers, reliability, and outcomes.\(^6\) Quantitative research is well suited for tasks such as testing the effectiveness of interventions, evaluating outcomes, and finding statistical associations.\(^6\) However, there are times when this type of inquiry is insufficient to address the issue. When phenomena are not easily measured, knowledge is limited, and process must be evaluated, qualitative research is warranted.\(^6\) Qualitative research is defined as a naturalistic approach that seeks to understand phenomena in uncontrolled, context specific settings.\(^6\) This type of research requires meticulous attention to elements such as research questions, objectives, study design, sample selections, and methodology, outcomes, and conclusions to be valid, reliable, and relevant.\(^6\)

One qualitative method, focus groups, are often used to generate evidence that is commonly used for evaluating diverse programs and policies.\(^6\) Focus groups are employed in different types of evaluations, such as needs assessments, program theory development, and implementation and outcome evaluation.\(^6\) Focus group methodology is well-suited for advancing our understanding of root causes of various health disparities.\(^3\) Essentially, the focus group interaction provides depth and breadth of information about the experiences related to the topic of interest, in a way quantitative data cannot.\(^3\)
In the past few decades, multiple disciples have begun to recognize that a mix of qualitative and quantitative methods can maximize the research endeavor. What’s more, when both qualitative and quantitative methods are utilized for the same question, it can results in enhancing understanding through validation and complementary results. When implementing an intervention, lack of attention to cultural and contextual factors, which not only facilitate or inhibit the effectiveness of the intervention, but also influence the social or ecological validity of the intervention, would be a major limitation. Qualitative research in obesity prevention can provide rich, in-depth data to help better develop strategies to specific populations and improve outcomes.

As referenced in the literature review (Table 1.3), there is little published data on interventions equally targeting the parent, child, and childcare provider. There is also a paucity in the data on the nutrition and physical activity environment of the child care facility. Data examining 2-5 year olds is limited, as most studies have focused on school aged children, even though younger children are under the most direct control of the parent and childcare provider. Therefore, this thesis seeks to address the gaps in the literature related to what is known about childcare facilities policies and practices related to pre-school diet and physical activity; the relationship between lifestyle and obesity in preschool aged children; and how the childcare setting affects the relationship between home and health.

The long-term goal of this proposed project is to reduce the rate of early childhood obesity. Therefore, the primary objective of this study will be to collect data to inform the development of a nutrition and physical activity focused obesity prevention
intervention targeted at children enrolled in Northern Virginia childcare facilities. Four objectives have been established to address the research questions, test the hypotheses, and to guide the design and methodology of this study.

**Objective 1:** To determine policies and practices related to nutrition and physical activity of two child development centers in Fairfax, VA, and compare with nationally accepted standards utilizing the EPAO instrument.

**Hypothesis 1:** A Child Development Center enrolled in CACFP will have policies and practices related to nutrition and physical activity that result in an environment more suitable for the development of healthy habits than a center that is not enrolled in CACFP.

**Objective 2:** To determine demographics (ethnicity, parent education, SES) and lifestyle factors (nutrition and activity habits) associated with children’s BMI-for-age and waist circumference percentile in a sub-sample of children aged 2-5 y, attending two child development centers in Fairfax, VA through cross-sectional assessment of child anthropometrics and parental questionnaires.

**Hypothesis 2:** Specific environmental and lifestyle factors may be possible indicators or risk factors of overweight and obesity in preschool children.
**Objective 3:** To explore children’s health status as well as differences in nutrition and physical activity habits between those children enrolled in a subsidized vs. non-subsidized child development center in Fairfax, VA.

**Hypothesis 3:** A Child Development Center that serves a higher-income population will be more likely to have children enrolled that are at a lower risk for overweight and obesity, than a center serving a lower-income population.

**Objective 4:** To gain a better understanding of the familial relation to health and how childcare can both support and hinder that system. Parent focus groups will be used to identify barriers to and potential interventions for healthy lifestyle promotion both in the home setting and in the childcare environment for children aged 2-5 y, attending childcare facilities in Fairfax, VA.

**Hypothesis 4:** When comparing two child development centers that serve populations of differing socio-economic status, the challenges faced by parents in promoting health at home will be different between the centers.
CHAPTER 3

Manuscript

BACKGROUND

Childhood obesity has more than doubled in children in the past thirty years, NHANES 2009-2010 reported that 26.7% of children 2-7 years old (y) were overweight and obese, up from 7% in 1999.\(^3,4,54\) Children that are overweight or obese are at a higher risk for chronic diseases later in life; in a population-based sample of 5-17 y, 70% of obese children had at least one risk factor for cardiovascular disease by the time they were 5.\(^9\) Most research conducted has looked at children aged 8-12 y, when the AR, the point of minimal leanness before BMI begins to rise, has already occurred and children have begun to determine their own eating habits.\(^11,54\) Thus, recent research suggests early childhood (2-5 y) as an ideal window for obesity prevention strategies, as children of this age are still easily influenced and poor behaviors can be altered.\(^54\)

Eighty-two percent of pre-school aged children under 6 y in the U.S. are enrolled in out-of-home care,\(^29\) and children from low-income backgrounds consume 50-100% of their Recommended Dietary Allowance (RDA) in these childcare settings.\(^1,3\) Therefore, to reach the majority of children in this age group, strategies should be developed and implemented at the child-care level.\(^3\) While there are science-based meal pattern
requirements used in federally funded programs, such as Head Start and those centers that are enrolled in the USDA CACFP, these standards are not mandatory for privately owned centers.\textsuperscript{57}

Furthermore, childcare nutrition and physical activity practices are limited in reach if they cannot also be reinforced in the home as family provides the resources to support health and make decisions about what they believe to be health promoting actions.\textsuperscript{6} Especially in young children, parents control the availability of food and so they must be utilized as mediators of change in childhood obesity prevention.\textsuperscript{35,36} With the burden of promoting healthy habits and development now falling equally on parents and childcare providers, it is essential to understand how they can work together to better influence our nation’s youth.

The primary goal of this research is to inform future early childhood obesity prevention strategies targeting childcare providers and parents as agents of change. Using mixed methodology, the current study aims to achieve this goal through the comparison of policies and practices related to nutrition and physical activity of two CDCs with nationally accepted standards utilizing the EPAO instrument; determining demographics and lifestyle factors associated with children’s BMI-for-age and waist circumference percentile in a sub-sample of children aged 2-5 y; examining children’s health status as well as differences in nutrition and physical activity habits between those children enrolled in a subsidized vs. non-subsidized CDC; and exploring the familial relation to health and how childcare can both support and hinder that system.
QUANTITATIVE METHODS

Two neighboring child development centers (CDC), 0.1 miles apart, in Fairfax, VA were selected for participation in this study, based on the different populations served. Center one (CDC 1) was subsidized based on household income, and is enrolled in the CACFP, while center two (CDC 2) is not subsidized and follows its own nutrition policy. The child care environment was assessed by researchers, with the help of administrators/directors, during a 1 day visit to the child care center involving direct observation of the nutrition and physical activity environment and document review of activities using the EPAO instrument. In addition, a cross sectional study was conducted with a sample of healthy children (no major medical contraindications) attending the same centers participating in the observation and document review. All parents and caregivers received an informational brochure about the study sent home with their child. Informed consent was obtained from all parents of children and George Mason University Human Subjects Institutional Review Board approved this study (Appendix 1).

*Environment and Policy Assessment and Observation Instrument (EPAO)*

Details about meal and snack times, as well as periods of physical activity were recorded. In addition a review of menus, nutrition policy and curriculum, physical activity policy and curriculum, fundraising, guidelines for parents, educational materials, and certification of staff training in nutrition and physical activity was completed. Each center was scored as suggested by NAP SACC into 16 different sections, half pertaining to nutrition: fruits and vegetables, whole grains and low fat meats, high
sugar/high fat foods, beverages, nutrition environment, staff behaviors-nutrition, nutrition training and education, and nutrition policy; while the other half assessed physical activity: active play, sedentary behaviors, sedentary environment, portable play environment, fixed play environment, staff behaviors-physical activity, physical activity training and education, and physical activity policy. Each center received scores for: (1) nutrition, (2) physical activity, and (3) combined overall. The purpose of these scores is to serve as a baseline for future evaluation concurrent to the implementation of a new policy or practice. Scores were used as a basis of comparison for the two centers.

_Cross Sectional Assessment of Children_

Children’s height was taken using a standiometer (Perspective Enterprises, Portable Adult/Infant Measuring Unit; Portage, MI), weight was measured with an electronic scale (Perspective Enterprises, Health-O-Meter 752KL; Portage, MI), and waist circumference (WC) measured with a non-stretch tape measure. Weight and height were used to calculate BMI (kg/m²), which was plotted on the WHO growth charts for BMI-for-age percentile and WC was also plotted on a nationally representative growth chart. All measurements were collected according to the NHANES protocol.

Parents were provided with questionnaires to complete and return via mail (Appendix 2-4). A demographics survey provided information on age, education of parents, family income range and employment. Parents were asked to self-identify their race/ethnicity. The Nutrition Screening Tool for Every Preschooler (NutriSTEP®) is a validated parent-administered questionnaire designed to identify preschool children at nutritional risk. It has been used previously to assess associations between children’s
eating behaviors and health risks. The questionnaire consists of 17 items (range of scores 0–68), with questions divided into the following 5 subscales: eating behaviors, dietary intake, parental concerns about food and activity, screen time duration (television, computer or video game use) and the use of supplements. Children's habitual activity was captured using the Habitual Activity Estimation Scale (HAES)\(^69\) validated for young children and composed of a short survey completed by parents. This questionnaire is composed of 29 questions regarding activity during the week and weekend days at home and outside of the home. The HAES provides a score for hours spent per day in activities at different levels of intensity (inactive, somewhat inactive, somewhat active and active). Questionnaires were available in English or Spanish.

**Statistical Analyses**

All statistical analysis was conducted using SPSS statistical software (IBM, version 19; Armonk, New York). All variables were checked for normality using the Shapiro-Wilk test; non-normal distributions were analyzed using non-parametric tests. For continuous variables, data was reported as mean ± SD for normally distributed and medians with interquartile Range (IQR) for non-normal data and n (%) for categorical variables. Pearson’s correlations were used to explore association between continuous variables (HAES, NutriSTEP scores) and children’s BMI-for-age and waist circumference percentiles. Student T-tests or ANOVA were used to explore associations between categorical variables (demographics) and children’s BMI-for-age and waist circumference percentiles. T-tests were also used to compare variables between the two child development centers.
QUANTITATIVE RESULTS

Center Environment

CDC 1 had 72 children enrolled at the time of recruitment, of which 16 participated (22%). CDC 2 had 120 children enrolled at the time of recruitment, of which 22 participated (18%). Not all children enrolled at the centers were eligible, as CDC 2 has a summer class of children over 5 and each center had children with pre-existing, contraindicative medical conditions. Overall, a total of 38 children participated in the cross sectional survey representing a 20% participation rate. This was comparable to research in child obesity prevention typically in the range of 20-30%.\(^\text{24}\)

CDC 1 scored higher on the EPAO for the majority of components compared to CDC 2 (Table 3.1). The difference in overall scores was statistically significant, p=0.036. CDC 1 scored an overall 73% (73% nutrition, 72% physical activity) with the highest scores related to high sugar foods, high fat foods, whole grains & low fat meats served, staff behavior related to both nutrition and physical activity, fixed play environment, and physical activity policy. CDC 2 scored an overall 53% (58% nutrition, 48% physical activity) with their highest scores related to high sugar and high fat foods served, staff behavior related to nutrition, nutrition policy, portable play environment, and sedentary behavior. Scores were lower for both sites (<10/20) in regards to nutrition and physical activity training and education required for staff, as both sites did not require staff to have specific training in these areas.

