DISSERTATION

UNDERSTANDING THE HOME FOOD AND ACTIVITY ENVIRONMENT OF LOW-INCOME, RURAL FAMILIES WITH YOUNG CHILDREN

Submitted by

Alexandra Celeste Burdell

Department of Food Science and Human Nutrition

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Fall 2014

Doctoral Committee:

Advisor: Laura Bellows
Co-Advisor: Susan L. Johnson

Richard Boles
Patricia Davies

ABSTRACT

UNDERSTANDING THE HOME FOOD AND ACTIVITY ENVIRONMENT OF LOW-INCOME, RURAL FAMILIES WITH YOUNG CHILDREN

Background

Child weight status is influenced by diet and activity as well as different environments – the home, school, and community- one approach to understand this relationship is from a social ecological approach. The family home remains one of the principal environments for children where the family's rules and preferences largely determine food availability and opportunities for physical activity. The availability and accessibility of food and activity items in the home is related to child dietary intake and physical activity level. The crucial role the home environment plays in a child‘s life makes it an important target for childhood obesity prevention efforts.

Purpose

The goal of this project was to understand the home food and activity environment for low income, rural families with young children as it relates to child dietary intake and family functioning. The study aims were to: 1) Identify relationships in the home food environment using a comprehensive home food assessment that relates to dietary intake of young children; 2) Refine and modify a home assessment tool to enhance psychometric properties; 3) Explore and identify relationships between family functioning and the home food and activity environment.

Methods

Aim 1 - Preschool aged children and parents enrolled in 6 rural preschool centers participated in the Colorado LEAP Study. Parents completed a self-report inventory of home foods (Home IDEA) and child food consumption (Block Food Frequency Questionnaire). Demographic and anthropometric variables were collected for both children (observed at the school) and parents (self-report). Correlations and linear regression were used to analyze relationships among availability of home food items and child dietary intake, weight status, and demographic variables.

Aim 2 - The psychometric properties of the home assessment were assessed using qualitative home interviews (phase 1, n=11) and quantitative analyses (phase 2, n=28). Home visits were conducted to better understand the home food and activity environment to aid in tool modifications and test modifications to achieve criterion validity. Parent participants were recruited from the same centers as Aim 1 but not enrolled in the LEAP study Participants were mailed an evaluation packet prior to home visits for both phase 1 (Demographic and Home IDEA) and phase 2 (Demographic and Home IDEA-2). Additionally, child and parent height and weight were measured in phase 2. Investigator triangulation analysis was used to identify consistent responses for the interview question set. Responses were used to identify and inform areas for tool modification. Inter-rater reliability testing of the modified Home IDEA (Home IDEA-2) was conducted using kappa statistics. Descriptive statistics were conducted for demographic, weight status, home, and family functioning measures.

Aim 3- In phase 2 (Aim 2), participants were mailed home additional measures for family functioning (Organization, Control, and Chaos). Participants were instructed to complete the questionnaires and have them ready for scheduled home visit in phase 2.

Results/Findings

Aim 1- Participants included preschool-aged children (n=153, 53% female; BMIz= .46± 1.1) and parents (90% mothers, 32% Hispanic, 70% below 185% poverty; BMI 26.7±5.8). Availability of fruit, vegetable, and whole grains predicted child dietary intake of fruit (R^2=0.06, F (1, 150) =10.3, p<0.001); vegetable (R^2=0.11, F (1, 149) =18.8 p<0.001); and whole grains (R^2=0.02, F (1, 151) =3.8, p=0.05, independent of demographic factors. SSB availability significantly predicted kilocalories from SSB, explaining an additional 6.0% of the variance (R^2=0.31, F (6, 122) = 9.0, p=0.002) over and above demographic and weight status variables.

Aim 2- Home interviews revealed parents completed the Home IDEA using their memory rather than conducting an inventory or using the nutrition label. Areas identified for improvement of the Home IDEA include clearer instructions, more detailed description of foods, and reorganization of items. Modifications were made based on home interviews, expert input, and questionnaire design best practices. Inter-rater reliability testing resulted in kappa statistics that were high (0.60-1.00) for 87 items (63 food, 16 PA, 8 sedentary), moderate (0.40-0.55) for 38 items (37 food, 1 PA), and poor for 16 items ($\leq$0.35) (15 food, 1 sedentary). Overall reliability improved from 53.0% of the original food and activity items the Home IDEA to 64.0% of the home food and activity items for the Home IDEA-2.

Aim 3- Family functioning did not relate to home food and activity availability except for Chaos and home meat availability (r_s=0.36, p=0.06). Family functioning was associated with demographic variables and weight status. Control (r_s =0.33; p=0.03) and Chaos (r_s =-0.29; p<0.05) were related to parent BMI. Control was related to parent age (r_s =-0.29; p=0.1) and child Ethnicity (Hispanic; r_s =-0.42; p=0.02).

Conclusions

This study demonstrated that rural families with young children, of mixed ethnicity (1/3rd Hispanic) and low income status, do not meet the dietary recommendations for a majority of key food groups; have a higher availability of less healthful food items; and the level of family functioning does not relate to home food and activity availability. Understanding of the home food environment was expanded beyond fruit and vegetable availability through the inclusion of foods more representative of a young child's diet (whole grain, dairy, legume, meat, fruit, vegetable, and SSB). Findings with respect to fruit and vegetable availability and their association with child diet were consistent with current literature, availability predicted intake. Further, using multiple methods to modify and test a home assessment tool enhanced psychometric properties and provided an evaluation measure for families with young children, which meets an identified need in the literature. Lastly, exploration of the relations between family functioning and the home food and activity environment did not yield significant findings but may have been limited by sample size. Family functioning variables (Control and Chaos) related to parent weight status. Additional explorations into the factors that influence the home environment are needed to further strengthen insight and intervention development for childhood obesity prevention efforts.

ACKNOWLEDGMENTS

I wish to thank various people for their contribution to this project, as this project could not have been completed without their involvement. First, I would like to thank my advisor, Dr. Laura Bellows. Her patient guidance, useful critiques, and constant advice were invaluable to my development as a doctoral student. This project would not have been completed without her persistence and support. I would also like to express my very great appreciation to Drs. Richard Boles, Susan Johnson, Patti Davies, and William Gavin. Each of their contributions, dedication, and time spent towards my growth and this project were instrumental towards its completion. Collectively, Drs. Laura Bellows, Richard Boles, Susan Johnson, Patti Davies, and William Gavin have taught me many valuable lessons, the value of collaboration, and given me a strong foundation to make my next move.

Outside of Colorado State University, I would like to thank the 6 Head Start centers, specifically Joan Marin, Lyndsay Pulsipher, Mary Cross, Susan Bassler, Mary Cannell, and Judy Blake. Their facilitation in my questions, working with the families, and most importantly their passion for the children made this project possible. The time spent with these women enriched this project by providing me additional insight into family homes, struggles in their communities, and their ideas for making healthy environments. I also wish to acknowledge all of the undergraduate and graduate students: Ashely Lopez, Tara Conlon, Anna D'Hoodge, Meri Nimz, Hannah Pensack-Reinheart, and many others, including staff. Not only did they dedicate their time and assistance to this project, they also became my good friends that provided me with constant support and encouragement.

Next, I would like to thank my family, friends, and dogs as they have been my anchor over the last 4 years. I am very grateful for my mother's open ears, my father's words of wisdom, my brother's even temperament, the yin to my yang, and my dogs' (Hooch and Pixy) loyalty. My friends have been understanding, supportive, and given me a balance during the work of this project that has been priceless. Lastly, I would like to thank all of the families that made this project possible. They opened up their homes and lives to me and are my constant inspiration to make the world a better and healthier place.

TABLE OF CONTENTS

Chapter 1: Introduction
- Overview ... 1
- Child Dietary Intake and Home Food Availability ... 1
- Home Environment Evaluation Measures ... 2
- Family Functioning and the Home Environment ... 3
- Study Aims ... 4
- References ... 5

Chapter 2: Literature Review
- Child Weight Status ... 9
- Ecological Model for Childhood Obesity ... 10
- Assessing the Home Food and Activity Environment ... 21
- The Colorado Longitudinal Eating And Physical activity Study (LEAP) ... 30
- Study Aims ... 33
- References ... 35

Chapter 3: The Relationship between the Home Food Availability, Environment and Child Dietary Intake in a Diverse, Rural Sample of Preschool-aged Children
- Summary ... 47
- Introduction ... 48
- Methods ... 50
- Results ... 54
- Discussion ... 57
- Conclusion ... 62
- Tables ... 64
- References ... 69

Chapter 4: A Multiple Methods Approach to the Modification of a Home Food and Activity Assessment Tool for Families with Young Children
- Summary ... 76
- Introduction ... 77
- Methods ... 78
- Results ... 82
- Discussion ... 82
- Conclusion ... 89
- Tables ... 90
- References ... 98

Chapter 5: An Exploratory Study to Examine the Relationship between Family Functioning and the Home Food and Activity Environment
- Summary ... 102
- Introduction ... 103
- Methods ... 104

Results 108
Discussion 110
Conclusion 113
Tables 114
References 120

Chapter 6: Discussion
Overview 124
Dietary Recommendations for Preschool-aged Children 124
Relationship between Home Food Availability and Child Dietary Intake 125
Measurement Limitations of the Home Food Environment and Child Dietary Intake 126
Questionnaire Development Challenges 128
Future Directions and Considerations for Research 130
Future Directions and Considerations for Interventions 134
Conclusion 136
References 138

Appendices 151

LIST OF TABLES

Table 3-1: Participant Characteristics for the Colorado LEAP Study 68

Table 3-2: Parent Reported Home Food Group Availability for Families in the Colorado LEAP Study 69

Table 3-3: Parent Reports of Child Dietary Intake of Preschool Children Enrolled in the Colorado LEAP Study (n=153) 70

Table 3-4: Correlations between Home Food Group Availability and Block Kids Food Screener Food Groups for Child Dietary Intake 71

Table 3-5: Significant Spearman Correlations for Demographic and Weight Status Correlations between Home Food Availability and Child Dietary Intake 72

Table 3-6: Hierarchical Linear Regression Model to Predict Kcals from Sugar Sweetened Beverages (SSB) by Home Food Sugar Sweetened Beverage (SSB) Availability 73

Table 4-1: Study Population Demographics for Phase 1: Qualitative Interviews (n=11) and Phase 2: Psychometric Testing (n=28) 95

Table 4-2: Results from Phase 1: Qualitative Interviews 96

Table 4-3: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Grain and Bean Food Items 97

Table 4-4: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Fruit and Vegetable Food Items 98

Table 4-5: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Protein and Dairy Food Items 99

Table 4-6: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Snacks and Sweet Treats and Beverage Items 100

Table 4-7: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Child Friendly and Other Food Items 101

Table 4-8: Results from Phase 2: Psychometric Testing, Kappa Statistic and Percent Availability for Child's Electronic Bedroom Environment Devices and Physical Activity Items 102

Table 5-1: Demographic Characteristics for Study Parent and Child Participants (n=28) 121

Table 5-2: Home Environment Means, Standard Deviations, Confidence Intervals, and Ranges for Study Parent Participants 122

Table 5-3: Comparison of Means and Standard Deviations among Study Population and Normal and Distressed Adults, and African American and Latino Populations 123

Table 5-4: Correlations among Family Functioning and the Home Food Environment 124

Table 5-5: Correlations among Family Functioning and the Home Activity Environment 125

Table 5-6: Correlations among Family Functioning, Demographic, and Weight Status for Study Participants 126

LIST OF FIGURES

Figure 2-1: Ecological Model of Childhood Obesity (Davison & Birch, 2001) 11

APPENDICES

Institutional Review Board (IRB)
Appendix A: Human Research Committee Letter of Approval 152

Appendix B: Recruitment Packet: Chapter 3 155

Appendix C: Recruitment Packet: Chapter 4 & 5- Interest Flyer and Letter of Consent 165

Evaluation Measures
Appendix D: Demographic Questionnaire: Chapter 3 172

Appendix E: Additional Demographic Questions: Chapter 4 & 5 176

Appendix F: Block Kids Food Screener: Chapter 3 177

Appendix G: The LEAP Home IDEA: Chapter 3 & 4 179

Appendix H: The Home IDEA-2: Chapter 4 & 5 190

Appendix I: Qualitative Interview Question Set: Chapter 4 203

Appendix J: Confusion, Hubbub, and Order Scale (CHAOS): Chapter 5 207

Appendix K: Family Environment Scale (FES) - System Maintenance Dimensions: Chapter 5 209

Supporting Documents
Appendix L: Triangulation Results: Chapter 4 211

Appendix M: Questionnaire Modification Sources: Chapter 4 214

FUNDING PROVIDED BY:

This project is supported by Agriculture and Food Research Initiative Competitive Grant no. 2010-85215-20648 from the USDA National Institute of Food and Agriculture and the Colorado Agricultural Experiment Station grant no. COL00663.