Parent Demographics
Parents from both centers shared similar backgrounds (Table 3.2). The majority of parents worked an average of 21-40 hours per work week. In regards to health status, 50% of parents reported BMI in the healthy range (18.5-24.9 kg/m2). Families from CDC 1 were more likely to have more children than those from CDC 2 (p=0.046). Significant differences between centers were noted for family income, education and race (p<0.05). From CDC 1, 44% of parents had household income of ≥$100,000+ compared to 82% from CDC 2 and 38% of CDC1 parents completed high school vs. 100% of CDC 2 parents (p=0.024). Although, the majority of parents from both centers reported their race/ethnicity as “White/Caucasian”, the other category differed among centers, 44% of CDC 1 parents reported being “Hispanic/Latino” while 36.3% of CDC 2 parents identified as “Asian” and “Middle Eastern”. The difference between the ethnic makeup of the parents from the two centers was statistically significant, p<0.05.

Children’s Anthropometrics, Nutrition and Activity Habits

The mean age, weight, height, and sex for children from both centers were very similar (Table 3.3). When looking at the entire sample, 67% of children fall in to the healthy BMI category of the 5th-85th percentile and 47% fall into the healthy WC category of 10th-75th percentile. No statistically significant differences in anthropometrics of the children were noted between centers.

Based on the NutriSTEP results, the majority of children were in the ‘Great’ category, indicating not needing changes to their dietary habits, with no differences between centers (Table 3.4). With regards to the NutriSTEP sub-scores, there was no statistically significant difference between the two centers, with the exception of
children’s screen time. Children from CDC 1 were reported to spend more time watching TV than CDC 2 children, p=0.019. There were no statistically significant differences between the two centers with respect to the HAES and the hours spent at different levels of intensity of physical activity (Table 3.4).

Predictors of Children’s Anthropometrics

The relationship between environmental predictors and risk of overweight and obesity was explored to identify significant interactions. No significant associations were found between anthropometrics (BMI z-scores and WC) and parent’s demographic characteristics, NutriSTEP scores, HAES scores, and parent/child age. Across both centers, children were more likely to fall above the 75th percentile for WC percentile (overweight and obese) if there were more children reported in the household (p=0.024). Males were more likely to fall above the 75th percentile for WC than females, across both centers (p=0.016).

QUALITATIVE METHODS

Each center also provided permission for the research team to recruit parents for focus group discussions. Recruitment criteria for parents required they have children between the ages of 2-5 y, enrolled at one of the centers, whom have no major medical contraindications.

A focus group script was developed based on a review of the literature and the desire to gather data on parent’s perceptions about their children’s nutrition, physical activity, and wellness (Figure 3.1). The script was developed using the topic approach,
which uses a list of topics or issues to frame the discussion.\textsuperscript{34} This focus group strategy allows participants to reflect on their own experiences, verbalize their opinions, and build on those viewpoints while providing the opportunity to hear others tell of their experiences and to compare their personal experiences with those others.\textsuperscript{34} Each focus group explored three key areas, including challenges in supporting health in the home, what works well in individual families to promote health, and parental views on the policies and practices of their CDC.

Focus groups were developed to last 60-90 minutes in duration, and we aimed to recruit a number of participants sufficient to hold an active discussion while still providing the opportunity for each person to be heard.\textsuperscript{34} No center staff was allowed to participate in the focus groups, only members of the research team including a moderator, co-moderator, a note taker, and a Spanish translator. The moderator facilitated the discussion using the script, while the co-moderator assisted with additional questions, and encouraging equal participation among all parents. Focus groups were audiotaped and hand written notes were taken. George Mason University Human Subjects Institutional Review Board approved this study.

\textit{Analysis}

Transcriptions of the audiotape recordings were checked against the handwritten notes to verify their accuracy and to clarify any confusing dialogue.\textsuperscript{70} Three steps were used to analyze the data. First, using the inductive method of grounded theory, the focus groups were open coded.\textsuperscript{71} Then, NVivo quantitative analysis software (QSR International, Victoria, Australia) was used to explore these themes and their sub-themes.
Finally, to address the research questions, recurrent themes were identified and explored further. Based on the analytical strategy, four emergent themes were found. The sub-themes were also elucidated to provide more depth and understanding.

**QUALITATIVE RESULTS**

A total of 15 parents were recruited for focus groups, however only thirteen participated (n=13). Seven parents participated in the CDC 1 session (one drop-out), all were female, and one required a Spanish translator. Six parents participated in the CDC 2 session (one drop-out), five were females and one was male, all spoke English. Six of the parents had previously completed the questionnaires and had their children measured by the research team. Both focus group sessions were held in December of 2014, lasted about 90 minutes, and were held at each respective center at a time when children were still under center care. All names have been changed to protect the privacy of participants.

During the focus groups the parents in this study shared their own personal experiences related to promoting healthy habits to their preschool children, which eventually revealed four key themes. Support from family, school, and peers; time associated with facilitating health in the home; harmony in beliefs and practices; and social judgement related to food were universal themes expressed by the parents from both centers.

*Support Across The System*
According to parents in both groups, consistency was deemed important otherwise promoting health can feel like a burden to parents. Some parents suggested that center practices can support family relations to health; while others notes they can also go create a barrier for parents. Parents can reinforce school lessons at home for more consistency and exposure, and were happier when their center implemented certain practices they supported. These practices included self-service, family style meals, clearing the table, and general table manners and civility. One CDC 1 mother of two, Melissa, shared, “We do family style at home, and with the family style he may not want it but he still wants to serve himself and for the most part they do eat everything. He’s very happy to serve himself and if I do it then he’s like ‘you took my job!’ and that comes from here… they learn it here and then we can reinforce it back at home.”

Child development centers can also relieve parents and families with certain pressures related to the health of their children. Parents from CDC 1 were very pleased with the center’s policies related to birthdays and celebrations. Lindsay, a mother of two boys enrolled in CDC 1 exclaimed: “I think it’s wonderful, it’s alleviating because it keeps everyone on an even playing field.” And Melissa agreed, “They really do a good job here. They have a church group that donates cupcakes so the parents do not need to bring in anything. That helps…”

At CDC 2, parents had mixed feelings about the foods served at the center. Some were relieved that they did not have to worry about packing an appropriate lunch and afternoon snack for the children. Elise, a mother of three, noted: “I must say it is nice to have one less thing to pack in the morning, when I’m packing for the other kids I know I
don’t need to pack that snack.” However, this became a point of contention for a few of the other parents. One mother, Lauren, commented: “I have issues with the whole menu. I know they are working with what they have… but I do think there’s lots of things that can be done more carefully, like the afternoon snack. But then I think well then I should just send her lunch with her if I’m going to have a problem with it, then I don’t and then I feel guilty.”

A center that is inclusive to the culture, values, and needs of the population they serve provides an additional level of support in preserving the harmony of the home-school-nutrition system. CDC 1 prepared all materials in English and Spanish, and had bilingual full time staff members; even the “Back-to-School” night was co-conducted by English and Spanish speakers. Aside from the cultural perspective, both centers offered vegetarian meals and had gluten free and dairy options for the children. According to CDC 1 mom, Melissa, “I bring gluten free crackers for the kids, and the office brings them too it’s a 50/50 split and they are really good about calling and asking if [my son] can have it. And I know [the catering company] has good gluten free options, which is really helpful.”

The teacher-student relationship was frequently commented on in both focus groups. Parents appreciated the influence teachers and center staff had on the children. At CDC 1, it was mentioned repeatedly that teachers encouraged children to try new foods and serve themselves according to their own hunger cues. Amelia, a young CDC 1 mom noted: “I had the opportunity to see the teachers give them lunch… and I saw how my daughter behaves was different with me than her teacher, she will listen to the teacher.
With the parents they are a little more comfortable.” Generally, parents from CDC 2 wanted a higher level of supervision of their children’s meal times, but the majority still respected the staff’s efforts. CDC 2 mom, Lauren, remarked: “I can say to her ‘What would your teacher say, what would [your teacher] say if you started eating like that?’ and she’s like ‘No, I would never do that at school.’”

One CDC 2 parent, Lauren, mentioned wanting to increase the level of support from the school and other parents. “They did have a parental advisory committee for a while and I was going to join it and I didn’t because of my teaching schedule but this year I think it is still not together – it’s something that needs to be reactivated.” All of the other parents nodded in agreement.

Intergenerational Harmony

Whether both parents were on in agreement with regards to parenting styles was an underlying theme throughout both focus group sessions. Many factors influenced this partnership, including their own up-bringing and family history, and their individual food preferences. Many parents reported feeling that food is equated to love and emotion, meaning much more to them than calories and proper portion sizes. If this was not a shared opinion between parents, discord ensued. One mother from CDC 2, Tara, who had a hard time getting her three year old daughter to eat, shared:

“My husband and I are basically on the same page. I think it’s a whole love to see her enjoy something, I’ll give her that piece of chocolate after dinner because I love to see her enjoy it. It’s so engrained, I just really love to see her enjoy it but my husband doesn’t think we should give her a treat each night, and I know why.”
Culture and how parents were raised created many problem situations in the home, and this topic was much more salient for CDC 2 parents. Tara commented:

“When I think of eating and my husband, we were raised very differently. His family is snackers… and I was raised breakfast-lunch-dinner, maybe a snack in between… Phillipino’s eat a lot of food… It goes back to the culture thing, that’s how you show respect and love…”

Elise added: “I came from a family where you finish what’s on your plate… so I used to always, even if I was full I’d finish it… my husband is totally opposite, he’s like ‘if you’re full then stop eating.’”

Multiple families either had in-laws that lived with them or lived close enough to see them on a daily basis. This was often a point of discontent for parents from CDC 2, as they did not agree with the practices of their elder generations. Ryan, a CDC 2 dad remarked: “…my in-laws, as soon as my son says he’s hungry they are handing him food… I mean it’s healthy food, but he’s not hungry for dinner…” However, CDC 1 parents discussed how important support from other family members was in terms of living a healthy lifestyle. Melissa commented:

“In 4th grade my dad was diagnosed with Type 2 Diabetes and the entire family went through the process of changing our diet together because I’m not sure he would have done it on his own. So any changing of the diet that goes on has been all ten of us that live in the immediate area and we typically try to rotate who makes dinner across everyone throughout the week. So at least three nights a
week someone else is making dinner for everyone so that’s been helpful for all of us…”

Other siblings in the home also had a powerful impact on the nutrition of the young children. JoAnna, a CDC 1 mom, was especially frustrated with the influence her oldest daughter had on her younger children:

“I’m a single mom with three kids, my daughter in secondary school has to leave by 6:30… so she doesn’t have much time for breakfast, most of the time she’ll just get a banana and eat that on the way. She doesn’t like to drink milk, and the little kids they follow what she does. So when she’s not there they will eat it… they just follow their big sister.”

*Time in the Context of Health*

All parents reported time a being a major barrier to promoting health in the home, but not just in the sense of not having time to prepare and cook nutritious meals. Each family had a different idea of what ‘family time’ means and how their family spends quality time together.