CHAPTER 1

INTRODUCTION

Overview

Childhood obesity continues to be a major public health concern, disproportionally affecting minority groups and those with limited resources (Kumanyika & Grier, 2006; Ogden et al., 2012). With 1 out of every 3 preschool aged children considered overweight or obese (Ogden et al., 2012), the need to address childhood obesity in this audience is warranted. There are several factors that impact child weight status including, dietary intake, physical activity, and sedentary behavior (Davison & Birch, 2001). Further, there are multiple environments, the home, school, and community, which influence children's dietary and physical activity behaviors (Davison & Birch, 2001). The home environment is a primary location for child development and many factors in the home such as food and activity device availability and accessibility, parent behaviors, and family functioning, can influence child diet, activity level, and weight status (Booth, 2001; Bryant & Stevens, 2006; Cullen et al., 2003; Guenther et al., 2006; Halliday et al., 2013; Johnson et al., 2011). Identifying and understanding areas in the home that influence a child's health will further strengthen efforts for the development and implementation of interventions to improve the home food and activity environment, ultimately to positively impact child health and further inform childhood obesity research.

Child Dietary Intake and Home Food Availability

Optimal child growth is achieved through proper nutrition, yet a majority of children do not meet the daily recommendations for key food groups (Guenther et al., 2006; Reicks et al., 2014). This deficit is a product of child preference for energy dense foods, high in sugar and fat, which leads

to the displacement of nutrient dense foods such as, vegetables (Gibson, 2003; Kant, 2003; Kant & Graubard, 2011). In addition to child preference, other factors such as geographical location and income contribute to diet quality, with families from rural communities or lower socioeconomic status having a poorer diet quality (Tai-Seale, 2003; Turrell & Kavanagh, 2006; Wang et al., 2013). The home environment influences child dietary intake through availability and accessibility of foods and is reflective of child diet quality. Research in the home food environment predominately focuses on fruit and vegetable availability as it relates to dietary intake in children and adolescents (Cullen et al., 2003; Ding et al., 2012; Gattshall et al., 2008; Kratt et al., 2000; Nanney et al., 2007; Neumark-Sztainer et al., 2003; Spurrier et al., 2008; Weber Cullen et al., 2000) with limited studies on other food groups such as snacks, fats, sweets, and beverages (Chi-Ming et al., 2007; Spurrier et al., 2008). Further insight in the homes of rural, families with limited resources and young children is necessary to identify and understand the determinants that impact a young child's diet, particularly related to the availability of foods present in the home.

Home Environment Evaluation Measures

There are various methods to assess or measure the home food and activity environment, each containing their own set of strengths and weaknesses (Bryant et al., 2008; Byrd-Bredbenner et al., 2009; Dwyer et al., 2008; French et al., 2009; Gattshall et al., 2008; Hales et al., 2013; Miller & Edwards, 2002; Patterson et al., 1997; Spurrier et al., 2008; Tabak et al., 2012). Evaluating the home environment through the use of nutrient profiling utilizes technology and database systems to capture food items in the home providing ease of data entry but it fails to capture certain foods (Byrd-Bredbenner et al., 2009). Shelf inventories and annotated receipts are both time and labor

intensive for researcher and participant (Coates et al., 1978; French et al., 2008). Check lists and self-report questionnaires are more cost efficient and prove to be less of a burden on the participant but have limitations as seen in self-report bias and memory recall (Cullen et al., 2003; Fulkerson et al., 2008; Miller & Edwards, 2002). While each of these methods aim to capture foods and, in some cases, activity devices in the home, there are still gaps in the research and understanding of the home food and activity environment that need to be addressed. A majority of the current research in the home environment is conducted with older children and adolescents from middle to upper-income, well-educated, white families living in urban and suburban communities (Campbell et al., 2007; Fulkerson et al., 2008; Hanson et al., 2005; Neumark-Sztainer et al., 2003). Furthermore, there is a lack of a comprehensive home assessment tool for homes with young children that has undergone rigorous psychometric testing (Pinard et al., 2012). As such, a valid, reliable, and comprehensive home assessment tool targeting families of young children with limited resources is needed to appropriately intervene and positively impact the home environment.

Family Functioning and the Home Environment

A comprehensive, psychometrically tested home evaluation tool for the availability of food and activity devices could expand our understanding of how availability of foods and activity devices impact child dietary intake and activity behaviors. Despite the importance of home food and activity availability, there are other factors in the home environment, such as family functioning, parent weight status, income, and education which impact child health outcomes, such as weight status and cognitive capabilities (Lohman et al., 2009; Petrill et al., 2004; Zeller et al., 2007). Family functioning as it relates to childhood obesity is not fully understood furthermore, the role

family functioning plays in the home food and activity environment is even more limited (Halliday et al., 2013; Rhee, 2008). Given the important relationship the home food and activity environment has on child behavior and the limited understanding of family functioning in the home, it is necessary to further explore the relationships and improve upon home environment evaluation measures to draw stronger and more complete conclusions. Further, the additional insight into the family environment will better inform intervention development and implementation through a more targeted and tailored intervention to improve child dietary intake and activity.

Study Aims

The overarching aim of this project was to: 1) enhance the psychometric properties of a self-report, home food and activity environment assessment (Home Inventory Describing Eating and Activity (Home IDEA) questionnaire); and 2) identify modifiable areas in the home that could assist rural families with limited resources and young children to create home environments which favor healthful lifestyles. Through a multiple methods approach utilizing both qualitative and quantitative methodologies, psychometric testing of a home food and activity environment assessment was conducted; and relationships between the home food environment, child dietary intake, and family characteristics were explored.

REFERENCES

Booth, S. L., Sallis, J. F., Ritenbaugh, C., Hill, J. O., Birch, L. L., Frank, L. D., Glanz, K., Himmelgreen, D. A., Mudd, M., Popkin, B. M., Richard, K. A., St Jeor, S., & Hays, N. P. (2001). Environmental and Societal Factors that affect Food Choice and Physical Activity: Rationale, Influences and Leverage Points. *Nutrition Revue 2001, 59*(3), S21-S39.

Bryant, M., & Stevens, J. (2006). Measurement of Food Availability in the Home. *Nutrition Reviews, 64*(2), 67-76. doi: 10.1301/nr.2006.feb.67-76.

Bryant, M. J., Ward, D. S., Hales, D., Vaughn, A., Tabak, R. G., & Stevens, J. (2008). Reliability and Validity of the Healthy Home Survey: a tool to measure factors within homes hypothesized to relate to overweight in children. *Int J Behav Nutr Phys Act, 5*, 23. doi: 10.1186/1479-5868-5-23

Byrd-Bredbenner, C., Abbot, J. M., & Cussler, E. (2009). Nutrient Profile of Household Food Supplies of Families with Young Children. *Journal of the American Dietetic Association, 109*(12), 2057-2062. doi: 10.1016/j.jada.2009.09.006.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations Between the Home Food Environment and Obesity-promoting Eating Behaviors in Adolescence. *Obesity, 15*(3), 719-730. doi: 10.1038/oby.2007.553.

Chi-Ming, H., Wei, L., Hsiao-Chi, Y., & Wen-Harn, P. (2007). The relationship between snack intake and its availability of 4th-6th graders in Taiwan. *Asia Pacific Journal of Clinical Nutrition, 16*, 547-552.

Coates, T. J., Jeffrey, R. W., & Wing, R. R. (1978). The Relationship between Persons' Relative Body Weights and the Quality and Quantity of Food Stored in their Homes. *Addict Behav, 3*(3-4), 179-184.

Cullen, K.W., Baranowski T., Owens E., Marsh T., Rittenberry L., de Moor C. (2003). Availability, Accessibility, and Preferences for Fruit, 100% Fruit Jjuice, and Vegetables Influence Children's Dietary Behavior. *Health Education and Behavior, 30*(5), 615-626. doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14582601.

Davison, K. K., & Birch, L. L. (2001). Childhood Overweight: A Contextual Model and Recommendations for Future Research. *Obes Rev, 2*(3), 159-171.

Ding, D., Sallis, J. F., Norman, G. J., Saelens, B. E., Harris, S. K., Kerr, J., Glanz, K. (2012). Community Food Environment, Home Food Environment, and Fruit and Vegetable Intake of Children and Adolescents. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2010.07.003.

Dwyer, G. M., Higgs, J., Hardy, L. L., & Baur, L. A. (2008). What do Parents and Preschool Staff Tell Us about Young Children's Physical Activity: A Qualitative Study. *International Journal of Behavioral Nutrition and Physical Activity, 5*(66).

French, S. A., Shimotsu, S. T., Wall, M., & Gerlach, A. F. (2008). Capturing the Spectrum of Household Food and Beverage Purchasing Behavior: A Review. *Journal of the American Dietetic Association, 108*(12), 2051-2058. doi: http://dx.doi.org/10.1016/j.jada.2008.09.001.

French, S. A., Wall, M., Mitchell, N. R., Shimotsu, S. T., & Welsh, E. (2009). Annotated Receipts Capture Household Food Purchases from a Broad Range of Sources. *Int J Behav Nutr Phys Act, 6*, 37. doi: 10.1186/1479-5868-6-37.

Fulkerson, J. A., Nelson, M. C., Lytle, L., Moe, S., Heitzler, C., & Pasch, K. E. (2008). The Validation of a Home Food Inventory. *Int J Behav Nutr Phys Act, 5*, 55. doi: 10.1186/1479-5868-5-55.

Gattshall, M. L., Shoup, J. A., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of a Survey Instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *Int J Behav Nutr Phys Act, 5*, 3. doi: 10.1186/1479-5868-5-3.

Gibson, E., & Wardle, J. (2003). Energy Density Predicts Preferences for Fruit and Vegtables in 4-year-old Children. *Appetite, 41*(1), 97-98.

Guenther, P. M., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2006). Most Americans Eat Much Less than Recommended Amounts of Fruits and Vegetables. *J Am Diet Assoc, 106*(9), 1371-1379. doi: 10.1016/j.jada.2006.06.002.

Hales, D., Vaughn, A. E., Mazzucca, S., Bryant, M. J., Tabak, R. G., McWilliams, C., Ward, D. S. (2013). Development of HomeSTEAD's Physical Activity and Screentime Physical Environment Inventory. *Int J Behav Nutr Phys Act, 10*, 132. doi: 10.1186/1479-5868-10-132.

Halliday, J. A., Palma, C. L., Mellor, D., Green, J., & Renzaho, A. M. (2013). The Relationship between Family Functioning and Child and Adolescent Overweight and Obesity: A Systematic Review. *Int J Obes (Lond)*. doi: 10.1038/ijo.2013.213.

Hanson, N. I., Neumark-Sztainer, D., Eisenberg, M. E., Story, M., & Wall, M. (2005). Associations between Parental Report of the Home Food Environment and Adolescent Intakes of Fruits, Vegetables and Dairy Foods. *Public Health Nutr, 8*(1), 77-85.

Johnson, L., van Jaarsveld, C. H., & Wardle, J. (2011). Individual and Family Environment Correlates Differ for Consumption of Core and Non-core Foods in Children. *Br J Nutr, 105*(6), 950-959. doi: 10.1017/s0007114510004484.

Kant, A. K. (2003). Reported Consumption of Low-Nutrient-Density Foods by American Children and Adolescents: Nutritional and Health Correlates, NHANES iii, 1988-1994. *Archives of Pediatrics & Adolsecent Medicine, 157*(8), 789-796.

Kant, A. K., & Graubard, B. I. (2011). 20-Year Trends in Dietary and Meal Behaviors were Similar in U.S. Children and Adolescents of Different Race/Ethnicity. *J Nutr, 141*(10), 1880-1888. doi: 10.3945/jn.111.144915.