Having multiple children with different schedules and activities, as well as having children at different periods of development with different food preferences, created obstacles aside from the previously mentioned role modeling. Elise, from CDC 2, remarked:

“I’ve got three kids so with their changing interests and making different meals was a challenge…. Eliciting their feedback in trying to meet them somewhere in the middle helps at least for a couple of weeks… I think it’s always going to be a
challenge, as soon as you have something figured out someone throws a wrench in it and you have to try something else.”

Parents found it tricky to come up with creative ways to get their children to eat nutritious meals on a weekly basis, and some truly disliked cooking in general, turning cooking into a chore. A CDC 2 mother of two, Danielle, commented:

“I agree I have a problem finding time and I also don’t really like cooking so I struggle with wanting to provide something tasty for my kids that’s healthy but still not having to take a lot of time or effort. Being creative, I’m not very good with that either, I also struggle with deciding to make two meals – one for me and my husband and one for my kids, and I even find since I have two kids they have different habits and catering to their habits. I try to give them that chance but that becomes a lot of work making like two or three meals.”

Vanessa, a CDC 1 mother of three, simply said “I only cook three times per week because I work a lot and come home very tired. So what I do is I just buy pizza, and they eat it.”

Judgement

Universally, parents all reported that at one time or another they had felt both internal and external judgements on their parenting practices. Often, this judgment presented itself as internal guilt for feeding their children frozen meals or fast food, and for using TV and iPads to get their children to sit and eat. CDC 1 mom, Lindsay, remarked: “My boys love McDonalds, and I brought two happy meals to a baseball game and I was looking for the eyes. Then one mom who I fully expected to give me a look
was like ‘Do you have the app on your phone? You get free stuff.’ I felt relieved, there’s a lot of expectations.” Additionally, multiple parents stated guilt over their own self-identified ‘poor’ habits and not being able to set a good example for their children. CDC 2 mom, Lauren, expressed: “…of course the emotional component is huge, trying not to transfer any issues I have to my daughter is my mindset when I’m trying to get her to eat and be healthy, so being aware of my habits, not using food as a reward, and not using treats as opposed to what is not a treat to create the idea that candy is good and broccoli is bad.”

Much of parental stress from judgement stems from ambivalence. Parents felt that the socially acceptable set of rules and best practices do not often align with what is realistic for each individual family. Parents from both centers had a lot to say about this:

“I feel like all these rules about ‘this is what you eat and if you don’t eat now you don’t get to eat.’ I just can’t do that…” (CDC 2 mom, Lauren)

“I feel like trying to stay away from processed foods right now is a big thing, there’s a lot of pressure not to just go to chicken nuggets or the easy things…it’s something I try to balance but it’s really hard.” (CDC 1 mother of 2, Allie)

“I talk to my mom a lot… and I feel like there is so much pressure and such judgement that my mom never felt when I was growing up.” (CDC 1 mother of 1, Alexandra)

Each shared experience of guilt and judgement became a source of recommendations and support from parent to parent about how they handle these situations themselves. CDC 1 mom Vanessa, a native Spanish speaker who required a
translator, shared how she manages getting her children to eat more vegetables:

“…sometimes when I blend the spinach I put a piece of pineapple, apple, and add a glass of orange juice and water, two of them love it.” Almost all of the other parents showed agreement with head nods and commenting that smoothies are a tool they use as well. This is a prime example of how these communal issues can surpass the barriers of ethnicity, demographics, and even culture.

DISCUSSION

Quantitative

The newly proposed, science-based, CACFP rules aim to ensure that children have access to health, balanced meals throughout the day. Meals will include a greater variety of fruits and vegetables, more whole grains, and less sugar and fat. Additionally, these proposed changes encourage family-style meals and offer-versus-serve meal service. These practices promote mealtime as a learning experience by allowing children to serve themselves and identify personal hunger cues. CDC 1, a participant of CACFP, already follows many of these practices, which contributed to the higher evaluation score for nutrition, physical activity, and overall. This supports the hypothesis that a center enrolled in CACFP will have a higher baseline EPAO score than a center not enrolled in CACFP.

According to the EPAO standards, CDC 1 scored better regarding the nutrition environment than did CDC 2. CDC 1 follows family style serving for all meals. Staff sat with the children, ate the same foods as them, and encouraged them to try new things at
mealtime. At CDC 2, meals were pre-portioned and served to children. The nutrition environment projected by CDC 1 matches the proposed best practices for the revised CACFP meal patterns. CDC 1 also scored better on the EPAO for the foods served/preparation in terms of menu variety. CDC 2 served 2% milk whereas the recommendation for children over the age of 2 years is for 1% or skim milk. Their menu offered less than four servings of whole grains for the entire week, dark green, red, and yellow vegetables were offered less than four times per week, and there was no source of alternative proteins such as lentils and beans on the weekly menu. These servings all fall below the CACFP recommendations.

Both centers scored poorly (8/20) on the EPAO portion regarding nutrition training and education. This assessed the level of formal nutrition education and the nutrition curriculum for the children as well as if the center provided trainings for staff in education, and if there were nutrition education workshops available for parents to attend. This is actually a limitation of the CACFP, as their requirements do not regulate nutrition education, but simply suggest incorporating nutrition education into daily activities.\textsuperscript{72}

Childcare settings can be improved by increasing hands-on activities and materials for engaging children in nutrition and physical activity education, with more opportunities for providers to change nutrition and physical activity practices that are low cost and low burden, and through more research to identify effective approaches to increase parental engagement in the nutrition and physical activity environments of preschool children.\textsuperscript{2}

In 2009, Neelon et al. conducted a randomized controlled trial in 32 licensed childcare centers in Boston, MA with a population with at least 50% minority children
aimed at improving policies and practices related to nutrition and physical activity within
the center. All centers were assessed using the EPAO at baseline and follow-up (six
months later). The mean baseline score for the intervention group was 134.5 (out of 320
possible points), and was 146.8 for the control group. After the preliminary observation,
the intervention centers worked with trained interventionists to choose target areas to
improve upon. These centers significantly improved their baseline scores, compared to
the control group, by 18.5 points at follow-up. Of the 32 enrolled centers, 81% of the
intervention group were CACFP participants, while only 63% of control centers
participated in CACFP. It was not determined if control centers attempted any
improvement on their own, without the help of the interventionists, nor did this study
look at child-level outcomes. These results of this study show promise for the use of self-
assessment tools as an intervention to improve center environments.

The baseline scores for CDC 1 (223) and CDC 2 (170), while significantly
different, were both higher than the 32 centers observed in the previously mentioned
study. The two childcare centers included in this current study are child development
centers, differing from other childcare facilities, including privately owned childcare and
home-based childcare, which follow a much less vigorous set of rules and regulations
pertaining to practices and policies than do CDCs. Non-CDC childcare facilities, even if
they are participants of CACFP, may have much lower EPAO scores as they can choose
to follow the minimum requirements of the program. CDC 1 is able to provide subsidized
tuition to their families due largely to funding from the federal and state agencies
(CACFP, NAEYC) which require compliance with strict practices. In the case of low-
income families across the nation, subsidized child development centers are few and these children may be resigned to childcare facilities with much less structure.

The EPAO evaluates centers using standards very similar to those of CACFP, which are research based and have been shown to develop healthy habits in children. Any childcare center can use the EPAO tool for self-assessment thus, by making changes to their policies and practices to improve their baseline score; they are inadvertently aligning with many of the CACFP standards without having to be enrolled in the program.

There were some major differences in parent demographics between the two centers. At CDC 1, 50% of families had a mean annual (2013) income less than or equal to $60,000, whereas 82% of CDC 2 families had a mean annual income of greater or equal to $100,000. This was in line with a higher level of education with the majority of CDC 2 parents, 73%, having masters or doctoral degrees. In the U.S., ethnicity and race are observably related to socio-economic status. Non-Hispanic white Americans tend to be more educated and have higher incomes than non-Hispanic blacks and Mexican Americans. The majority of parents at both centers were white; at CDC 1 the only other reported ethnicity was Hispanic; at CDC 2, Asian and Middle Eastern were reported, and there were none that identified as Hispanic.

Current literature associates lower socio-economic status (SES) and education levels of parents with greater rates of overweight and obesity for children. SES has been implicated as a key predictor of childhood obesity, and children with lower SES tend to have significantly higher rates of obesity. Non-Hispanic blacks and Mexican Americans
are more likely to be affected by obesity; 35% and 37% are overweight, 20% and 19% are obese, respectively.\textsuperscript{7}

While not significant, the data mirrored what we expected to see, that children’s BMI z-score was associated to parent’s BMI category, in that parents that were classified as overweight were more likely to have a child fall above the 85\textsuperscript{th} percentile for BMI-for-age compared to parents that had a healthy BMI. Copious data support that parent eating behaviors and weight status do influence children’s eating behaviors.\textsuperscript{36} It is possible that parents foster the development of obesity through child feeding practices, the foods they make available, and also through their role modeling of appropriate behaviors.\textsuperscript{34} Thus, providing further evidence that parents need to be involved as mediators in early childhood obesity prevention.

It is important to note that this was a culturally unique sample in that CDC 1’s minority population only identified as Hispanic Americans. Americans of Latino descent and Hispanic immigrants have a naturally lower expected height than do non-Hispanic white and black Americans.\textsuperscript{73} Therefore, using the standard BMI assessment for this population will result in categorizing many of the parents as overweight or obese. Additionally, the rate of acculturation has an impact on the health status of first and second generation Latino immigrants. Living in the U.S. for $\geq$15 years was associated with a BMI increase of 1.39, a jump from the 0.88 increase in BMI for those living in the U.S. only 10-15 years.\textsuperscript{74} In future research, this paradox must be considered when assessing health status of Hispanic-Americans, or different tools need to be used to measure and categorize their BMI.
One interesting finding was the difference in the number of children in the home. Families from CDC 1 were more likely to have more children than CDC 2 families. 25% of CDC 1 families had three or more children, while no family at CDC 2 had more than 2 children. One limitation with this data is that we do not know if these children were all siblings, as the questions was “how many children are living in the household?” The reported number of children could include other family relations such as cousins. CDC 1 families were 43.8% Hispanic, and 31.3% had a mean annual income equal to or less than $30,000. This supports the current data as nationally, lower income families are more likely to have more children than families with a higher SES, nearly 40% of children in the U.S. live in low-income homes.75 Furthermore, the average household size for Hispanic families is 3.47 persons, compared to the national average of 2.62 persons per family. The Health and Human Services Poverty Guidelines for Virginia for the year 2013 establish a mean household income of $23,550 for a family of four and $27,570.76

We examined the relationship between environmental factors and lifestyle with the children’s anthropometrics. The most salient result found was a correlation between the number of children in the household and a child’s WC. Children across the centers were more likely to fall above the 75th percentile for WC if there was a greater number of other children in the home (p=0.024). There are various reasons that may explain this relationship, having more children may lead to less time to prepare and cook healthful meals, as well as less money to be spent on food, leading to an increase in the consumption of calorie dense, nutrient lacking foods. It is also possible that having multiple children of different ages may make it more difficult for parents to prepare one
meal that everyone will eat, making processed foods and fast food a more favorable option. Older siblings can act positively as role models but also lead to higher food costs and less attention paid to younger siblings. Currently, there is no available literature on the effect of family size on the development of children 2-5 y. The link between family size and risk for obesity should be explored further in future research, specifically in lower-SES, Hispanic populations.

Using BMI-for-age and WC percentiles, we found a trend between health status and child’s sex. Males, across both centers, were more likely to be classified as overweight or obese than females. The proportion of overweight and obese males, according to their BMI-for-age percentile was 45.5%, while only 18.5% of females had a BMI in this category (p=0.097). The same held true for WC percentile, 68.2% of males were overweight or obese, compared to 37% of females (p=0.079). This is consistent with the most recent NHANES data (2011-2012) which showed that 33.4% of males 2-5 y were overweight or obese, compared to only 28.9% of females of the same age.8

Due to the vast evidence on health disparities due to lower socio economic status, it was hypothesized that the children from CDC 1 would be at greater risk for overweight and obesity that the children from CDC 2. With regards to BMI, this was not the case. Across both centers the majority of children were in the healthy BMI-for-age percentile ranges. When we compared the two centers for WC percentiles, there did appear to be more children in CDC 1 in the overweight range than the healthy range compared to CDC 2. Chi-square analysis observed a trend in the data, p=0.091. Waist circumference is not standard in the assessment of children’s health status; however, our results showed
that WC was a more sensitive indicator for overweight and obesity. BMI is a general measure of adiposity whereas WC measures visceral adiposity therefore, WC should be used in tandem with BMI when measuring young children in future research.

Still, there were no significant differences found between the children of the two centers for age, weight, height, HAZ, WAZ, zBMI, WC, or sex. As this is inconsistent with the literature\textsuperscript{7,8}, we suggest this lack of support for our hypothesis is evidence that a childcare facility that follows specific meal and snack requirements can protect its population from environmental health determinants such as parent income, ethnicity, and education.

In our sample, 31% of children were considered to be overweight or obese. The 2011-2012 NHANES data showed that while 31.2% of children 2-5 y are overweight or obese,\textsuperscript{8} there are great ethnic disparities. Non-Hispanic white children are less likely to be overweight or obese than Hispanic children (24.4% compared to 46.5%).\textsuperscript{8} Asian children have the lowest rate of obesity and overweight, 12.4%.\textsuperscript{8} When we look at the centers separately, 42% of CDC 1 children were overweight or obese, a much greater number than the 20% of children at CDC 2. Since CDC 1 families are almost equally split into non-Hispanic white and Hispanic, and CDC 2 families identified as either non-Hispanic white or Asian, these numbers are consistent with the NHANES data, showing that the sample children are a good representation of the general population.

The 17 item NutriSTEP survey is used to assess nutritional risk in preschool age children; the higher the score, the greater the risk.\textsuperscript{66} Both centers scored similarly, with an average of 17, suggesting that the majority of parents perceived their child’s habits as
healthy and at low risk. These results are consistent with our findings as the majority of children fell in the healthy range for BMI-for-age percentiles. While not statistically significant, children from CDC 1 scored higher on all subscores than did CDC 2 children, suggesting an increase in nutritional risk for these children.

A cross-sectional study involving children 3-5 y in Ontario primary care practices assessed the relationship between eating behaviors (assessed by NutriSTEP) and serum levels of cholesterol. The eating behaviors subscore was significantly associated with serum cholesterol; for each unit increase in the subscore suggesting greater nutritional risk, there was an increase of 0.02 mmol/L in serum cholesterol. We used these same subscores to examine differences between the two centers. CDC 2 children’s eating behaviors were better, parents had less concerns about their children’s habits, and these children spent less time watching TV; CDC 1 children took less supplements as replacement for food and had a better overall dietary intake. The only significant difference between the scores was for screen time, CDC 1 children were reported to watch more TV than CDC 2 children. Increased screen time (watching TV, playing video games, using computers, iPads, smart phones) is directly related to decreased physical activity. Also, children who consume meals while watching TV are more likely to overeat as they are less sensitive to hormonal cues of hunger and satiety.

The HAES questionnaire measures habitual activity by asking parents to report percent of time at a specific level of physical intensity. We explored the differences between each center for both weekday and weekend activity by hours spent at each intensity. During the week, CDC 1 children spent less time being inactive or somewhat
inactive but CDC 2 children spent more time being somewhat active or active. On weekends, the same was true for both centers. During the weekday, parents of CDC 2 reported just over 8 hours of moderate to vigorous physical activity (somewhat active and active), while CDC 1 parents reported only 6.5 hours. During the weekend, CDC 1 parents reported almost 7.5 hours of moderate to physical activity and CDC 2 parents again reported a greater amount of time, 9 hours. No significant differences in the HAES results between the two centers were noted. However, this slight disparity in the amount of time spent active and somewhat active may be related to the amount of screen time; CDC 1 children watched more TV and did not spend as much time as CDC 2 children being somewhat active or active on weekdays and weekends.

The National Association for Sport and Physical Education (NASPE) recommends preschool children accumulate at least 60 minutes of structured physical activity, engage in at least 60 minutes of active play, and not be sedentary for longer than 60 minutes at a time.21 Structured physical activity and active play were not assessed in the HAES questionnaire; and many parents did not know what the physical activity schedule of their children consisted of when they are at school. The EPAO does assess structured physical activity, active play, and sedentary time. Therefore, using these two in conjunction will procure more in depth description on children’s daily activity. At both centers, more than 60 minutes of active play was observed; outdoor play was observed at each center, but in both cases was less than 60 minutes; structured physical activity was observed at CDC 1 but not CDC 2; and children were not observed to be sedentary for more than 30 minutes in either center.
Qualitative

Views were directly obtained from parents in the Fairfax, VA area regarding their perception of family nutrition and lifestyles including related factors of childhood obesity in childcare settings. Parents expressed the various challenges faced daily in promoting health in their family, as well as strategies that work well for their individual familial needs. Four salient themes emerged as key to improving the family-school-child ecology; support, time, harmony, and judgement. Each of these determinants had a powerful impact on the system alone, but were even more prevailing when combined (Figure 3.2). Time and judgement were often related to challenges, while support and harmony were seen in a more positive light. It was hypothesized that the themes identified by parents would be different between the two centers. The data lends little support to this theory, in that the themes were collective across both centers. There were some disparities, however, in the specific ways these determinants affected families depending on their center.

Support was essential for the family unit to function in promoting health to children. This included support from immediate and extended family, peer support, and support from the child development center. When parents supported each other and were on the same page, messages to children were clearer and better enforced. Often older siblings and live-in in-laws disrupted this balance by modeling different behaviors and ignoring the parent’s preferences. For CDC 1 parents, siblings were noted as more of a concern, whereas at CDC 2 in-laws and grandparents created more issues for parents. The harmony that came from intra-family support was a major source of relief for parents.
Support from the CDC was translated through the policies and practices that parents could reinforce at home. The ‘Hip Hop to Health Jr. obesity prevention program for preschool children included a weekly newsletter to parents reflecting what the children had learned with an assignment to reinforce these lessons.\textsuperscript{51} Intervention children saw a significant decrease in BMI, in part due to the consistency between school and home.\textsuperscript{51} Additionally, when the CDC was inclusive to the families’ culture and values, they were better able to promote healthy development across the system.

Support and harmony both played a vital role in reducing the negative impact of time and judgement. Many parents felt time was a major constraint, in that it was difficult to consistently prepare and cook creative meals that their children would eat. This became even harder if there were multiple children in the home, or parents had different values or were raised differently. Ubiquitously, parents felt internal guilt with regards to not being able to get their children to eat a variety of foods, specifically vegetables and fruits. For many parents, knowing that the center served a wide variety and staff encouraged children to try new foods relieved guilt. Many parents acknowledged that certain practices they utilized towards child nutrition were not ideal. Using screen time to get children to sit and eat, using certain (‘unhealthy’) foods as a reward, and being picky eaters themselves all made parents feel ashamed. Often, focus groups can act as mini-interventions, as they did in this instance. Since all parents were reporting these same feelings of judgement, pressure, and guilt, there was a realization that they were not alone in this struggle. Parents began discussing different solutions that worked for them in an effort to help each other.
It is important to note that food was very closely associated with emotion by parents. At the end of the day, parents just wanted their children to be happy, even if it meant going against what they knew to be best. No parent identified money or access to healthy food as barriers to promoting health in the home. Considering the link between nutritional status and SES in the current literature,\textsuperscript{78} it is possible that the parents whom participated in the focus groups did not accurately represent their center’s population, but also menus offered by the CDCs may make this less of a stressor for parents. Still, there is shame and discomfort associated with speaking about income, and so we do not wish to dismiss money as an issue for parents. This is a definite limitation of the current study, the development of trust with the parents may have been insufficient. Future research strategies should involve parents from the beginning, and attempt to communicate with them directly, without the childcare facility acting as the intermediary.

\textit{Triangulation}

Our qualitative results add detail and richness to the quantitative data indicating the relationship between home and childcare practices in the prevention of early childhood obesity.

Overall, the CDC 1 parents expressed feeling more connected to their CDC, whereas parents from CDC 2 did not appear to be as knowledgeable about their center’s policies and practices. This is supported by the significant difference in the EPAO scores between the centers. According to CDC 1 parents, their children were more likely to be exposed to a variety of new foods, specifically fruits and vegetables, and would try these new foods both in the center and then at home. Parents from CDC 1 were also more
pleased than CDC 2 parents with the habits their children had learned at the center, specifically table-manners, serving themselves, clearing the table, and sitting down for quiet meal time.

Childcare-focused studies examining the effectiveness of interventions to improve childcare service implementation of healthy eating and physical activity promoting policies and practices have reported non-significant findings or improvements only in a minority of those policies and practices targeted by interventions. A common theme among interventions is that they did not include parents or consider the impact of home life on child development. Improving lines of communication between providers and parents with strategies such as support staff and newsletters could be the key in ensuring the success of these programs.

It is interesting to consider the difference in demographics of the populations served between the two centers. In this sample, the center serving children who were more likely to come from lower SES homes and Hispanic families were happier with their children’s health and development and felt more connected to the center. It is possible that the centers that follow science-based guidelines to govern nutrition and physical activity may counteract the risks that are associated with lower socio-economic status. More research would need to be conducted, but this may support the implementation of certain policies and practices, or self-assessment, at the child care level as a protective element against determinants of health faced in the home setting.

Parents from both centers expressed the difficulties faced having multiple children. Siblings of different ages and at different levels of development had different
tastes and preferences, often requiring parents to make more than one meal. Additionally, children’s activity schedules took away from family time as well as time to cook and eat a meal together. Parents were frustrated with the influence older children would have on their younger siblings in terms of food preference and eating habits. This can be linked to our finding that the number of children in the home may be associated to a higher WC percentile. Further research can be done to explore how sibling relationships have an effect on nutrition health status.

While no parent explicitly said they were out of health or overweight, many of the parents from CDC 2 were concerned with guarding their children from their poor habits and emotional issues related to nutrition. This data does mirror the research, in that parent BMI category might be a possible predictor for child’s BMI-for-age z-score. The children from CDC 2 did have lower proportions of overweight and obesity than CDC 1, so it is possible that parental awareness of their own lifestyle can be helpful in promoting health to their children.

Physical activity was not a prominent topic in the focus groups for either center, however one parent from CDC 2 expressed concern that her child did not get enough physical activity at school. Our results showed that CDC 2 children actually spent more time being both somewhat active and active on weekdays and weekends, compared to CDC 1 children. Similarly, CDC 2 parents expressed guilt over their children’s use of TV, iPads, and overall screen time. Our results showed that CDC 1 children accumulated more screen time during the day, but this was never brought up in the CDC 1 focus group.
All four themes were universal, not dependent on center, SES, or cultural barriers. It is possible then, that center policies and practices should be shaped to address these challenges rather than according to demographics of the families served. A possible way to explore this would be to conduct the same study on two centers that serve similar populations or two centers that have the same policies and practices but serve differing populations. A larger scale study could possibly support achievement of population-level improvements.