Kratt, P., Reynolds, K., & Shewchuk, R. (2000). The Role of Availability as a Moderator of Family Fruit and Vegetable Consumption. *Health Education and Behavior*. 27.

Kumanyika, S., & Grier, S. (2006). Targeting Interventions for Ethnic Minority and Low-income Populations. *The Future Of Children / Center For The Future Of Children, The David And Lucile Packard Foundation, 16*(1), 187-207.

Lohman, B. J., Stewart, S., Gundersen, C., Garasky, S., & Eisenmann, J. C. (2009). Adolescent Overweight and Obesity: Links to Food Insecurity and Individual, Maternal, and Family Stressors. *J Adolesc Health, 45*(3), 230-237. doi: 10.1016/j.jadohealth.2009.01.003.

Miller, C., & Edwards, L. (2002). Development and Validation of a Shelf Inventory to Evaluate Household Food Purchases Among Older Adults with Diabetes Mellitus. *Journal of Nutrition Education and Behavior, 34*(5), 261-267. doi: Doi: 10.1016/s1499-4046(06)60104-8.

Nanney, M. S., Johnson, S., Elliott, M., & Haire-Joshu, D. (2007). Frequency of Eating Homegrown Produce is Associated with Higher Intake among Parents and Their Preschool-Aged Children in Rural Missouri. *Journal of the American Dietetic Association, 107*(4), 577-584. doi: 10.1016/j.jada.2007.01.009.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of Fruit and Vegetable Intake among Adolescents: Findings from Project EAT. *Preventive Medicine, 37*(3), 198-208. doi: http://dx.doi.org/10.1016/S0091-7435(03)00114-2.

Ogden, C. L., Carroll, M., Kit, B. K., Flegal, K. M. (2012). Prevalence of Obesity and Trends in Body Mass Iindex among US Children and Adolescents, 1999-2010. *JAMA, 307*(5), 483-490.

Patterson, R. E., Kristal, A. R., Shannon, J., Hunt, J. R., & White, E. (1997). Using a Brief Household Food Inventory as an Environmental Indicator of Individual Dietary Practices. *Am J Public Health, 87*(2), 272-275.

Pelletier, A. L., Chang, W. W., Delzell, J. E., Jr., & McCall, J. W. (2004). Patients' Understanding and Use of Snack Food Package Nutrition Labels. *J Am Board Fam Pract, 17*(5), 319-323.

Pinard, C. A., Yaroch, A. L., Hart, M. H., Serrano, E. L., McFerren, M. M., & Estabrooks, P. A. (2012). Measures of the Home Environment Related to Childhood Obesity: A Systematic Review. *Public Health Nutr, 15*(1), 97-109. doi: 10.1017/s1368980011002059.

Reicks, M., Jonnalagadda, S., Albertson, A. M., & Joshi, N. (2014). Total Dietary Fiber Intakes in the US Population are Related to Whole Grain Consumption: Results from the National Health and Nutrition Examination Survey 2009 to 2010. *Nutrition Research*(0). doi: http://dx.doi.org/10.1016/j.nutres.2014.01.002.

Rhee, K. (2008). Childhood Overweight and the Relationship between Parent Behaviors, Parenting Style, and Family Functioning. *The ANNALS of the American Academy of Political and Social Science, 615*(1), 11-37. doi: 10.1177/0002716207308400.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Tabak, R. G., Tate, D. F., Stevens, J., Siega-Riz, A. M., & Ward, D. S. (2012). Family Ties to Health Program: A Randomized Intervention to Improve Vegetable Intake in Children. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2011.06.009.

Tai-Seale T., C. (2003). Nutrition and Overweight Concerns in Rural Areas: A Literature Review. (Vol. 2). College Station, TX In Rural Healthy People 2010: A Companion Document to Healthy People 2010: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center.

Turrell, G., & Kavanagh, A. M. (2006). Socio-economic Pathways to Diet: Modelling the Association between Socio-economic Position and Food Purchasing Behaviour. *Public Health Nutr, 9*(3), 375-383.

Wang, L., Dalton, W. T., 3rd, Schetzina, K. E., Fulton-Robinson, H., Holt, N., Ho, A. L., Wu, T. (2013). Home Food Environment, Dietary Intake, and Weight among Overweight and Obese Children in Southern Appalachia. *South Med J, 106*(10), 550-557. doi: 10.1097/smj.0000000000000008.

Weber Cullen, K., Baranowski, T., Rittenberry, L., Cosart, C., Owens, E., Hebert, D., & de Moor, C. (2000). Socioenvironmental Influences on Children's Fruit, Juice and Vegetable Consumption as Reported by Parents: Reliability and Validity of Measures. *Public Health Nutr, 3*(3), 345-356.

Zeller, M. H., Reiter-Purtill, J., Modi, A. C., Gutzwiller, J., Vannatta, K., & Davies, W. H. (2007). Controlled Study of Critical Parent and Family Factors in the Obesigenic Environment. *Obesity (Silver Spring), 15*(1), 126-136. doi: 10.1038/oby.2007.51

CHAPTER 2

LITERATURE REVIEW

Child Weight Status

The prevalence of obesity in children has doubled over the last 30 years while with an even higher increase is found in adolescents (Ogden et al., 2014). Between 2011-2012, 32% of children and adolescents (2-19 years) were overweight or obese (BMI for age $\geq 85^{th}$ percentile) and 16.9% of children and adolescents were obese (BMI for age $\geq 95^{th}$ percentile) (Ogden et al., 2014). This increase is particularly affecting children in their preschool years, with 22.8% of children 2-5 years considered overweight or obese (BMI for age $\geq 85^{th}$ percentile) and 8.4% considered obese (BMI for age $\geq 95^{th}$ percentile; Ogden et al., 2014). It is estimated that 1 out of every 3 preschool-aged children are considered to be either overweight or obese (Ogden et al, 2010). Overweight and obesity continues to rise with the age of the child, 34.2% of children 6-11 and 34.5% of adolescents 12-19 are considered overweight or obese (BMI for age $\geq 85^{th}$ percentile). Further, 17.7% of children 6-11 and 20.5% of adolescents 12-19 are considered obese (BMI for age $\geq 95^{th}$ percentile) (Ogden et al., 2014).

Despite the increased rate of obesity among all races/ethnicities and age groups, disparities in the prevalence of obesity exist and disproportionately affect minority groups and those with limited resources (Kumanyika & Grier, 2006; Strauss & Knight, 1999). Minority children, specifically Hispanic and Black, have higher rates of obesity than other ethnic groups (Ogden et al., 2014). Approximately 16.7 % of Hispanic children aged 2-5 years are considered obese while 29.8% are considered overweight or obese (Ogden et al., 2014), whereas, 20.9% of non-Hispanic white children 2-5 years are considered overweight or obese and 3.5% are considered obese (Ogden et

al., 2014). Trends for childhood obesity (2-19 years) have remained relatively stable from 2003-2012 but for children 2-5 years, obesity has slightly decreased from 13.9% in 2003-2004 to 8.4% in 2011-2012. In spite of this small decrease in obesity among this age group, trends for childhood obesity are still high and disproportionately affect minority groups (Ogden et al., 2010) and therefore should be addressed.

Obesity carries with it short and long term health effects, such as chronic disease, social and emotional difficulties, and increased lifetime obesity. Obese children are at increased risk for adult obesity (Freedman et al., 2005) and are more likely than non-obese children to experience significant short-term health problems such as hyperlipidemia, hypertension, insulin resistance and sleep apnea (Kang et al., 2012; Lee et al., 2012; Nevin, 2013; Williams et al., 2004. Obese children are more likely to have depression, anxiety, stress, a lower self-image, and behavioral disorders (Lampard et al., 2014; Lohman et al., 2009; Sweeting et al., 2005).

Social Ecological Approach

Child weight status is complex and impacted through many different channels, such as, the school, home, and built food environment. These environments and their determinants can be understood through an ecological approach, with child characteristics and weight status at the core of the model. Bronfenbrenner describes the premise of the ecological perspective as the role of the changing environments and how each environment affects the individual (Bronfenbrenner, 1979). To fully understand child weight status, there is a need for exploration into the relationships between the multiple levels of influence. Davison and Birch's Ecological Model of Childhood Obesity (Davison & Birch, 2001) depicts the multiple environments of influence on

the weight status of the child. This model highlights the need for multilevel efforts within the community (through resources and the school), policy (through access and regulations), as well as the home (through healthful environments) to optimize childhood growth **(Figure 2-1).**

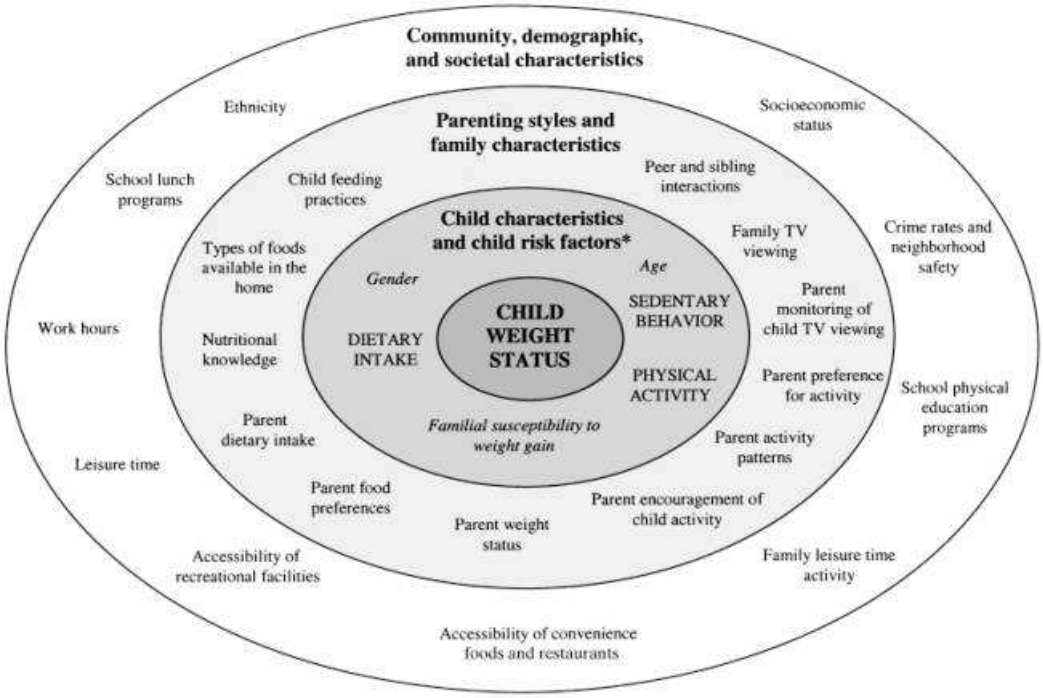


Figure 2-1: Ecological Model of Childhood Obesity (Davison & Birch, 2001)

Child Characteristics and Child Risk Factors

The first sphere in the ecological model for child weight is child characteristics and risk factors, depicting the biologic characteristics (gender and age) and child behaviors that directly impact weight status. Identifying factors associated with the child's behaviors -dietary intake, physical activity, and sedentary behavior- allows for a greater understanding of the issues associated with the child's weight status as well as setting a foundation to better understand other environmental influences.

Child dietary intake. Dietary intake in children is associated with weight status as obese children consume more daily calories than their healthy weight peers (Skinner et al., 2012; Van Duyn & Pivonka, 2000). Fruit and vegetable consumption are important variables to consider when health status of a child is involved due to the positive relationship they share with health (Lee, 2007; Van Duyn & Pivonka, 2000) such as a decreased likelihood of becoming obese. Another important component in diet quality, and one that is under consumed, is whole grains. Whole grain intake is associated with a decreased risk for type 2 diabetes, cancer, and heart disease (Chatenoud et al., 1998; Jacobs et al., 1998; Montonen et al., 2003). Further, children prefer sweet and high-fat foods over vegetables and foods of lower energy density (Gibson, 2003). Energy dense foods are lower in nutrients and displace more healthful alternatives such as fresh fruits and vegetables, which may reduce children's diet quality and intake of essential nutrients (Kant, 2003; Templeton, 2005). The dietary recommendations for a child 4 years of age include: 5 ounces of grains (at least 2.5 ounces should be whole grain), 1.5 cups of vegetables, 1.5 cups of fruit, 2.5cups of milk, 4 ounces of protein foods, and 4 tsp. of oil. Nationally, 15.1% of 4-8 year olds consume the recommended daily servings of fruits and vegetables (Guenther et al., 2006) and the average daily intake for whole grains is 0.57 ounces, about 2 ounces less than current dietary recommendations (Reicks et al., 2014). The importance of healthful diet pattern during childhood is crucial because food preferences are predictive of nutrient intakes and early food choices are predictive of adult food preferences (Pliner, 1993; Rozin & Vollmecke, 1986).

Child physical activity. The lack of physical activity is a known determinant of childhood obesity and is influenced by many different factors, such as preference for activity (Kantomaa et al., 2011) and parent activity level (Finn et al., 2002). The level of activity decreases as the child

ages and children who are obese are less active than non-obese children (Amisola & Jacobson, 2003; Basterfield et al., 2011; Belcher et al., 2010; Bukara-Radujkovic & Zdravkovic, 2009). Research shows that lower levels of physical activity and habitual exercise among children are associated with higher BMI, greater skinfold thickness, greater fat mass, obese status, and adulthood depression (Jacka et al., 2011; Jimenez-Pavon et al., 2010).

The National Association for Sport and Physical Education (NASPE) standard guidelines for physical activity in preschool children state that children aged 2-5 should receive 60 minutes of structured physical activity and at least 60 minutes of unstructured physical activity each day. In addition, children should engage in fundamental motor skills that will provide the foundation for future motor skillfulness and physical activity (NASPE, 2009). Studies have shown that preschool activity levels vary between school day and weekend day (Reilly et al., 2006; Vale, 2010), with activity being higher during the weekday. The lack of activity at home provides an area that could be targeted to help children meet daily physical activity guidelines. Further, physical activity in children is associated with health benefits (Janssen & Leblanc, 2010) and is essential to help maintain energy regulation and decrease risk for adulthood obesity (Freedman et al., 2005).

Child sedentary behavior. Sedentary behaviors can be identified based on their low intensity levels (Ainsworth, 2000) and include watching television, movies, playing video games, reading, listening to music, relaxing, and resting. There are many physical, social, and environmental factors that contribute to sedentary behaviors with TV viewing being the largest contributor to sedentary behavior (Dennison et al., 2002).

The current recommendation from the American Academy of Pediatrics (AAP) for screentime activity for children ages 2-18 is no more than two hours a day (AAP, 2013) and NASPE recommends that no more than 60 minutes at a time should be spent in sedentary behavior, except for sleeping (NASPE, 2009). Despite this recommendation, many young children exceed this amount. Nelson and colleagues have reported that on average, children spend more than twice as much time watching television and using computers as they do engaging in physical activity (Nelson, 2006). The decrease in physical inactivity, coupled with increased screentime puts children at an increased risk of body fat accumulation over time (Proctor, 2003).

Parenting Styles and Family Characteristics

The second sphere within the ecological model for child weight is parenting styles and family characteristics. This sphere depicts physical and social attributes of parents and families and their impact on child risk factors. Parent characteristics and behaviors such as weight status, activity level, dietary intake and food available at home all can impact their child's activity level and dietary intake, and thus weight status (Booth, 2001). Given the direct relationship the parent has with the child and the home environment, it is imperative to understand modifiable factors within the home that will positively impact child growth.

The home environment. Significant changes have occurred in the built environment which have resulted in increased availability of energy dense foods and reduced opportunities for physical activity (Jeffery, 2003). These changes in environmental factors have heavily impacted the health of children, as the environmental factors continue to favor obesogenic lifestyles. With the unfavorable environments for children, a crucial target to promote a healthful lifestyle is the

home given the important relationship the family and the home food and activity environment play on child dietary intake, physical activity, and weight status (Cullen et al., 2003; Halliday et al., 2013; Kitzman et al., 2008; Spurrier et al., 2008) . The home remains one of the principal environments for children and the family‘s rules and preferences largely determine food availability and opportunities for physical activity (Booth, 2001; Gatshall et al., 2008; Cullen et al., 2003; Spurrier et al., 2008). The home environment provides the child with a healthy or unhealthy place to grow and learn. The large role the home environment plays in the development of child behaviors makes it an important target for childhood obesity prevention. Identifying the factors, both physical and social, within the home environment is a fundamental aspect when addressing childhood obesity through a social ecological perspective.

The home food environment. The home food environment plays an important role in food selection and is a key influencer of food intake (Bryant & Stevens, 2006). Home food availability is the most important determinant for food intake, as approximately two-thirds of what a child consumes relates to what is available in the home (Rosenkranz & Dzewaltowski, 2008). Several studies have identified a strong relationship between fruit and vegetable availability and child dietary intake (Cullen et al., 2003; Ding et al., 2012; Gattshall et al., 2008; Kratt et al., 2000; Nanney et al., 2007; Neumark-Sztainer et al., 2003; Spurrier et al., 2008; Weber Cullen et al., 2000). Neumark-Sztainer et al (2003) found that home fruit and vegetable availability and taste intake preference for fruits and vegetables were related to dietary intake, with home fruit and vegetable availability being more important than taste preference. Additionally, amount and variety of fruit and vegetable availability has been shown to have a positive impact on intake for both (Resnicow et al., 1997; Spurrier et al., 2008).

Families that lack availability of healthful foods and frequently consume fast food meals have diets that result in higher intakes of fat and soda (Downs et al., 2009). Johnson et al (2011) found that children's consumption of processed, high fat and sugar foods was associated with higher availability of those items. Further, other studies have identified similar relationships between fats, sweets, snacks, and sugar sweetened beverages and the consumption of those items (Chi-Ming et al., 2007; Ding et al., 2012; Gattshall et al., 2008; Hebden et al., 2013; Spurrier et al., 2008; Wang et al., 2013).

In addition to home food availability, other factors in the home that influence the home food environment include: accessibility, exposure, and parental behaviors. Parents are the gatekeepers to the availability and accessibility of foods that are in the home and their behaviors - role modeling, parenting practices, and food opportunities - directly impact child dietary intake (Gattshall et al., 2008; Johnson et al., 2011; Reinaerts et al., 2007; Spurrier et al., 2008; Wyse et al., 2011). The accessibility of unhealthful snacks is associated with the consumption of unhealthful snacks (Chi-Ming et al., 2007; Gattshall et al., 2008) and children who like fruits and vegetables only need them to be available where as children who dislike fruits and vegetables need them to be accessible (foods that are available in a form and at a location and time that facilitate their consumption) in order to eat them (Cullen et al., 2003). Parent role modeling of healthful eating behavior and healthful food policies at home can positively impact child dietary intake (Gattshall et al., 2008; Pearson et al., 2009; Spurrier et al., 2008; Wyse et al., 2011). Moreover, unhealthful food parenting behaviors, such as use of food as rewards (Campbell et al., 2007; Spurrier et al., 2008), parent intake of unhealthy foods (Johnson et al., 2011), and meals

eaten in front of the TV (Pearson et al., 2009; Spurrier et al., 2008) can negatively impact child dietary intake.

The home physical activity environment. Children's physical activity level is influenced by many different environmental factors including those at school and at home (Dwyer, 2008; Ferreira et al., 2007; Spurrier et al., 2008). Similar to the food environment, physical activity-related parent behaviors, as well as, availability and accessibility of physical activity devices, are associated with child physical activity behaviors and weight status (Finn et al., 2002; Hales et al., 2013; Maddison et al., 2009; Maitland et al., 2013; Spurrier et al., 2008). Spurrier et al (2008) found that higher outdoor play time, which is associated with increased physical activity levels (Ferreira et al., 2007), was associated with greater backyard size and more items of outdoor play equipment in the backyard. Similarly, other studies have identified that the presence and density of physical activity devices in the home are associated with more physical activity in adolescents and children (Maddison et al., 2009; Sirard et al., 2010). Hales et al. (2013) found that a child's weight status is influenced by fixed and portable play equipment and the presence of adult exercise equipment, with an inverse association between physical activity device availability and child weight status.

Further, Gatshall et al (2008) found that availability of physical activity devices is associated with accessibility of physical activity devices, parent role modeling, and home policies physical activity. Several studies have reported that parent role modeling of physical activity is directly related to the child's physical activity level (Ferreira et al., 2007; Finn et al., 2002; Gattshall et al., 2008; Spurrier et al., 2008). Additionally, parent policies for physical activity, such as time

spent outdoors, are associated with child physical activity levels (Ferreira et al., 2007; Gattshall et al., 2008). The more healthful activity policies set at home (e.g. limit screentime) is related to a decrease in sedentary behavior. Finally, parent knowledge of physical activity levels can influence child activity. Dwyer et al (2008) found that both parents and teachers understand the value of physical activity but are unaware of the guidelines and do not understand the intensity component.

The home sedentary activity environment. Sedentary behaviors influence child physical activity, dietary intake, and weight status (Campbell et al., 2007; Hales et al., 2013; Rosenberg et al., 2010; Spurrier et al., 2008). Several studies have shown that the physical presence and amount of electronic items in the home are positively associated with sedentary behavior in children (Hales et al., 2013; Mathias et al., 2013; Rosenberg et al., 2010). A review of the literature for sedentary behaviors in children revealed that TV viewing is the largest contributor to sedentary behavior and obesity in young children (Rey-López et al., 2008). This risk factor is further exacerbated when the presence of the TV is in the child's bedroom (Dennison et al., 2002; Hales et al., 2013; Rosenberg et al., 2010). Further, Hales et al (2013) found that amount and condition of portable play equipment was positively associated with TV viewing time. Additionally, children's intake of non-nutritive foods is associated with greater amount of time spent watching TV (Johnson et al., 2011). Media and advertisements influence child's food preferences by linking certain foods with toys and gimmicks, which draw the child into desiring a food product (Campbell et al., 2007). Finally, parental rules for screentime activity significantly impact child's sedentary activity: the more rules that are set for limiting screentime, the lower the child's sedentary activity level (Spurrier et al., 2008).

Family functioning. When examining the home environment, it is important to consider family functioning due to the integral role the home and family play in the development of young children (Booth, 2001). The family unit is a complex and interconnected system with various units and subsystems that influence the family dynamics (White, 2008). Childhood overweight and obesity has been linked to family conflict, disruptive homes, family cohesion and stress (Gundersen et al., 2011; Kitzmann et al., 2008; Rhee, 2008). Additionally, the level of chaos, parenting stress, and organization within the home have a direct impact on other domains of child development including cognitive ability, verbal development, school performance and behavioral outcomes (Baker et al., 2003; Hanscombe et al, 2011; Pelletier et al., 2004). A review of the psychosocial stressors and childhood obesity identified that health outcomes, including obesity, are influenced by psychosocial stressors present in the family environment (Kitzmann et al., 2008). The impact of family functioning and its potential influence on the home food and activity environment have yet to be explored. A need exists to better understand family functioning and to tailor interventions for obesity prevention and treatment on the basis of family functioning (Kitzmann et al., 2008; Skelton et al., 2012).

Community, Demographic, and Societal Characteristics

The outer sphere in the ecological model for childhood obesity depicts characteristics of the community through school programs, socioeconomic status, accessibility of community food and physical activity programs and outlets, as well as, ethnicity (Davison & Birch, 2001). While these factors are less modifiable, they are important to note and understand when addressing childhood obesity.

Socioeconomic status. Factors such as income, education, and culture all influence dietary quality and the home food and activity environment (Tai-Seale, 2003; Walker et al., 2010; Xie et al., 2003). Low income families are less likely to purchase foods that are high in fiber and low in fat, salt, and sugar (Turrell & Kavanagh, 2006) and consume greater amounts of SSB (Pinard et al., 2012; Wang et al., 2008). Additionally, families with low education are less likely to meet the dietary recommendations for dairy, fruits, and vegetables (Giang et al., 2008; Xie et al., 2003). Low income residents have limited access to supermarkets and are less likely to have healthier food options, increasing their risk factors for adverse diet related health outcomes (Giang et al., 2008; Glanz et al., 2007). Barriers to healthful home food availability identified by low income mothers included the cost of healthy foods, convenience of eating out, and social influences from spouse and children (Hampson., 2009). Additionally, low income families have less access to child play equipment and more access to electronic items in the child's bedroom (Tandon et al., 2012). Parents from low income homes have more restrictive rules about physical activity levels, have less choices and opportunities, and are more likely to engage in screentime activities with their children than physical activity (Dwyer, 2008; Ferreira et al., 2007; Hampson, 2009; Tandon et al., 2012).