Limitations

This was a small sample in a specific area that cannot be generalized for comparison to the national population. Due to the size of the sample, statistically differences were difficult to detect, and the risk of type II errors are more likely. A larger sample size may shed additional light on trends between environmental predictors and health outcomes. We acknowledge that participants whom volunteer their time to participate in focus groups usually do so because they have specific issues they want to discuss, which could have indirectly guided the focus group discussions. The EPAO was only conducted one time at each center, and these observations were influenced by multiple factors including weather and scheduled field trips. All surveys were self-reported, and so the assumption is made that participants responded to the very best of their knowledge.

Although this was a small study, it is the only current research assessing both familial relations and the childcare environment including two CDCs serving populations of differing SES. Future obesity prevention work targeting preschool aged children
should focus on encouraging childcare centers to implement and adhere to those policies and practices in the childcare environment which are dually supported by parents in promoting healthy habits.

**CONCLUSION**

Child obesity has a complex etiology, making it necessary to develop strategies targeting multiple agents of change. Both the childcare setting and the home environment offer opportunities for health promotion and risk reduction activities. Childcare providers and families can support each other in the promotion of health with consistency in practice. Our data suggests that parents already support many of the federal childcare policies and practices identified as important to promoting healthful lifestyles, and childcare providers can improve these policies and practices through the use of self-assessment tools. Parent education, ethnicity, and education may not be as strong of predictors for obesity risk as previously assumed, as no statistically significant difference were found in the children’s anthropometrics when compared by center. Parents need support and consistency to counteract time constraints and societal judgement in order to encourage healthy habits at home. The results of the current study inform and encourage continued efforts to advance the health of preschool children through the collaborations between parents and childcare providers.
<table>
<thead>
<tr>
<th>EPAO Component</th>
<th>CDC 1</th>
<th>CDC 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition subscore</strong></td>
<td></td>
<td></td>
<td>0.273</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td>15</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Whole grains and low fat meats</td>
<td>17</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>High sugar/high fat foods</td>
<td>18</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Beverages</td>
<td>13</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Nutrition environment</td>
<td>13</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Staff behaviors-nutrition</td>
<td>20</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Nutrition training and education</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Nutrition policy</td>
<td>13</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td><strong>Physical activity subscore</strong></td>
<td>116/160 = 72%</td>
<td>77/160 = 48%</td>
<td>0.069</td>
</tr>
<tr>
<td>Active Play</td>
<td>13</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Sedentary behaviors</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Sedentary environment</td>
<td>13</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Portable play environment</td>
<td>14</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Fixed play environment</td>
<td>16</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Staff behaviors-physical activity</td>
<td>17</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physical activity policy</td>
<td>20</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Physical activity training and education</td>
<td>10</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>Overall Score</strong></td>
<td>233/320 = 73%</td>
<td>170/320 = 53%</td>
<td>0.036</td>
</tr>
</tbody>
</table>
Table 3.2  Demographic characteristics of participating families by center (total n=38).\(^1\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>CDC 1 (n=16)</th>
<th>CDC 2 (n=22)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent Parent Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>81.3%</td>
<td>86.4%</td>
<td>0.682</td>
</tr>
<tr>
<td>Male</td>
<td>18.8%</td>
<td>13.6%</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>56.3%</td>
<td>63.6%</td>
<td>0.000</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>43.8%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Asian &amp; Middle Eastern</td>
<td>0.0%</td>
<td>36.3%</td>
<td></td>
</tr>
<tr>
<td>Age (Mean, SD)</td>
<td>36.7 ± 7.2</td>
<td>37.0 ± 4.4</td>
<td>0.897</td>
</tr>
<tr>
<td>Mean Household Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤$30,000</td>
<td>31.3%</td>
<td>0.0%</td>
<td>0.024</td>
</tr>
<tr>
<td>$30,000-60,000</td>
<td>18.8%</td>
<td>9.1%</td>
<td></td>
</tr>
<tr>
<td>$60,000-100,000</td>
<td>6.3%</td>
<td>9.1%</td>
<td></td>
</tr>
<tr>
<td>$100,000+</td>
<td>43.8%</td>
<td>81.8%</td>
<td></td>
</tr>
<tr>
<td>Parent Highest Level of Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>37.6%</td>
<td>0.0%</td>
<td>0.010</td>
</tr>
<tr>
<td>Bachelors/Associates</td>
<td>25.0%</td>
<td>27.3%</td>
<td></td>
</tr>
<tr>
<td>Masters/Doctoral</td>
<td>31.3%</td>
<td>72.7%</td>
<td></td>
</tr>
<tr>
<td>Number of children in the home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>18.8%</td>
<td>31.8%</td>
<td>0.046</td>
</tr>
<tr>
<td>2</td>
<td>56.3%</td>
<td>63.6%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>25.0%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Born in the US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>40.0%</td>
<td>52.4%</td>
<td>0.516</td>
</tr>
<tr>
<td>Father</td>
<td>61.5%</td>
<td>47.6%</td>
<td>0.497</td>
</tr>
<tr>
<td>Weekly hours spent working</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;40</td>
<td>12.5%</td>
<td>18.2%</td>
<td>0.672</td>
</tr>
<tr>
<td>21-40</td>
<td>75%</td>
<td>72.7%</td>
<td></td>
</tr>
<tr>
<td>1-20</td>
<td>6.3%</td>
<td>4.5%</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>4.5%</td>
<td></td>
</tr>
<tr>
<td>Parent BMI, reported, kg/m(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (&lt;18.5)</td>
<td>0.0%</td>
<td>9.1%</td>
<td>0.278</td>
</tr>
<tr>
<td>Healthy (18.5-24.9)</td>
<td>50.0%</td>
<td>50.0%</td>
<td></td>
</tr>
<tr>
<td>Overweight/Obese (≥25)</td>
<td>50.0%</td>
<td>40.9%</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Normally distributed data reported as Mean ± SD, non-normally distributed data reported as Median [IQR]
Table 3.3 Children’s characteristics and anthropometrics, by center\textsuperscript{1,2}

<table>
<thead>
<tr>
<th></th>
<th>CDC 1 n= 24</th>
<th>CDC 2 n= 25</th>
<th>All Children n= 49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>54.0%</td>
<td>36.0%</td>
<td>45.0%</td>
</tr>
<tr>
<td>Female</td>
<td>46.0%</td>
<td>64.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>Age (y)</td>
<td>4.0 ± 0.64</td>
<td>4.2 ± 0.8</td>
<td>4.1 ± 0.72</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>17.6 ± 2.1</td>
<td>17.8 ± 3.2</td>
<td>17.7 ± 2.7</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>103.2 ± 6.5</td>
<td>104.5 ± 7.5</td>
<td>103.9 ± 7.0</td>
</tr>
<tr>
<td>Height-for-age Z-score (HAZ)</td>
<td>0.06 ± 1.1</td>
<td>0.12 ± 0.83</td>
<td>0.09 ± 0.96</td>
</tr>
<tr>
<td>Weight-for-age Z-score (WAZ)</td>
<td>0.84 [1.13]</td>
<td>0.49 [0.88]</td>
<td>0.51 [0.92]</td>
</tr>
<tr>
<td>BMI-for-age Z-score (BMIZ)</td>
<td>1.21 [1.27]</td>
<td>0.35 [0.88]</td>
<td>0.54 [1.17]</td>
</tr>
<tr>
<td>BMI-for-age, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight &lt;5\textsuperscript{th} percentile</td>
<td>0.0%</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Healthy 5\textsuperscript{th} – 85\textsuperscript{th} percentile</td>
<td>58.0%</td>
<td>76.0%</td>
<td>67.0%</td>
</tr>
<tr>
<td>Overweight 85\textsuperscript{th} – 95\textsuperscript{th} percentile</td>
<td>38.0%</td>
<td>16.0%</td>
<td>27.0%</td>
</tr>
<tr>
<td>Obese &gt;95\textsuperscript{th} percentile</td>
<td>4.0%</td>
<td>4.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
<td>54.5 [5.4]</td>
<td>52.8 [4.7]</td>
<td>53.1 [6.1]</td>
</tr>
<tr>
<td>Waist Circumference \textsuperscript{a,b}, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight &lt;10\textsuperscript{th} percentile</td>
<td>0.0%</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Healthy 10\textsuperscript{th} – 75\textsuperscript{th} percentile</td>
<td>42.0%</td>
<td>52.0%</td>
<td>47.0%</td>
</tr>
<tr>
<td>Overweight 75\textsuperscript{th} – 95\textsuperscript{th} percentile</td>
<td>54.0%</td>
<td>32.0%</td>
<td>43.0%</td>
</tr>
<tr>
<td>Obese &gt;95\textsuperscript{th} percentile</td>
<td>4.0%</td>
<td>12.0%</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

\textsuperscript{1}No statistically significant differences between CDC 1 and CDC 2
\textsuperscript{2}Normally distributed data reported as Mean ± SD, non-normally distributed data reported as Median [IQR]
Table 3.4 Children’s nutrition and physical activity habits, by center\(^1\)

<table>
<thead>
<tr>
<th></th>
<th>CDC 1 (n=16)</th>
<th>CDC 2 (n=22)</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td><strong>NutriSTEP Scores</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Overall Score</td>
<td>17.9 ± 4.7</td>
<td>16.5 ± 5.5</td>
<td>0.372</td>
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<tr>
<td>Sub-scores(^2)</td>
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<tr>
<td>Eating Behaviors</td>
<td>4.0 [2.0]</td>
<td>3.0 [2.0]</td>
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<tr>
<td>Dietary Intake</td>
<td>4.5 [2.0]</td>
<td>3.0 [2.0]</td>
<td>0.405</td>
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<tr>
<td>Parental Concern</td>
<td>2.0 [4.0]</td>
<td>0.0 [2.0]</td>
<td>0.112</td>
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<tr>
<td>Screen time</td>
<td>1.0 [2.0]</td>
<td>0.0 [1.0]</td>
<td>0.048†</td>
</tr>
<tr>
<td>Supplements</td>
<td>0.0 [3.0]</td>
<td>2.0 [2.0]</td>
<td>0.609</td>
</tr>
<tr>
<td><strong>Score categories(^3)</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Great, (\leq 20)</td>
<td>68.8%</td>
<td>72.7%</td>
<td>0.995</td>
</tr>
<tr>
<td>Okay, 21-25</td>
<td>25.0%</td>
<td>22.7%</td>
<td></td>
</tr>
<tr>
<td>Needs Improvement (\geq 26)</td>
<td>6.3%</td>
<td>4.5%</td>
<td></td>
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<tr>
<td><strong>Hours of physical activity at level of Intensity (HAES)(^1)</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Weekend</td>
<td></td>
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<tr>
<td>Inactive</td>
<td>0.77 [1.6]</td>
<td>0.6 [0.8]</td>
<td>0.795†</td>
</tr>
<tr>
<td>Somewhat Inactive</td>
<td>2.8 [2.4]</td>
<td>3.4 [3.9]</td>
<td>0.877</td>
</tr>
<tr>
<td>Somewhat Active</td>
<td>5.1 [5.4]</td>
<td>4.3 [4.5]</td>
<td>0.074</td>
</tr>
<tr>
<td>Active</td>
<td>2.9 [4.1]</td>
<td>3.1 [5.3]</td>
<td>0.438†</td>
</tr>
</tbody>
</table>

\(^1\)Normally distributed data reported as Mean ± SD, non-normally distributed data reported as Median [IQR]

\(^2\)NutriSTEP subscores adopted from Persaud et al., 2013\(^67\)

\(^3\)NutriSTEP scoring legend\(^66\)

\(^4\)Parents reported % of time per day at each intensity level: Inactive (lying down, sleeping, resting, napping); Somewhat inactive (sitting, reading, screen time); Somewhat active (walking, light household chores); Active (running, jumping, bicycling, swimming, games that require lots of movement and labored breathing). This was calculated into hours depending on the reported wake up, breakfast, lunch, dinner, and bed times for each individual child.\(^69\)

\(^5\)Non-parametric test
The following script is intended to act as guide to help facilitate an open discussion. Not all questions will be 
addressed; some may surface as important themes that need further exploration. The script will be used for both 
sessions at each center, with the second session picking up where the first left off.