Geographical location. Differences in diet and physical activity are seen based on geographical location with rural populations having less environmental facilitators to healthy eating and physical activity (Tai-Seale, 2003). People living in rural communities across the United States have a higher rate of obesity and less education when compared to their urban counterparts (Davis et al., 2011; Lutfiyya et al., 2007; Tai-Seale, 2003). Further, rural populations are more likely to consume diets that are higher in calories and fat and low in fruits and vegetables

(Crooks, 2000; Tai-Seale, 2003). Rural residents also drive further distances to do their shopping, making fresh produce more difficult to have available in the home (Hartley, 2011). Lastly, rural families are less likely to engage in physical activity and spend more time TV viewing (Crooks, 2000; Tai-Seale, 2003).

Assessing the Home Food and Activity Environment and Child Dietary Intake

Home Environment Evaluation Measures

Accurately assessing the home environment is critical to understanding elements of the home environment that are related to other dietary and activity behaviors. Unfortunately, many developed tools to measure various aspects of the home food, physical activity, and sedentary behavior environment have weak validity, reliability, and generalizability (Pinard et al., 2012). Methods to assess the home environment range from nutrient profiling through the use of electronic scanning to capture food items, shelf inventories, annotated receipts, checklists, and self-report questionnaires (Bryant et al., 2008; Byrd-Bredbenner & Abbot, 2009; Dwyer, 2008; French et al., 2008; French et al., 2009; Gattshall et al., 2008; Hales et al., 2013; Miller & Edwards, 2002; Patterson et al., 1997; Spurrier et al., 2008; Tabak et al., 2012). Each method carries with it strengths and limitations and should be carefully considered based on research objectives and population.

Open inventories/shelf inventories. Open inventories are conducted by trained researchers who inventory all food items in a participant's home. This was the first method utilized to capture the home food environment in the United Kingdom between 1940 and 1951 (MOF, 1955). Food waste, in addition to food items, is recorded and both measures are used to calculate food

consumption. Few studies have adhered to this method for home food environment measures due to the labor intensive requirements for research personnel. Those that have used it have included additional variables, such as, food location and storage; number of days since last shopping trip; number of people in the home (Coates et al, 1978); and food receipts (Sanjur, 1979). Open inventories provide a very accurate account of what is present in the home and were a necessary step to understand the home food environment. In addition, using a researcher to inventory the home reduces social desirability among research participants. This method is cost, labor, and time intensive for the research personnel and can be for the participant. It is not feasible to conduct with a large sample size; and data analysis is difficult and often uses approximations about food present in the home.

Annotated receipts. The purpose of annotated receipts is to capture food purchasing behavior and includes all foods and beverages that are purchased from grocery stores, restaurants, convenience stores, and any other establishment in which a consumer purchases food (French et al., 2008). The methods for annotated receipts require the participant to collect and record all receipts from food sources and question other household members about their food purchasing behaviors (French et al., 2009). Receipts are then coded, entered, and categorized by research personnel. The strength in this method is the ability to identify foods available to the individual and to provide a link to the home environment and the diet quality. It also provides a robust assessment of food source, type, and cost (French et al., 2009). However, this method is labor intensive for the participant, who has to keep track of all food purchasing receipts, record all receipts, and track other household member's food purchasing activities. The burden also lies on

the research personnel, in the coding and processing of receipts and annotations from participants.

Predefined check lists. Predefined checklists are composed of a set of food items that were previously established by the researcher. These checklists require the researcher or participant to identify the presence or absence of food items within the home. The most common administration of this type of inventory is over the phone or a mailed questionnaire (Crockett et al., 1992; Gattshall et al., 2008; Hearn, 1998; Neumark-Sztainer et al., 2003; Spurrier et al., 2008). The Home Fruit and Vegetable Availability Checklist was developed by Hearn and used in Georgia on the 5-A-Day project. This original checklist only included 11 fruits and 11 vegetables and was developed to assess availability over time by asking the parents if these items were present over the last week. Criterion validity of this tool was not established on initial use for the project but subsequent researchers using the tool have conducted sensitivity and specificity analyses (Cullen et al., 2001; Cullen et al., 2003; Cullen et al., 2004; Reynolds et al., 1999). Despite the modifications of this tool, the primary foods of concern in the studies that followed are fruits and vegetables, making it limited in scope for only fruits and vegetables. The Crockett Inventory of Foods Reflecting Guidelines to Reduce Cancer was developed by Crockett et al (1992) to measure the availability of foods associated with having cancer reducing properties. This checklist includes 80 items and was validated with participant self-reported inventories using an interviewer-completed, same-day inventory as the gold standard. Sensitivity, and specificity were considered to be high. Similar inventory checklists have been developed for specific disease states such as diabetes (Miller & Edwards, 2002) as well as nutrient focused instruments such as those that capture dietary fat (Cullen et al., 2004; Patterson

et al., 1997; Raynor et al., 2004). These measures were developed and tested for a specific outcome and do not provide a comprehensive representation of the home food environment. A more inclusive assessment of the home food and activity environment is the Home Health Environment (HHE) assessment. This assessment is a self-report instrument that was developed to identify differences in the home food and activity environment, according to weight status, of families with normal weight, overweight and obese preschool children. It includes 4 major assessment areas, healthy and unhealthy foods and drinks; fresh fruits and vegetables; electronic media devices; devices or areas in or around the home that promote physical activity. Further, the HHE underwent psychometric testing with adequate reliability yet there were areas that proved problematic, particularly with food items (kappa >0.60; Boles et al., 2013). In addition to the previously discussed checklists, many more have been developed or modified that fail to conduct the appropriate psychometric testing and are only inclusive of a few select foods within the home (Gattshall et al.,2008; Kratt et al., 2000; Patterson et al., 1997; Spurrier et al., 2008).

Self-report questionnaires. Self-report questionnaires are similar to checklists and often times contain an element where participants are required to assess the availability of items but self-report questionnaires contain additional questions related to participant behavior. This assessment method allows the participant to subjectively assess elements of their physical home environment as well as behavioral questions about the social home environment. The Home Environment Survey (HES) was developed to measure the physical and social home food and activity environment (Gattshall et al., 2008). The HES incorporated measures from other validated tools that were then modified and newly developed items which were included for specific study-related outcomes for children aged 8-12 years. The HES included accessibility and

availability of fruits (n=13), vegetables (n=10), and fats/sweet snacks (n=8) as well as measures for parental eating and policies (Gattshall et al., 2008). The physical activity environment was assessed through 22 physical activity items, accessibility and parent role modeling and policies. Psychometric testing was conducted for the HES through validation from a Food Frequency Questionnaire for fruits, vegetables, and sugar sweetened drinks and snacks. Additionally, test/retest for reliability was utilized with parents for the HES with a one to two week gap between administrations. Finally, inter-rater reliability was conducted by having both parents, of the two parent participating families, concurrently complete the HES. While appropriate psychometrics were achieved for the HES, it fails to provide a representative assessment of the home food environment, as it only concentrates on fruits, vegetables, and fats/sweet snacks.

Similarly, The Physical and Nutritional Home Environment Inventory was developed based on prior formative work through direct observation with preschool aged children in Australia (Spurrier et al., 2008). This inventory includes 74 items, 33 items for activity and 41 food items (fruit, vegetable, fruit juice, dairy, savory snacks, candy, breakfast bars, cakes, and carbonated beverages). Items for the food environment were based on 4 predetermined messages: fruits and vegetables, low fat dairy, non-core food snacks, and drinking water. Food items were recorded by 5 trained researchers while parents reported food related behaviors (e.g. number of snacks per day). Similarly, items for physical activity were assessed by trained researchers (e.g. size of backyard and number of televisions in home) and parent reported activity related behavior (e.g. extra-curricular activities; Spurrier et al., 2008). The Physical and Nutritional Home Environment Inventory requires the use of trained research personnel to assess home food and activity environment, supplemented by parent report of food and activity related behavior. This

method requires the use of research personnel which is expensive and time consuming for future research studies. It also does not provide a comprehensive representation of the home food environment but does capture food and activity behavior around eating and activity in the home with preschool aged children.

Self-report questionnaires allow for an understanding between behaviors and the physical presence of food and activity items within the home. However, current assessments are limited by incomplete food lists that fail to represent a complete diet. Also, most are developed for specific study related outcomes, as opposed to a comprehensive assessment of the home food and activity environment.

Nutrient profiling. Nutrient profiling is a method to assess the home food environment through the use of handheld barcode scanners which read the Universal Product Codes (UPCs). The UPCs are used to collect the food data which is then linked to databases that contain nutrient contents for food items (Byrd-Bredbenner, 2007). This method fails to capture foods without UPCs or mixed foods such as leftovers and analysis is limited by foods present in the current database. Byrd-Bredbenner (2007) aimed to improve upon the current databases for handheld barcode scanners by merging USDA Standard Reference data with UPC databases. Using the handheld scanners requires the research personnel to enter the home of the participant and scan all food items except alcoholic beverages, commercially prepared baby food, infant formula, pet foods, refrigerated leftovers, foods of minimal nutrient content (vinegar, baking powder, salt, herbs, spices, cooking spray, non-caloric sweeteners, gum, coffee and tea-except packaged beverages containing caloric sweeteners), condiments typically used in small quantities (ketchup,

mustard, mayonnaise, hot sauce), and bulk supplies of sugar, flour, and fats (oils, shortening, and butter) (Byrd-Bredbenner et al., 2009; Stevens et al., 2011). For items without a barcode, databases can be searched and the food can be entered (Byrd- Bredbenner et al., 2009; Stevens et al., 2011). This method captures the foods available within the home and allows for a nutrient analysis of those foods. However, this method is labor intensive for participants due to the nature of scanning and recording foods available in the home and could fail to capture foods that were not entered by participant (e.g. ones that require manual entry).

Child Dietary Intake Measures

Diet intake of young children is an important element to understand given the importance of nutrients needed for healthy growth and development. Current measures to assess dietary intake in children under the age of 5 include 24 hour recall, food records/diaries, and weighed food records (Magarey, 2001; Smithers, 2011). These methods are cost and time intensive for both parent participant as well as research staff (Magarey, 2011). Short tools for evaluation such as food frequency questionnaires/screeners require less participant burden, are low cost, and easy for data handling. They provide a summation of a child's diet, and are most often used to assess dietary intake of young children (Bell, 2013).

Food frequency questionnaire (FFQ). A FFQ is a dietary collection method in which a participant is presented with a predetermined list of foods. Generally, the participant is asked to respond to how often each food is eaten (e.g. "x" times per day/week/month). The foods on a FFQ are usually chosen for study specific purposes with a majority designed to assess nutrient intake not necessarily total diet (Cade et al., 2002). Food frequency questionnaires the most often

used assessment of diet in research studies given their benefits which include less participant burden, low cost, and easy data handling, and provide a summation of a diet (Bell, 2013). Despite the many advantages of using a FFQ, there are also disadvantages, particularly with the preschool age group. Child report for this age group is not reliable; therefore parental report of child dietary intake is required. Another limitation of parent report of child dietary intake is recall bias and the large amount of time children spend away from parent monitored food intake. These limitations are also found with other dietary assessments for child intake, however, the FFQ limits parents to a set of predetermined foods that may not be representative of a child's usual dietary intake. Despite these disadvantages, the use of a FFQ in a research study provides a measure of child dietary intake that has the ability to monitor trends with low participant burden (Magarey, 2011).

Other child dietary assessment measures. In addition to FFQs, there are several objective and subjective methods to collect dietary intake. Objective dietary assessments include research observation through the duplicate diet method (collection of duplicate dietary intake) or food consumption record (observation recorded by trained researcher) (Shim et al., 2014). These methods require collection of dietary intake by a trained researcher which make them labor intensive and not ideal for large scale research studies. Other more common methods of dietary assessments include 24 hour recall and dietary records (Bell et al., 2013; Magarey et al., 2011; Shim et al., 2014). Dietary record and 24 hour dietary recall both require in depth interviews through open-ended surveys about a variety of food consumed over time (Shim et al., 2014). These methods capture a vast amount of information about dietary intake and can be applied to a

diverse groups. However, they are subject to recall bias, over/under reporting, and only capture food patterns over a short amount of time (Shim et al., 2014).

Questionnaire Development

The current methods to assess the home environment aim to measure foods and, in some cases activity devices, yet there are still apparent gaps in understanding the home environment and a need for a valid and reliable comprehensive home assessment. The most important step to accurately assess the home environment is through the use of a valid and reliable measure. Design, development, and target audience considerations are important elements to address to ensure that a questionnaire resonates with the target audience, which will improve psychometric properties, including validity and reliability. Development and design considerations through formative work with the target audience are underrepresented in the literature for home environment assessments (Pinard et al., 2012). The development of a valid and reliable home assessment that captures a comprehensive representation of a home food and activity environment will help guide future researchers to identify modifiable factors in the home to improve child health. Questionnaire design and best practices are crucial components to understand in utilize during questionnaire development.

Development. The use of questionnaires and measurement tools to capture determinants of childhood obesity is extensive. The development of a questionnaire requires time and resources and should consider many elements including: ordering of questions, visual appeal, comprehension and acceptability, and how to motivate the respondent to complete the questionnaire (CDC, 2009; Dillman, 2006; Townsend et al., 2008). Emphasis on design should

account for measurement problems such as unintended order and nonresponse (e.g. missing data) (Dillman, 2006). Dillman stresses the importance of beginning with relevant questions and implementing appropriate ordering of questions by grouping related questions that cover similar topics together (Dillman, 2006). The grouping of similar questions can be enhanced by visually grouping the related information in regions through the use of contrast or through enclosed sections. This facilitates in the ease of completion by enabling the respondents to easily chunk together information (Dillman, 2006).

Another important element in questionnaire development is visual processing and design. The three stages of visual processing include basic page layout, information organization, and task completion (Dillman, 2006). The basic page layout is the respondent's first exposure to the questionnaire and it is at this point that they take in the layout of the page and process the basic visual properties. During the second stage, the participant begins to organize the information by segmenting the page into various regions. The final step involves the respondent completing the questionnaire from a top down approach (Dillman, 2006). Visual elements of the questionnaire should enhance all three elements of the respondent's visual processing. Addressing these elements in the design of questionnaire development and modification will enhance the overall comprehension and acceptability of the questionnaire (Dillman, 2006; Townsend et al., 2008). Additionally, consistency should be established in the visual presentation of the questions along with the layout of the entire page. To help respondents organize information, consistency should be upheld throughout the entire questionnaire, making the start/end of a new section easy to determine for the respondent (Dillman, 2006). Finally, color, contrast, and avoiding visual clutter

will also help respondents recognize different elements of the questionnaire, aid in navigating, and make the task of answering questions easier (Dillman, 2006).

Low literacy and health literacy considerations. Additional considerations for questionnaire development and design include literacy and health literacy levels of the target audience. Populations with low health literacy have difficulty translating and understanding technical or scientific information (Rudd, 2007) and are at an increased risk for poorer health outcomes (Dewalt et al., 2004). For populations with low literacy levels, certain elements of design should be addressed. The first step in translating information is to ensure that the information is clear. To achieve clarity, the most important information should go first, instructions should be concise and direct, the audience should be told what they will gain from the information, scientific jargon should be limited and sentences should be short (CDC, 2009; Dillman, 2006). Further, materials and text should be formatted for ease of participant completion. The font should be in serif between 12-14 points with headings at least 2 points larger than the main text. In addition, using all capital letters should be avoided (CDC, 2009). To emphasize words or phrases, bold type and the use of underling and italics should be limited. Also, using terms and words that your audience is comfortable with enhance acceptability and comprehension. Finally, readability of your material should be assessed to ensure that the reading level is appropriate for your audience (CDC, 2009; Townsend et al., 2008).

Visuals should be used to enhance communication and comprehension. The use of “real life” pictures which contain one message per visual and have a caption help emphasize and explain the text and enhance comprehension (CDC, 2009; Townsend et al, 2008). Townsend et al (2008)

found that text alone is difficult to understand and realistic or representative photographs are optimal for audiences with low income and literacy levels. Additionally, visuals or pictures should be placed next to the text to which they refer, along with explanatory captions and photographs should be culturally relevant and sensitive to the target audience (CDC, 2009). Finally, leaving white space in the questionnaire helps avoid overwhelming the respondents with unnecessary information (CDC, 2009). The use of appropriate visual cues to facilitate understanding will make the information and collection easy and enjoyable for participant completion.

Food related considerations. For nutrition related measures, there are additional factors that are important to take into account. The use of Food frequency questionnaires (FFQ) is a common method in nutrition research to evaluate food intake (Burrows et al., 2010). Food Frequency Questionnaires can be defined as a questionnaire in which the respondent is presented with a list of foods and is required to say how often each is eaten in broad terms, such as "x" times per day, per week, or per month, etc. They were originally developed to study relationships between diet and chronic disease, primarily for epidemiological studies to show associations between diet and disease (Boyd, 1993; Liu et al., 1978; Prentice, 1996). Foods listed are usually chosen for the specific purposes of a study and may not assess total dietary intake (Cade et al., 2002). The basic principles for the development of a FFQ should include full variability of the population's diet and a food list that is appropriate for the study population. The principles for FFQ food inclusions also translate to the home food environment. The foods that are used on an assessment for a home food inventory should be inclusive and representative of the target audiences, diet and home food availability.

The Longitudinal Eating And Physical activity Study (LEAP)

The Colorado Longitudinal Eating And Physical activity (LEAP) Study is a longitudinal, cohort study that uses a social ecological approach to explore and understand the social and environmental influences of nutrition and physical activity on healthy child growth (Bellows et al., 2013). The primary research questions relate to longitudinal impacts of the intervention on child food preference, gross motor performance, and weight status after participation in a preschool food and nutrition intervention, *The Food Friends*®. In addition to the primary research questions, the LEAP study explores behavioral and environmental factors in the home. The home environment is assessed through parent feeding and activity practices and behaviors, as well as, through the availability and accessibility of food and activity devices (Bellows et al., 2013).

The Home Inventory Describing Eating and Activity (Home IDEA). The Home IDEA is a self-report questionnaire for the availability and accessibility of food and activity items in the home. The Home IDEA was developed based on the Home Health Environment (HHE) assessment, a previously validated home assessment (Boles et al., 2013; Boles, et al., 2010; Stark et al., 2010) and modified to expand items to fully capture the home environment of low income families. Items that were included came from the Allowable Foods List from The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC program), the Block FFQ, and a modified Harvard FFQ (Boles et al., 2014). In addition, target audience and expert input were included to expand the food and activity items. The Home IDEA includes: 131 food and drink items, 16 physical activity devices, and 12 sedentary devices.

Psychometric testing of the Home IDEA was conducted to achieve validity (face, content, and criterion) and reliability (inter-rater reliability; Boles et al., 2014). To establish a gold standard, independent raters were trained to complete the Home IDEA. Researchers, trained to reliability, completed home assessments and were compared to the referent coder on all categories (food/beverages, electronics, and physical activity items) using agreement statistics (kappa scores at or above 0.60; (Landis & Koch, 1977). Following reliability testing between researchers, the independent raters and a subsample of randomly selected LEAP study parent participants concurrently completed the Home IDEA. The data was tested for inter-rater reliability, again using the kappa statistic for agreement. All inter-rater reliability testing was conducted between availability and accessibility of food and activity categories on the item level with scores of 0.60 or greater considered reliable. In addition, frequency distributions, on the item level of reliable food and activity items, were calculated (Boles et al., 2014).

Independent raters, when compared to the referent coder, achieved substantial to outstanding agreement (0.67-1.00) for all 3 categories on the Home IDEA (Food/Beverage, electronic items, and physical activity items). These results established the gold standard criterion and demonstrated that the assessment could reliably be administered in the home environment by research personnel. The results for the subsample of LEAP study participants and researcher raters revealed a wide range of variability within the kappa statistic among all 3 categories for availability on the Home IDEA, but the most variability was seen in the food category. There were 62/131 items deemed unreliable within the food category, 3/12 in the electronic devices, and 3/16 in the physical activity items (kappa statistic of < 0.60; Landis & Koch, 1977). In total, there were 85 items, from all 3 categories, that met the reliability criteria (Boles et al., 2014).

Areas of concern were identified through reliability testing (poor preforming items and categories), as well as, during home visits (researcher observation). The most problematic section was seen with the food items, due to the variability in the range of the kappa statistic. There was a large amount of missing data from the parent participants; it was clear that they skipped over items that they did not have or did not wish to answer. For example, in the milk section, all milk types were listed- whole, 2%, 1%, skim, goat milk, butter milk, and milk alternatives. If the parent only had 2% milk, they checked 2% as "yes" (it was available) but did not check "no" for all the other milk options. In contrast, the researcher completed each section with either a "yes" or "no" response. Another potential influence on reliability was thought to be in the parent participant not physically getting up to check for items. The independent raters physically identified every item on the Home IDEA and therefore when parents relied on their memory, conflicting results emerged.

Additionally, a majority of the reliable food items were low frequency items within the home, meaning they were not present in the home at the time of assessment or they were items not representative of the sample. This is problematic as it is desired to capture food and activity devices that are representative of the target audience to draw appropriate conclusions about the home food and activity environment. Finally, there seemed to be food classification confusion among the parent participants. This was seen in mixed foods and food states. For example, a bag of frozen vegetables could consist of broccoli, carrot, and cauliflower, but the parent participant did not check "yes" for all 3 vegetable items. For food states, parents did not seem to understand that if it was fresh, frozen, or canned, it would still count. Despite the overall adequate reliability

achieved on the Home IDEA, there were still areas of concern, such as in questionnaire design, which could enhance the psychometric properties.

Study Aims

Enhancing our understanding of determinants in the home food, activity, and family environment has the potential to strengthen interventions aimed at improving child dietary intake and physical activity. Currently, there is a lack of comprehensive and psychometrically tested assessment examining the home food and activity environment, particularly for rural families with limited resources and young children. Thus, additional research was warranted. A valid and reliable assessment tool will allow for expanded understanding of homes where the knowledge of food and activity environment is limited. Therefore, to expand on current research, this project aimed to:

1. Identify food items in the home environment that relate to child dietary intake.
2. Modify and test a home food and activity assessment for families with young children to improve psychometric properties.
3. Explore family functioning (Chaos, Organization, and Control) and its relationship to the home food and activity environment.

To achieve these study aims, a multi method approach, utilizing both quantitative and qualitative methodologies, was employed with the goal of enhancing questionnaire psychometrics and exploring, and identifying factors that influence the home food and activity environment, and child dietary intake.

REFERENCES

Ainsworth, B. E. (2000). Compendium of Physical aActivities: An Update of Activity Codes and MET intensities. *Medicine and Science in Sports and Exercise, 32*(9; SUPP/1), S498.

American Academy of Pediatrics. (2013). Children, Adolescents, and the Media. *Pediatrics, 132*(5), 958-961. doi: 10.1542.

Amisola, R. V., & Jacobson, M. S. (2003). Physical Activity, Exercise, and Sedentary Activity: Relationship to the Causes and Treatment of Obesity. *Adolesc Med, 14*(1), 23-35.

Baker, B. L., McIntyre, L. L., Blacher, J., Crnic, K., Edelbrock, C., & Low, C. (2003). Pre-school Children with and without Developmental Delay: Behaviour Problems and Parenting Stress over time. *Journal of Intellectual Disability Research, 47*(4-5), 217-230. doi: 10.1046/j.1365-2788.2003.00484.x.

Basterfield, L., Adamson, A. J., Frary, J. K., Parkinson, K. N., Pearce, M. S., & Reilly, J. J. (2011). Longitudinal Study of Physical Activity and Sedentary Behavior in Children. *Pediatrics, 127*(1), e24-30. doi: 10.1542/peds.2010-1935.

Belcher, B. R., Berrigan, D., Dodd, K. W., Emken, B. A., Chou, C. P., & Spruijt-Metz, D. (2010). Physical Activity in US Youth: Effect of Race/Ethnicity, Age, Gender, and Weight Status. *Medicine and Science in Sports and Exercise, 42*(12), 2211-2221.

Bell, L. K., Golley, R. K., & Magarey, A. M. (2013). Short Tools to Assess Young Children's Dietary Intake: A Systematic Review Focusing on Application to Dietary Index Research. *J Obes, 2013*, 709626. doi: 10.1155/2013/709626.