‘Healthy Kids’ Focus Group

I. Purpose of the Meeting

Welcome to our meeting of parents of children enrolled in ______ CDC. As you may know, the ‘Healthy Kids’ Study
is interested in learning more about the nutrition and physical activity environment of your children. The goal of our
research is to inform the development of an obesity prevention intervention program for Northern Virginia CDCs. You
were invited here today to help us figure out what the biggest nutritional and health challenges are for children in your
community, and how you think some of those challenges could be remedied or addressed by university-community
partnerships. We also want to know what you think about young children’s nutrition and physical activity habits and
how you might be able to improve on them.

Before we begin, does anyone have a question about the consent form? This session will be audio-recorded for study
purposes only; no personal information will be used or made public.

There are a few ground rules for a successful focus group that I would like to mention. Since we are using a tape
recorder, we ask that only one person speaks at a time. This is a judgment free zone, there is no right or wrong answer,
we simply want to have a respectful conversation and our job as facilitators will be to encourage everyone to share.

We have three main topics we would like to address today:

1. Home life
2. Outside factors
3. Child Development Center

Our goal is to understand your family’s relationship to food. We want to hear about your priorities, worries, and
challenges when it comes to these three topics.

Introduction of the research team…

II. Opening Discussion

Let’s spend the first few minutes of the meeting introducing ourselves. Tell us a little bit about you and your family
[everyone participates].

Now tell us the first two words that come to mind when you hear ‘Healthy Kids.’ – for instance, “Important and
difficult”… [Just for parents]

That was a great start. I heard a lot of you say “_____” let’s talk about that.

III. Issue 1: Healthful Habits in the Home

What do you feel you do well to support health in your household?

What makes you most proud about the health of your family?

Where do you get your nutrition information?

What influences your food and nutrition choices?

Would you say your child spends more than 2 hours per day watching TV, playing video games, or using the
computer/internet?

About how much time per day does your child spend engaged in moderate to vigorous physical activity (such as
running, jumping, riding a bicycle, heavy chores, etc)?
On average, how often does your family eat food cooked in the home during the week?  
Cooked food from a restaurant or fast-food?

Does your family usually sit at the table and eat together?  
Eat in front of the TV?

Are ‘healthy’ foods available to your child for snacking? (i.e. cut and peeled fruit and vegetables)

Would you say everyone in your home is on the same page about health and food?

Is decision making around food purchases equally shared by the guardians of the home? If not, who holds this power? (Parent, grandparent, etc.)

Do you use food as a reward or punishment for behavior?

Do you let your child decide how much they want to eat?

From your cultural vantage point, what meanings come to mind in relation to food?

How do you think your culture influences your approach to health promotion in your family?

IV. **Issue 2: Outside Factors**  
When grocery shopping, do you read the nutrition labels?

Where do you usually get your food stuff and groceries? (i.e. super-market, corner store, international store, farmer’s market…)

Do you bring your child(ren) with you when you grocery shop? Why or why not?

Would you say ‘healthy’ (fresh fruits and vegetables, lean meats, whole grains) foods are more expensive?

Does media play a role in your decision making?

Does the media (magazine ads, commercials, TV/movies, billboards) make you feel ‘unhealthy’?

Do you have an outdoor space at home or a park/play-ground close to home where your child can safely play? How often do you and your child use this space?

Does your neighborhood have sidewalks?  
Street lights?

Do you feel your neighborhood is a safe place for your child to play?

Do you have a grocery store/market close to your home? How close?

Do you have a recreational center or community center close to your home? How close?

Do other children of the same age live in your neighborhood for your child to play with?

V. **Issue 3: Child Development Center Practices**  
Do you feel that your child’s teachers have a role in promoting healthy nutrition and physical activity?

Does your child get the majority of their meals at the CDC?

Does your child get the majority of their physical activity at the CDC?
Do you feel comfortable speaking with your child’s teachers about health-related issues?

Do you feel that the teachers and staff at your child’s CDC are knowledgeable about nutrition and physical activity?

What, if anything, could teachers and staff at the CDC do to promote more healthful outcomes for children?

VI. Unanswered Questions

Now that we are winding down, I would like to talk about a few things that have not been mentioned…

Let’s talk about what could be done to make your child more ‘healthful’…

What do you believe are the barriers to your children having healthy habits?

What do you think needs to happen generally to support families as they work to meet the needs of their children and promote more healthful outcomes?

VII. Honorarium

Thank everyone for participating.

Any other questions?

Raffle drawing for $100

Figure 3.1 Focus Group Guide. Adapted from Randolph & Koblinsky (1996)
Figure 3.2 Model: Barriers and solutions perceived by parents to promoting healthy habits in preschoolers
CHAPTER 4

Summary

Findings from this study provide rich implications for future obesity intervention programs for preschool aged children. Specific nutrition and physical activity policies and practices at the childcare level were identified that are significant in supporting health promotion and compared these to the policies and practices at two CDCs in Fairfax, VA. Characteristics of children attending the two centers were compared to assess the difference in these practices and their possible effect on risk of obesity. Specifically, the differences in demographics between the families of the children attending the two centers were explored, and the relationship between these predictors and the children’s anthropometric status was assessed. Parent’s perceptions of health promotion both in the home setting and in the childcare environment were examined and contributed a better understanding of the familial relation to health and how childcare can both support and hinder that system.

Self-assessment tools, such as the EPAO, can help all childcare centers align their policies and practices with federally established research based guidelines that support obesity prevention at the childcare level. Most childcare facilities are struggling with limited budgets that would allow them to provide the best and most nutritional options to children. Fortunately, there are many cost-free changes these facilities can make to
promote the development of healthy habits in children.² One of these best practices include changing meal service from serving pre-portioned dishes to a family-style, self-serve method.³⁻⁰ As providers’ feeding practices are highly associated with children’s dietary intake,³⁻⁰ other simple changes include having staff sit with children at meal time and encouraging them to try new foods. These methods allow children to become self-sufficient and capable of identifying their own hunger and satiety body cues.³⁻⁰ Additionally, prompting staff to encourage drinking water throughout the day, and not having children be sedentary for longer than sixty minutes at a time (aside from meal and nap times) can be very effective.²¹⁻²⁷ Private childcare facilities can also consider enrolling in CACFP, as they will then be required to follow these practices and policies but are then federally reimbursed for doing so.²⁵

These results further support the current literature which encourages the involvement of parents in preschool age obesity interventions.⁵⁻⁶,⁵⁵⁻⁶⁶ Without knowing how their centers scored in comparison to each other, parents from the center which had stronger standards expressed feeling more allied to their center and were more confident in that center’s ability to develop healthy habits in their children. Parents from the other center had mixed feelings, and seemed disconnected from their children’s center. Parents take on the task of further solidifying healthy habits when their children return home, and this cannot be possible if there is discord between what the parent is capable of and what the center is implementing.

Future interventions can use similar parent focus groups to help develop specific nutrition and physical activity goals and childcare education, or parents and childcare
providers can work together to attain these goals. Possible methods include creating parent-teacher advisory boards, weekly newsletters from providers to keep parents abreast and involved, and weekend or week night activities for parents to participate in at the childcare facilities. Community Based Participatory Research (CBPR) could be a viable option, working with parents and childcare providers together from the start to build trust early, grow relationships, and better develop the interventions. Parents could have a say in the policies and practices the centers implement, or at least help providers decide which nutrition and physical activity policies and practices are worth changing.

As we know that the socio-economic status of parents is associated with children’s health risk,\textsuperscript{3,7,8} we propose that a more strict set of policies and practices at the childcare level can help protect against these, to a certain degree. In this study sample there were no significant differences between the two centers, even though one served a much more vulnerable population (i.e. lower income, minority, less education). This center scored higher on the environmental assessment, suggesting better alignment to recommended best practices,\textsuperscript{33} compared to the other center. A comparison between centers that have the same standards but serve opposing populations would be necessary to know whether our results are consistent. This could be important evidence to support a national requirement for all childcare centers to comply with specific nutrition and physical activity policy and practice guidelines, or at least support the mandatory use of self-assessment tools for all licensed childcare facilities.

Childhood obesity is a major public health issue, primarily because of its likelihood to continue into adolescence then adulthood.\textsuperscript{1} Furthermore, the prevalence of
this chronic disease is higher in minority groups that are more likely to be at a socio-economic disadvantage. The key to reducing the risk of lifelong obesity is prevention at an early age. Prevention strategies will need to be powerful enough to combat the various environmental and ecological factors that contribute to obesity. Parents and childcare providers have the opportunity to promote health and development in preschool aged children, and will need to work together to do so effectively.

The U.S. does not lend much support to the care and development of children 5 and younger, and many national and state-level policies will need to change to aid parents and childcare providers with the assistance needed to effectively prevent obesity through proper growth. Work-place policies can be more flexible for parents of young children to spend more time nurturing healthful habits; minimum-wage can be increased so parents do not have to work as many hours; SNAP and meal assistance can be greater for families with preschool children to ensure these children are getting proper nutrition. We have to think of obesity as an issue beyond the individual, and understand that micro-level outcomes cannot happen without changes in the macro-systems.
APPENDICES

A.1. Human Research Ethics Approval Letter
A.2. Human Subjects Training (CITI) Completion Report
A.3. General Family Health Questionnaire
A.4. NutriSTEP Questionnaire
A.5. Habitual Activity Estimation Scale
A.1. Human Research Ethics Approval Letter

Office of Research Integrity and Assurance
Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-0445; Fax: 703-993-8590

DATE: October 20, 2014
TO: Sina Galle, PhD, RD
FROM: George Mason University IRB
Project Title: [502554-5] Early life predictors of obesity: Examining the individual, familial and environmental factors in preschoolers
SUBMISSION TYPE: Amendment/Modification
ACTION: APPROVED
APPROVAL DATE: October 20, 2014
EXPIRATION DATE: June 23, 2015
REVIEW TYPE: Expedited Review
REVIEW TYPE: Expedited review categories 4, 7

Thank you for your submission of Amendment/Modification materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and assurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the Office of Research Integrity & Assurance (ORIA). Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the ORIA.

The anniversary date of this study is June 23, 2015. This project requires continuing review by this committee on an annual basis. You may not collect data beyond this date without prior IRB approval. A continuing review form must be completed and submitted to the ORIA at least 30 days prior to the
anniversary date or upon completion of this project. Prior to the anniversary date, the ORIA will send you a reminder regarding continuing review procedures.

Please note that all research records must be retained for a minimum of five years, or as described in your submission, after the completion of the project.

If you have any questions, please contact Bess Dieffenbach at 703-993-4121 or edieffen@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI)
HUMAN RESEARCH CURRICULUM COMPLETION REPORT
Printed on 02/17/2014

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<tr>
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<th>Ashley Shaw (ID: 3971191)</th>
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<tr>
<td>DEPARTMENT</td>
<td>Food &amp; Nutrition Studies</td>
</tr>
<tr>
<td>PHONE</td>
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<tr>
<td>EMAIL</td>
<td><a href="mailto:aslaw12@gmu.edu">aslaw12@gmu.edu</a></td>
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GROUP 1 SOCIAL & BEHAVIORAL RESEARCH: This group is appropriate for Social & Behavioral Research Investigators and Key Personnel.

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<th>REQUIRED MODULES</th>
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<tr>
<td>Introduction</td>
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<tr>
<td>Cultural Competence in Research</td>
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<tr>
<td>History and Ethical Principles - SBE</td>
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<td>Defining Research with Human Subjects - SBE</td>
<td>01/28/14</td>
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<td>The Regulations - SBE</td>
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<td>Assessing Risk - SBE</td>
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</table>

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Failed test information and unauthorized use of the CITI course site is unethical, and may be considered research misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director, Office of Research Education
CITI Course Coordinator
A.3. General Family Health Questionnaire

Participant ID No.

GENERAL FAMILY HEALTH QUESTIONNAIRE

This questionnaire will help us to get to know you a little better. All questions are taken from validated questionnaires and will be used for statistical purposes only. All information is kept confidential, and you will only be identified by your ID number. Please note that in this and other questionnaires “the participant” refers to your child participating in this study.

There are different parts to the questionnaire.
PART 1: Getting to know you ...
PART 2: Energy in ...
PART 3: Energy out ...
PART 4: Neighborhood questions

** Should you not feel comfortable answering a question, you may leave it blank.

PART 1: Getting to know you ... These questions will help us understand who you are as individuals, particularly about education, ethnicity and family income.

Q.001 Specify your relationship to the participant.

Q.002 How many people live in your household? _________ (number of members)

Q.002a How many adults live in your household? _________ (number of members)

Specify the relationship of each to the participant?
1. ________________ 3. ________________ 5. ________________
2. ________________ 4. ________________ 6. ________________

Q.002b How many children live in your household? _________ (number of members)

Specify the relationship of each to the participant?
1. ________________ 3. ________________ 5. ________________
2. ________________ 4. ________________ 6. ________________

Q.003 What was your family’s income (household) last year (2013)?

- Less than 15,000
- 15,000 – 29,000
- 30,000 – 44,999
- 45,000 – 59,999
- 60,000 – 74,999
- 75,000 - 100,000
- 100,000 and over
- Refused to answer
- Does not know

Healthy Kids Study - George Mason University
Participant ID No. __________________________

GENERAL FAMILY HEALTH QUESTIONNAIRE

Q.004 How old are you? ________ (years)
   Refused to answer □

Q.005 What was the highest grade you completed?
   Elementary school □ grade: ______
   High School □ grade: ______
   Vocational school/Apprenticeship □ years: ______
   College □ years: ______
   University □ Degree earned: ______
   Refused to answer □

Q.006a Are you employed for pay?
   Yes □
   No □
   Refused to answer □

Q.006b If yes, about how many hours do you work/week? ______ hours/week worked

Q.007 What would you say is your profession/career? __________________________
   Refused to answer □

For questions Q.008-Q.009, please answer for the biological mother and father.

| Q.008 What is your race? Mark [X] for all that apply (circle the applicable race). |
|---------------------------------|----------------|
| Mother                         | Father         |
| White, Caucasian (French, Scottish, etc.) | [ ]          | [ ]          |
| Black, African (Haitian, Jamaican, Somali, etc.) | [ ]          | [ ]          |
| Hispanic, Latino, Spanish (Puerto Rican, Colombian, etc.) | [ ]          | [ ]          |
| Asian (Chinese, Japanese, Korean) | [ ]          | [ ]          |
| Native Hawaiian or Pacific Islander | [ ]          | [ ]          |
| Arab, Armenian, Egyptian, Iranian, Lebanese, North Africa | [ ]          | [ ]          |
| American Indian | [ ]          | [ ]          |
| Some other race (including multi-racial) | [ ]          | [ ]          |
| Refused to answer | [ ]          | [ ]          |

Q.009 In what country where you born? __________________________

Q.009a If you were not born in the U.S. how long have you lived in the U.S.? _______ (years)

Q.010 Do you speak English?
   Yes □
   If yes, how well? Well □
   Poor □

Healthy Kids Study - George Mason University
<table>
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<tr>
<th>Q.011</th>
<th>Do you generally speak to, read to, or sing to your child in English?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>□</td>
</tr>
<tr>
<td>No</td>
<td>□ If no, what language? ____________________</td>
</tr>
<tr>
<td>Refused to answer</td>
<td>□</td>
</tr>
<tr>
<td>Does not know</td>
<td>□</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q.012</th>
<th>Do you or someone in your household smoke?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>□ If yes, how many? ________ (cigarettes/day)</td>
</tr>
<tr>
<td>No</td>
<td>□</td>
</tr>
<tr>
<td>Refused to answer</td>
<td>□</td>
</tr>
<tr>
<td>Does not know</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Q.011a</th>
<th>Was the participant breastfed from birth?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>□ If yes, for how long? ________ (number of months)</td>
</tr>
<tr>
<td>No</td>
<td>□</td>
</tr>
<tr>
<td>Refused to answer</td>
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<table>
<thead>
<tr>
<th>Q.011b</th>
<th>When did the participant start consuming solid foods? ________ (number of months)</th>
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<tbody>
<tr>
<td>Do not know</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Q.012</th>
<th>What is your current weight? ________ Specify: kg or lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not know</td>
<td>□</td>
</tr>
<tr>
<td>Refused to answer</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Q.013</th>
<th>What is your current height? ________ Specify: cm or inches</th>
</tr>
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<tbody>
<tr>
<td>Do not know</td>
<td>□</td>
</tr>
<tr>
<td>Refused to answer</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Q.014</th>
<th>How do you perceive your weight?</th>
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<tr>
<td>Underweight</td>
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<tr>
<td>Normal weight</td>
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</tr>
<tr>
<td>Overweight</td>
<td>□</td>
</tr>
<tr>
<td>Obese</td>
<td>□</td>
</tr>
<tr>
<td>Do not know</td>
<td>□</td>
</tr>
<tr>
<td>Refused to answer</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Q.015</th>
<th>In general, how would you rate your health?</th>
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<tbody>
<tr>
<td>Poor</td>
<td>□</td>
</tr>
<tr>
<td>Fair</td>
<td>□</td>
</tr>
<tr>
<td>Good</td>
<td>□</td>
</tr>
<tr>
<td>Excellent</td>
<td>□</td>
</tr>
</tbody>
</table>

Healthy Kids Study - George Mason University
Participant ID No.

GENERAL FAMILY HEALTH QUESTIONNAIRE

Do not know □
Refused to answer □

Q.016 In general, who in your home does the grocery shopping, meal preparation, and cooking?
Participant ID No.  

GENERAL FAMILY HEALTH QUESTIONNAIRE

Part 2: Energy in... We are curious to know about your eating practices and beliefs.

Q.017 What type of dairy foods do experts say people should eat? Please check [X] one.
- Full fat milk
- Lower fat milk
- A mixture of both full fat & lower fat milk
- Neither, dairy foods should not be eaten
- I'm not sure

Q.018 Which would be a healthy snack for your child? Please check [X] one.
- Honey on one slice of white toast
- A cereal snack bar
- A plain biscuit
- One banana with plain yogurt
- One glass of orange juice
- I'm not sure

Q.019 How many servings of fruits and vegetables does your child need each day? Please check [X] one.
- 5 servings
- 3 servings
- 1 servings
- I'm not sure

We want to know about YOUR eating habits.

Q.020 How many days each week do you eat breakfast? Please check [X] one.
- None
- 1 - 2 days
- 3 - 5 days
- 6 - 7 days

Q.021 How many dairy products do you consume per day? Please check [X] one.
- Don’t know
- None
- 1 - 2
- 3 +
GENERAL FAMILY HEALTH QUESTIONNAIRE

PART 3: Energy out... We are interested in finding out about the kinds of physical activities that you spent doing in the last 7-days.

VIGOROUS ACTIVITIES take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

Q.022a During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, acrobics, or fast bicycling? ____________ days per week

No vigorous activities □

Q.022b How much time did you usually spend doing vigorous physical activities on one of those days? _______ hours per day ________ minutes per day ________ Don’t know

MODERATE ACTIVITIES refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

Q.023a During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. ____________ days per week

No moderate activities □

Q.023b How much time did you usually spend doing moderate physical activities on one of those days?

_______ hours per day ________ minutes per day ________ Don’t know

Think about the time you spent WALKING in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

Q.024a During the last 7 days, on how many days did you walk for at least 10 minutes at a time? ____________ days per week

No walking activities □

Q.024b On one of those days, how much time did you usually spend walking?

_______ hours per day ________ minutes per day ________ Don’t know

The last question is about the time you spent SITTING on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

Q.025 During the last 7 days, how much time did you spend sitting on a typical week day?

_______ hours per day ________ minutes per day ________ Don’t know
GENERAL FAMILY HEALTH QUESTIONNAIRE

PART 4: Neighborhood  We want to know about your neighborhood and what it has to offer.

<table>
<thead>
<tr>
<th>Neighbourhood Question:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.026: I like my neighbourhood.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q.027: I have access to sport or recreational programs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Q.028:** Please describe the programs that are close to your home.

- **Q.029:** Do you use these programs?  Yes ☐  No ☐

<table>
<thead>
<tr>
<th>Neighbourhood Question:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.030: I have access to stores which sell vegetables and fruits.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Q.031:** Please describe the stores to purchase vegetables and fruits from that are close to your home.

- **Q.032:** How do you get to these stores?  Walk ☐  Drive ☐  Bus ☐  Bike ☐  Other ☐

- **Q.033:** How many blocks away are you from these stores?  _______ blocks

<table>
<thead>
<tr>
<th>Neighbourhood Question:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.034: My neighbourhood is safe to play outside.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q.035: My neighbourhood is unsafe for my child due to traffic.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## GENERAL FAMILY HEALTH QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Neighbourhood Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.036: My neighbourhood is unsafe for my child due to crimes.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Q.037: There are good playgrounds and parks in my neighbourhood.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Q.038:** Please describe the parks or playgrounds that are close to your home.

**Q.039:** How do you get to these parks or playgrounds?
- Walk □
- Drive □
- Bus □
- Bike □
- Other □

**Q.040:** How many blocks away are you from parks or playgrounds? ________ blocks

**Q.041:** How often do you go to these parks or playgrounds?

**Q.042:** Do you live close to community centers? Yes □ No □

<table>
<thead>
<tr>
<th>Neighbourhood Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.043: There are sidewalks on my streets.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Q.044: There is adequate lighting on my streets.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Q.045: My child [participant] lives close to other children his/her age and plays often with them.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

***The End. Thank you for participating***

Healthy Kids Study - George Mason University
A.4. NutriSTEP Questionnaire

Nutrition Screening Tool for Every Preschooler

Instructions

Below are questions about your preschool child’s (2 to 5 year old) eating and other habits.

- Think about your child’s every day habits when answering. Check (✓) only one answer for each question.
- There is a number from 0 to 4 beside each answer. This number is a score for that question. At the bottom of each page is a box for the score for the page. For each page, add up the scores for each question.
- At the end of the questionnaire, you will add the page scores to get the total score.