Bellows, L. L., Johnson, S. L., Davies, P. L., Anderson, J., Gavin, W. J., & Boles, R. E. (2013). The Colorado LEAP Study: Rationale and Design of a Study to Assess the Short Term Longitudinal Effectiveness of a Preschool Nutrition and Physical Activity Program. *BMC Public Health, 13*, 1146. doi: 10.1186/1471-2458-13-1146.

Boles, R. E., Burdell, A. C., Johnson, S. L., Gavin, W. J., Davies, P. L., & Bellows, L. L. (2014). Home Food and Activity Assessment: Development and Validation of an Instrument for Diverse Families of Young Children. *Appetite*(0). doi: http://dx.doi.org/10.1016/j.appet.2014.04.026.

Boles, R. E., Scharf, C., Filigno, S. S., Saelens, B. E., & Stark, L. J. (2013). Differences in Home Food and Activity Environments between Obese and Healthy Weight Families of Preschool Children. *Journal of Nutrition Education and Behavior, 45*(3), 222-231. doi: http://dx.doi.org/10.1016/j.jneb.2012.09.012.

Boles, R. E., Scharf, C., & Stark, L. J. (2010). Developing a Treatment Program for Obesity in Preschool-Age Children: Preliminary Data. *Children's Health Care, 39*(1), 34-58. doi: 10.1080/02739610903455137.

Booth, S. L., Sallis, J. F., Ritenbaugh, C., Hill, J. O., Birch, L. L., Frank, L. D., Glanz, K., Himmelgreen, D. A., Mudd, M., Popkin, B. M., Richard, K. A., St Jeor, S., & Hays, N. P. (2001). Environmental and Societal Factors that Affect Food Choice and Physical Activity: Rationale, Influences and Leverage Points. *Nutrition Revue 2001, 59*(3), S21-S39.

Boyd, N. F. (1993). A Meta-Analysis of Studies of Dietary Fat and Breast Cancer Risk. *British Journal of Cancer, 68*(3), 627.

Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, Massachusetts, and London, England: Harvard University Press.

Bryant, M., & Stevens, J. (2006). Measurement of Food Availability in the Home. *Nutrition Reviews, 64*(2), 67-76. doi: 10.1301/nr.2006.feb.67-76.

Bryant, M. J., Ward, D. S., Hales, D., Vaughn, A., Tabak, R. G., & Stevens, J. (2008). Reliability and Validity of the Healthy Home Survey: A Tool to Measure Factors within Homes Hypothesized to Relate to Overweight in Children. *Int J Behav Nutr Phys Act, 5*, 23. doi: 10.1186/1479-5868-5-23.

Bukara-Radujkovic, G., & Zdravkovic, D. (2009). Physical Activity as an Important Determinant in Developing Childhood Obesity. *Med Pregl, 62*(3-4), 107-113.

Burrows, T. L., Martin, R. J., & Collins, C. E. (2010). A Systematic Review of the Validity of Dietary Assessment Methods in Children when Compared with the Method of Doubly Labeled Water. *J Am Diet Assoc, 110*(10), 1501-1510. doi: 10.1016/j.jada.2010.07.008.

Byrd-Bredbenner, C., & Abbot, J. M. (2009). Differences in Food Supplies of U.S. Households with and without Overweight Individuals. *Appetite, 52*(2), 479-484. doi: 10.1016/j.appet.2008.12.011.

Byrd-Bredbenner, C., Abbot, J. M., & Cussler, E. (2009). Nutrient Profile of Household Food Supplies of Families with Young Children. *Journal of the American Dietetic Association, 109*(12), 2057-2062. doi: 10.1016/j.jada.2009.09.006.

Byrd-Bredbenner C, B. (2007). *Universal Product Codes as a Means for Assessing Food and Nutrient Availability in Households.* Paper presented at the Nutrient Data Bank Conference, Washington, DC.

Cade, J., Thompson, R., Burley, V., & Warm, D. (2002). Development, Validation and Utilisation of Food-Frequency Questionnaires - A Review. *Public Health Nutr, 5*(4), 567-587. doi: 10.1079/phn2001318.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations Between the Home Food Environment and Obesity-promoting Eating Behaviors in Adolescence. *Obesity, 15*(3), 719-730. doi: 10.1038/oby.2007.553.

Chatenoud, L., Tavani, A., La Vecchia, C., Jacobs, D. R., Jr., Negri, E., Levi, F., & Franceschi, S. (1998). Whole Grain Food Intake and Cancer Risk. *Int J Cancer, 77*(1), 24-28.

Chi-Ming, H., Wei, L., Hsiao-Chi, Y., & Wen-Harn, P. (2007). The Relationship between Snack Intake and its Availability of 4th-6th graders in Taiwan. *Asia Pacific Journal of Clinical Nutrition, 16*, 547-552.

Coates, T. J., Jeffrey, R. W., & Wing, R. R. (1978). The Relationship between Persons' Relative Body Weights and the Quality and Quantity of Food Stored in their Homes. *Addict Behav, 3*(3-4), 179-184.

Center for Disease Control and Prevention. (2009). *Simply Put: A Guide for Creating Easy-to-Understand Materials*. Atlanta, GA.

Crockett, S. J., Potter, J. D., Wright, M. S., & Bacheller, A. (1992). Validation of a Self-reported Shelf Inventory to Measure Food Purchase Behavior. *J Am Diet Assoc, 92*(6), 694-697.

Crooks, D. L. (2000). Food Consumption, Activity, and Overweight among Elementary School Children in an Appalachian Kentucky Community. *Am J Phys Anthropol, 112*(2), 159-170. doi: 10.1002/(sici)1096-8644(2000)112:2<159::aid-ajpa3>3.0.co;2-g.

Cullen, K. W., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & de Moor, C. (2001). Child-reported Family and Peer Influences on Fruit, Juice and Vegetable Consumption: Reliability and Validity of Measures. *Health Educ Res, 16*(2), 187-200.

Cullen, K.W., Baranowski, T., Owens E, Marsh T, Rittenberry L, De Moor C. (2003). Availability, Accessibility, and Preferences for Fruit, 100% Fruit Juice, and Vegetables influence children's dietary behavior. *Health Education and Behavior, 30*(5), 615-626. doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14582601.

Cullen, K. W., Klesges, L. M., Sherwood, N. E., Baranowski, T., Beech, B., Pratt, C., Rochon, J. (2004). Measurement Characteristics of Diet-related Psychosocial Questionnaires among African-American Parents and their 8- to 10-Year-old Daughters: Results from the Girls' Health Enrichment Multi-site Studies. *Preventive Medicine, 38*, 34. doi: 10.1016/j.ypmed.2003.05.002.

Davis, A. M., Bennett, K. J., Befort, C., & Nollen, N. (2011). Obesity and Related Health Behaviors Among Urban and Rural Children in the United States: Data from the National Health and Nutrition Examination Survey 2003–2004 and 2005–2006. *Journal of Pediatric Psychology, 36*(6), 669-676. doi: 10.1093/jpepsy/jsq117.

Davison, K. K., & Birch, L. L. (2001). Childhood overweight: A Contextual Model and Recommendations for Future Research. *Obes Rev, 2*(3), 159-171.

Dennison, B. A., Erb, T. A., & Jenkins, P. L. (2002). Television Viewing and Television in Bedroom Associated with Overweight Risk among Low-income Preschool Children. *Pediatrics, 109*(6), 1028-1035.

Dewalt, D. A., Berkman, N. D., Sheridan, S., Lohr, K. N., & Pignone, M. P. (2004). Literacy and Health Outcomes: A Systematic Review of the Literature. *J Gen Intern Med, 19*(12), 1228-1239. doi: 10.1111/j.1525-1497.2004.40153.x.

Dillman, D. A., Smyth, J. D., Christian, L. M. (2006). *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method* (3 ed.). Chapter 4-6. Hoboken, NJ: Wiley, John & Sons, Incorporated.

Ding, D., Sallis, J. F., Norman, G. J., Saelens, B. E., Harris, S. K., Kerr, J., Glanz, K. (2012). Community Food Environment, Home Food Environment, and Fruit and Vegetable Intake of Children and Adolescents. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2010.07.003.

Downs, S. M., Arnold, A., Marshall, D., McCargar, L. J., Raine, K. D., & Willows, N. D. (2009). Associations among the Food Environment, Diet Quality and Weight Status in Cree Children in Québec. *Public Health Nutrition, 12*(9), 1504-1511. doi: 10.1017/s1368980008004515.

Dwyer, G. M., Higgs, J., Hardy, L. L., & Baur, L. A. (2008). What do Parents and Preschool Staff Tell us about Young Children's Physical Activity: A Qualitative Study. *International Journal of Behavioral Nutrition and Physical Activity, 5*(66).

National Association for Sport and Physical Education. (2009). *Active Start: A Statementof Phsical Activity Guidelines for Children from Birth to Age 5*. Sewickley, PA: American Alliance for Health, Physical Education, Recreation, and Dance.

Ferreira, I., van der Horst, K., Wendel-Vos, W., Kremers, S., van Lenthe, F. J., & Brug, J. (2007). Environmental Correlates of Physical Activity in Youth - A Review and Update. *Obes Rev, 8*(2), 129-154. doi: 10.1111/j.1467-789X.2006.00264.x.

Finn, K., Johannsen, N., & Specker, B. (2002). Factors Associated with Physical Activity in Preschool Children. *J Pediatr, 140*(1), 81-85.

Freedman, D. S., Khan, L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The Relation of Childhood BMI to Adult Adiposity: the Bogalusa Heart Study. *Pediatrics, 115*(1), 22-27. doi: 10.1542/peds.2004-0220.

French, S. A., Shimotsu, S. T., Wall, M., & Gerlach, A. F. (2008). Capturing the Spectrum of Household Food and Beverage Purchasing Behavior: A Review. *Journal of the American Dietetic Association, 108*(12), 2051-2058. doi: http://dx.doi.org/10.1016/j.jada.2008.09.001.

French, S. A., Wall, M., Mitchell, N. R., Shimotsu, S. T., & Welsh, E. (2009). Annotated Receipts Capture Household Food Purchases from a Broad Range of Sources. *Int J Behav Nutr Phys Act, 6*, 37. doi: 10.1186/1479-5868-6-37.

Gattshall, M. L., Shoup, J., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of aS instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *International Journal of Behavioral Nutrition and Physical Activity, 5*(3).

Giang, T., Karpyn, A., Laurison, H. B., Hillier, A., & Perry, R. D. (2008). Closing the Grocery Gap in Underserved Communities: The Creation of the Pennsylvania Fresh Food Financing Initiative. *J Public Health Manag Pract, 14*(3), 272-279. doi: 10.1097/01.PHH.0000316486.57512.bf.

Gibson, E., & Wardle, J. (2003). Energy Density Predicts Preferences for Fruit and Vegtables in 4-Year-old Children. *Appetite, 41*(1), 97-98.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2007). Nutrition Environment Measures Survey in Stores (NEMS-S): Development and Evaluation. *American Journal of Preventive Medicine, 32*(4), 282-289. doi: http://dx.doi.org/10.1016/j.amepre.2006.12.019.

Guenther, P. M., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2006). Most Americans Eat much Less than Recommended Amounts of Fruits and Vegetables. *J Am Diet Assoc, 106*(9), 1371-1379. doi: 10.1016/j.jada.2006.06.002.

Gundersen, C., Mahatmya, D., Garasky, S., & Lohman, B. (2011). Linking Psychosocial Stressors and Childhood Obesity. *Obesity Reviews, 12*(5), e54-e63. doi: 10.1111/j.1467-789X.2010.00813.x.

Hales, D., Vaughn, A. E., Mazzucca, S., Bryant, M. J., Tabak, R. G., McWilliams, C., Ward, D. S. (2013). Development of HomeSTEAD's Physical Activity and Screen Time Physical Environment Inventory. *Int J Behav Nutr Phys Act, 10*, 132. doi: 10.1186/1479-5868-10-132.

Halliday, J. A., Palma, C. L., Mellor, D., Green, J., & Renzaho, A. M. (2013). The Relationship between Family Functioning and Child and Adolescent Overweight and Obesity: A Systematic Review. *Int J Obes (Lond)*. doi: 10.1038/ijo.2013.213.

Hampson S.E., M. J., Jorgensen J., and Barker M. (2009). A Social Marketing Approach to Improving the Nutrition of Low-income Women and Children: An Initial Focus Group Study. *Public Health Nutrition, 12*(9).