1. My child usually eats grain products:
   Examples are bread, bagel, bun, cereal, pasta, rice, roti and tortillas.
   - More than 5 times a day
   - 4 to 5 times a day
   - 2 to 3 times a day
   - Less than 2 times a day

2. My child usually has milk products:
   Examples are white or chocolate milk, cheese, yogurt, milk puddings or milk substitutes, such as fortified soy beverages.
   - More than 3 times a day
   - 3 times a day
   - 2 times a day
   - Once a day or less

3. My child usually eats fruit:
   - More than 3 times a day
   - 3 times a day
   - 2 times a day
   - Once a day
   - Not at all

Total Score for Page 1

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4. My child usually eats vegetables:
   □ More than 2 times a day
   □ 2 times a day
   □ Once a day
   □ Not at all

5. My child usually eats meat, fish, poultry or alternatives:
   *Alternatives can be eggs, peanut butter, tofu, nuts, or dried beans, peas and lentils.*
   □ More than 2 times a day
   □ 2 times a day
   □ Once a day
   □ A few times a week
   □ Not at all

6. My child usually eats "fast food":
   □ 4 or more times a week
   □ 2 to 3 times a week
   □ Once a week
   □ A few times a month
   □ Once a month or less

7. I have difficulty buying food to feed my child because food is expensive:
   □ Most of the time
   □ Sometimes
   □ Rarely
   □ Never

8. My child has problems chewing, swallowing, gagging or choking when eating:
   □ Most of the time
   □ Sometimes
   □ Rarely
   □ Never

9. My child is not hungry at mealtimes because he/she drinks all day:
   □ Most of the time
   □ Sometimes
   □ Rarely
   □ Never

☐ Total Score for Page 2
10. My child usually eats:
   - ☐ Less than 2 times a day
   - ☐ 2 times a day
   - ☐ 3 to 4 times a day
   - ☐ 5 times a day
   - ☐ More than 5 times a day

11. I let my child decide how much to eat:
   - ☐ Always
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

12. My child eats meals while watching TV:
   - ☐ Always
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

13. My child usually takes supplements:
    *Examples are multivitamins, iron drops, cod liver oil.*
   - ☐ Always
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

14. My child:
   - ☐ Needs more physical activity
   - ☐ Gets enough physical activity

15. My child usually watches TV, uses the computer, and plays video games:
   - ☐ 5 or more hours a day
   - ☐ 4 hours a day
   - ☐ 3 hours a day
   - ☐ 2 hours a day
   - ☐ 1 hour or less a day

☐ **Total Score for Page 3**
16. I am comfortable with how my child is growing:
   ☐ Yes
   ☐ No

17. My child:
   ☐ Should weigh more
   ☐ Is about the right weight
   ☐ Should weigh less

Total Score for Page 4

To get a total score, add the scores for each page.

_______ Score for Page 1
 + _______ Score for Page 2
 + _______ Score for Page 3
 + _______ Score for Page 4

= _______ Total Score

What does your NutriSTEP® score mean?

If the total score is 20 or less:
Your child’s eating and activity habits are good. There may be things that you want to work on; check out the educational material provided for tips and more information.

If the total score is 21 to 25:
Your child’s eating and activity habits can be improved by making some small changes. Check out the educational material provided or contact your local public health department for tips and more information.

If the total score is 26 and greater:
Your child’s eating and activity habits can be improved by making some changes. For suggestions, talk to a health professional such as a registered dietitian, your family doctor or paediatrician or contact your local public health department for more information.

May 2009.
A.5. Habitual Activity Estimation Scale

Participant ID No.

Habitual Activity Estimation Scale (HAES)

This questionnaire will ask you about your child’s daily activity levels. Please read all the instructions carefully and answer each question as truthfully as you can.

INSTRUCTIONS (Please Read!)

This form will ask you to think about a typical weekday (Tuesday, Wednesday, or Thursday) and one typical Saturday within the past two weeks. For each part of the day please estimate the percentage of time that your child spent in each different activity level. In each part, the total time spent in all activity levels must add up to 100%.

The different activity levels are described below:

<table>
<thead>
<tr>
<th>ACTIVITY LEVEL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>These descriptions give you examples of activities that are</td>
</tr>
<tr>
<td>typical of each activity level. Please refer back to these</td>
</tr>
<tr>
<td>descriptions as often as you need when completing your estimates.</td>
</tr>
<tr>
<td>a) Inactive – lying down, sleeping, resting, napping</td>
</tr>
<tr>
<td>b) Somewhat inactive – sitting, reading, watching television,</td>
</tr>
<tr>
<td>playing video games, time in front of the computer, playing</td>
</tr>
<tr>
<td>games or activities that are mostly done sitting down</td>
</tr>
<tr>
<td>c) Somewhat active – walking, shopping, light household chores</td>
</tr>
<tr>
<td>– washing dishes</td>
</tr>
<tr>
<td>d) Very active – running, jumping, skipping, bicycling,</td>
</tr>
<tr>
<td>skating, swimming, or games that require lots of movement and</td>
</tr>
<tr>
<td>make you breathe hard</td>
</tr>
</tbody>
</table>

Following is a sample of a completed time period with examples of activities:

<table>
<thead>
<tr>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>From when your child finished supper until bed-time, please</td>
</tr>
<tr>
<td>estimate the percentage of time that you spent in each of</td>
</tr>
<tr>
<td>the following activity levels?</td>
</tr>
<tr>
<td>a) Inactive 5% (e.g., having a nap)</td>
</tr>
<tr>
<td>b) Somewhat inactive 60% (e.g., watching TV, talking with</td>
</tr>
<tr>
<td>friends)</td>
</tr>
<tr>
<td>c) Somewhat active 25% (e.g., going for a walk, helping with</td>
</tr>
<tr>
<td>meals)</td>
</tr>
<tr>
<td>d) Very Active 10% (e.g., riding a bike fast, running)</td>
</tr>
<tr>
<td>TOTAL 100%</td>
</tr>
</tbody>
</table>

Healthy Kids Study - George Mason University
Participant ID No. ____________________

Habitual Activity Estimation Scale (HAES)

WEEKDAY ACTIVITY

For a typical weekday in the past 2 weeks (choose from one of Tuesday, Wednesday or Thursday), please answer the following questions as accurately as possible in the spaces provided. If your child missed a meal just put down the time they would normally eat and put in a zero (0) for the time spent eating!

When did your child get out of bed in the morning? __:__ A.M.
When did your child start eating breakfast? __:__ A.M.
How long did your child spend eating breakfast? _____ min.
When did your child start eating lunch? __:__ P.M.
How long did your child spend eating lunch? _____ min.
When did your child start eating supper? __:__ P.M.
How long did your child spend eating supper? _____ min.
At what time did your child go to bed? __:__ P.M.
Habitual Activity Estimation Scale (HAES)

For the typical weekday that you are describing, please estimate the percentage of time your child spent in each activity level.

After getting out of bed until starting breakfast:

a) Inactive ______ %
b) Somewhat inactive ______ %
c) Somewhat active ______ %
d) Very Active ______ %
TOTAL 100 %

After finishing breakfast until lunch:

a) Inactive ______ %
b) Somewhat inactive ______ %
c) Somewhat active ______ %
d) Very Active ______ %
TOTAL 100 %

After finishing lunch until starting supper:

a) Inactive ______ %
b) Somewhat inactive ______ %
c) Somewhat active ______ %
d) Very Active ______ %
TOTAL 100 %

After finishing supper until bedtime:

a) Inactive ______ %
b) Somewhat inactive ______ %
c) Somewhat active ______ %
d) Very Active ______ %
TOTAL 100 %

Healthy Kids Study - George Mason University
Participant ID No.

Habitual Activity Estimation Scale (HAES)

For the typical weekday that this questionnaire has asked you about, please rate your child’s overall level of activity: (circle your choice)

a) Very inactive
b) Inactive
c) Somewhat inactive
d) Somewhat active
e) Active
f) Very active

Please complete the following sentence by circling your choice:

The weekday I described in this form is:

a) Very much like most weekdays in the last six months
b) A little bit like most weekdays in the last six months
c) A little bit different from most weekdays in the last six months
d) Very different from most weekdays in the last six months

In the last six months has your child become:
(please circle your choice)

a) Much less active on weekdays than six months ago
b) Somewhat less active on weekdays than six months ago
c) No real change in activity on weekdays from six months ago
d) Somewhat more active on weekdays than six months ago
e) Much more active on weekdays than six months ago
**Participant ID No.**

**Habitual Activity Estimation Scale (HAES)**

**SATURDAY ACTIVITY**

For *one typical Saturday in the past 2 weeks*, please answer the following questions as accurately as possible in the spaces provided. If your child missed a meal just put down the time they would normally eat and put in a zero (0) for the time spent eating!

When did your child get out of bed in the morning?  ___:___ A.M.

When did your child start eating breakfast?  ___:___ A.M.

How long did your child spend eating breakfast?  ___ min.

When did your child start eating lunch?  ___:___ P.M.

How long did your child spend eating lunch?  ___ min.

When did your child start eating supper?  ___:___ P.M.

How long did your child spend eating supper?  ___ min.

At what time did your child go to bed?  ___:___ P.M.
For the typical Saturday that you are describing, please estimate the percentage of time your child spent in each activity level.

After getting out of bed until starting breakfast:

a) Inactive ________ %
b) Somewhat inactive ________ %
c) Somewhat active ________ %
d) Active ________ 
TOTAL 100 %

After finishing breakfast until starting lunch:

a) Inactive ________ %
b) Somewhat inactive ________ %
c) Somewhat active ________ %
d) Active ________ 
TOTAL 100 %

After finishing lunch until starting supper:

a) Inactive ________ %
b) Somewhat inactive ________ %
c) Somewhat active ________ %
d) Active ________ 
TOTAL 100 %

After finishing supper until bedtime:

a) Inactive ________ %
b) Somewhat inactive ________ %
c) Somewhat active ________ %
d) Active ________ 

Healthy Kids Study - George Mason University
Participant ID No.

Habitual Activity Estimation Scale (HAES)

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>100 %</th>
<th>VERY ACTIVE</th>
</tr>
</thead>
</table>

For the typical Saturday that this questionnaire has asked you about, please rate your child's overall level of activity (circle your choice)

- a) Very inactive
- b) Inactive
- c) Somewhat inactive
- e) Somewhat active
- f) Active
- g) Very active

Please complete the following sentence by circling your choice:

The Saturday I described in this form is:

- a) Very much like most Saturdays in the last six months
- b) A little bit like most Saturdays in the last six months
- c) A little bit different from most Saturdays in the last six months
- d) Very different from most Saturdays in the last six months

In the last six months has your child become:
(please circle your choice)

- a) Much less active on weekends than six months ago
- b) Somewhat less active on weekends than six months ago
- c) No real change in activity on weekends from six months ago
- d) Somewhat more active on weekends than six months ago
- e) Much more active on weekends than six months ago

You are finished now - Thank you for completing this form!
REFERENCES CITED


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BIOGRAPHY

Ashley Shaw is a graduate student at George Mason University, completing this thesis for the Master’s Degree in the Science of Nutrition. She graduated from the Pennsylvania State University in 2011 with dual Bachelor of Science degrees in Nutritional Sciences and Bio-Behavioral Health. She then completed a dietetic internship with CUNY Hunter College and became a Registered Dietitian in July of 2012. Ashley looks forward to continuing her work with early childhood obesity prevention working in community nutrition education and breastfeeding promotion.