Hanscombe, K. B., Haworth, C. M., Davis, O. S., Jaffee, S. R., & Plomin, R. (2011). Chaotic Homes and School Achievement: A Twin Study. *J Child Psychol Psychiatry, 52*(11), 1212-1220. doi: 10.1111/j.1469-7610.2011.02421.x.

Hartley D., A. N., Fox K., Lenardson J. (2011). How Does the Rural Food Environment Affect Rural Childhood Obesity? *Childhood Obesity, 7*(6). doi: 10.1089/chi.2011.0086.

Hearn, M. D., Baranowski, T., Baranowski J, Doyle C, Smith M, Lin LS, Resnicow K. (1998). Environmental Influences on Dietary Behavior among Children：Availability and Accessibility of Fruit and Vegetables Enable Consumption. *J Health Education, 29*(1), 26-32.

Hebden, L., Hector, D., Hardy, L. L., & King, L. (2013). A Fizzy Environment: Availability and Consumption of Sugar-sweetened Beverages among School Students. *Preventive Medicine, 56*(6), 416-418. doi: http://dx.doi.org/10.1016/j.ypmed.2013.02.017.

Jacka, F. N., Pasco, J. A., Williams, L. J., Leslie, E. R., Dodd, S., Nicholson, G. C., Berk, M. (2011). Lower Levels of Physical Activity in Childhood Associated with Adult Depression. *Journal of Science and Medicine in Sport, 14*(3), 222-226. doi: http://dx.doi.org/10.1016/j.jsams.2010.10.458.

Jacobs, D. R., Jr., Meyer, K. A., Kushi, L. H., & Folsom, A. R. (1998). Whole-grain Intake May Reduce the Risk of Ischemic Heart Disease Death in Postmenopausal Women: The Iowa Women's Health Study. *Am J Clin Nutr, 68*(2), 248-257.

Janssen, I., & Leblanc, A. G. (2010). Systematic Review of the Health Benefits of Physical Activity and Fitness in School-aged Children and Youth. *Int J Behav Nutr Phys Act, 7*, 40. doi: 10.1186/1479-5868-7-40.

Jimenez-Pavon, D., Kelly, J., & Reilly, J. J. (2010). Associations between Objectively Measured Habitual Physical Activity and Adiposity in Children and Adolescents: Systematic Review. *International Journal of Pediatric Obesity, 5*(1), 3-18. doi: 10.3109/17477160903067601.

Johnson, L., van Jaarsveld, C. H., & Wardle, J. (2011). Individual and Family Environment Correlates Differ for Consumption of Core and Non-core Foods in Children. *Br J Nutr, 105*(6), 950-959. doi: 10.1017/s0007114510004484.

Kang, K. T., Lee, P. L., Weng, W. C., & Hsu, W. C. (2012). Body Weight Status and Obstructive SleepA in Children. *Int J Obes (Lond), 36*(7), 920-924. doi: 10.1038/ijo.2012.5.

Kant, A. K. (2003). Reported Consumption of Low-Nutrient-Density Foods by American Children and Adolescents: Nutritional and Health Correlates, NHANES iii, 1988-1994. *Archives of Pediatrics & Adolsecent Medicine, 157*(8), 789-796.

Kantomaa, M. T., Purtsi, J., Taanila, A. M., Remes, J., Viholainen, H., Rintala, P., Tammelin, T. H. (2011). Suspected motor problems and low preference for active play in childhood are associated with physical inactivity and low fitness in adolescence. *PLoS One, 6*(1), e14554. doi: 10.1371/journal.pone.0014554.

Kitzmann, K. M., Dalton, W. T., & Buscemi, J. (2008). Beyond Parenting Practices: Family Context and the Treatment of Pediatric Obesity. *Family Relations, 57*(1), 13-23. doi: 10.1111/j.1741-3729.2007.00479.x.

Kratt, P., Reynolds, K., & Shewchuk, R. (2000). The Role of Availability as a Moderator of Family Fruit and Vegetable Consumption. *Health Educ Behav, 27*(4), 471-482.

Kumanyika, S., & Grier, S. (2006). Targeting Interventions for Ethnic Minority and Low-Income Populations. *The Future Of Children / Center For The Future Of Children, The David And Lucile Packard Foundation, 16*(1), 187-207.

Lampard, A. M., Franckle, R. L., & Davison, K. K. (2014). Maternal Depression and Childhood Obesity: A Systematic Review. *Prev Med, 59*, 60-67. doi: 10.1016/j.ypmed.2013.11.020.

Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. *Biometrics, 33*(1), 159-174.

Lee, J. M., Gebremariam, A., Vijan, S., & Gurney, J. G. (2012). Excess Body Mass Index-years, a Measure of Degree and Duration of Excess Weight, and Risk for Incident Diabetes. *Arch Pediatr Adolesc Med, 166*(1), 42-48. doi: 10.1001/archpedi.166.1.42.

Lee, W. R. (2007). An Overview of Pediatric Obesity. *Pediatric Diabetes, 8*, 76-87. doi: 10.1111/j.1399-5448.2007.00337.x.

Liu, K., Stamler, J., Dyer, A., McKeever, J., & McKeever, P. (1978). Statistical Methods to Assess and Minimize the Role of Intra-individual Variability in Obscuring the Relationship between Dietary Lipids and Serum Cholesterol. *Journal of Chronic Diseases, 31*(6–7), 399-418. doi: http://dx.doi.org/10.1016/0021-9681(78)90004-8.

Lohman, B. J., Stewart, S., Gundersen, C., Garasky, S., & Eisenmann, J. C. (2009). Adolescent Overweight and Obesity: Links to Food Insecurity and Individual, Maternal, and Family Stressors. *J Adolesc Health, 45*(3), 230-237. doi: 10.1016/j.jadohealth.2009.01.003.

Lutfiyya, M. N., Lipsky, M. S., Wisdom-Behounek, J., & Inpanbutr-Martinkus, M. (2007). Is Rural Residency a Risk Factor for Overweight and Obesity for U.S. Children? *Obesity, 15*(9), 2348-2356.

Maddison, R., Hoorn, S. V., Jiang, Y., Mhurchu, C. N., Exeter, D., Dorey, E., Turley, M. (2009). The Environment and Physical Activity: The Influence of Psychosocial, Perceived and Built Environmental Factors. *Int J Behav Nutr Phys Act, 6*, 19. doi: 10.1186/1479-5868-6-19.

Maitland, C., Stratton, G., Foster, S., Braham, R., & Rosenberg, M. (2013). A Place for Play? The Influence of the Home Physical Environment on Children's Physical Activity and Sedentary Behaviour. *Int J Behav Nutr Phys Act, 10*, 99. doi: 10.1186/1479-5868-10-99.

Mathias, K. C., Slining, M. M., & Popkin, B. M. (2013). Foods and Beverages Associated with Higher Intake of Sugar-Sweetened Beverages. *American Journal of Preventive Medicine, 44*(4), 351-357. doi: http://dx.doi.org/10.1016/j.amepre.2012.11.036.

Magarey, A., Watson, J., Golley, R. K., Burrows, T., Sutherland, R., McNaughton, S. A., Collins, C. (2011). Assessing Dietary Intake in Children and Adolescents: Considerations and Recommendations for Obesity Research. *Int J Pediatr Obes, 6*(1), 2-11. doi: 10.3109/17477161003728469.

Miller, C., & Edwards, L. (2002). Development and Validation of a Shelf Inventory to Evaluate Household Food Purchases Among Older Adults with Diabetes Mellitus. *Journal of Nutrition Education and Behavior, 34*(5), 261-267. doi: Doi: 10.1016/s1499-4046(06)60104-8.

Ministry of Food (1955). The National Food Survey in Great Britain. *Nature, 175*(4449), 241-242.

Montonen, J., Knekt, P., Jarvinen, R., Aromaa, A., & Reunanen, A. (2003). Whole-grain and Fiber Intake and the Incidence of Type 2 Diabetes. *Am J Clin Nutr, 77*(3), 622-629.

Nanney, M. S., Johnson, S., Elliott, M., & Haire-Joshu, D. (2007). Frequency of Eating Homegrown Produce Is Associated with Higher Intake among Parents and Their Preschool-Aged Children in Rural Missouri. *Journal of the American Dietetic Association, 107*(4), 577-584. doi: 10.1016/j.jada.2007.01.009.

Nelson, J. A., Carpenter, K., Chiasson, MA. (2006). Diet, Activity, and Overweight Among Preschool-Aged Children Enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). *Preventing Chronic Disease, 3*(2), http:www.cdc.gov/pcd/issues/2006/apr/2005_0135.htm.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of Fruit and Vegetable Intake among Adolescents: Findings from Project EAT. *Preventive Medicine, 37*(3), 198-208. doi: http://dx.doi.org/10.1016/S0091-7435(03)00114-2.

Nevin, M. A. (2013). Pediatric Obesity, Metabolic Syndrome, and Obstructive Sleep Apnea Syndrome. *Pediatr Ann, 42*(10), 205-210. doi: 10.3928/00904481-20130924-11.

Ogden, C. L., Carrol, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of High Body Mass Index in US Children and Adolescents, 2007-2008. *Journal of the American Medical Association, 303*(3), 242-249.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA, 311*(8), 806-814. doi: 10.1001/jama.2014.732.

Patterson, R. E., Kristal, A. R., Shannon, J., Hunt, J. R., & White, E. (1997). Using a Brief Household Food Inventory as an Environmental Indicator of Individual Dietary Practices. *Am J Public Health, 87*(2), 272-275.

Pearson, N., Biddle, S. J., & Gorely, T. (2009). Family Correlates of Fruit and Vegetable Consumption in Children and Adolescents: A Systematic Review. *Public Health Nutr, 12*(2), 267-283. doi: 10.1017/s1368980008002589.

Pelletier, A. L., Chang, W. W., Delzell, J. E., Jr., & McCall, J. W. (2004). Patients' Understanding and Use of Snack Food Package Nutrition Labels. *J Am Board Fam Pract, 17*(5), 319-323.

Pinard, C. A., Yaroch, A. L., Hart, M. H., Serrano, E. L., McFerren, M. M., & Estabrooks, P. A. (2012). Measures of the Home Environment Related to Childhood Obesity: A Systematic Review. *Public Health Nutr, 15*(1), 97-109. doi: 10.1017/s1368980011002059.

Pliner, P., Pelchat, M., & Grabski, M. (1993). Reduction of Neophonia in Humans by Exposure to Novel Foods. *Appetite, 20*(2), 111-123.

Prentice, R. L. (1996). Measurement Error and Results from Analytic Epidemiology: Dietary Fat and Breast Cancer. *J Natl Cancer Inst, 88*(23), 1738-1747.

Proctor, M. H., Moore, L.L., Gao, D., Cupples, L.A., Bradlee, M.L., Hoodand, M.Y., Ellison, R. C. (2003). Television Viewing and Change in Body Fat from Preschool to Early Adolescence: The Framingham Children's Study. *International Journal of Obesity, 27,* 827-833.

Raynor, H. A., Polley, B. A., Wing, R. R., & Jeffery, R. W. (2004). Is Dietary Fat Intake Related to Liking or Household Availability of High- and Low-Fat Foods? *Obesity Research, 12*(5), 816-823. doi: 10.1038/oby.2004.98.

Reicks, M., Jonnalagadda, S., Albertson, A. M., & Joshi, N. (2014). Total Dietary Fiber Intakes in the US Population are Related to Whole Grain Consumption: Results from the National Health and Nutrition Examination Survey 2009 to 2010. *Nutrition Research*(0). doi: http://dx.doi.org/10.1016/j.nutres.2014.01.002.

Reilly, J. J., Kelly, L., Montgomery, C., Williamson, A., Fisher, A., McColl, J. H., Grant, S. (2006). Physical Activity to Prevent Obesity in Young Children: Cluster Randomised Controlled Trial. *Bmj, 333*(7577), 1041.

Reinaerts, E., de Nooijer, J., Candel, M., & de Vries, N. (2007). Explaining School Children's Fruit and Vegetable Consumption: The Contributions of Availability, Accessibility, Exposure, Parental Consumption and Habit in Addition to Psychosocial Factors. *Appetite, 48*(2), 248-258. doi: 10.1016/j.appet.2006.09.007.

Resnicow, K., Davis-Hearn, M., Smith, M., Baranowski, T., Lin, L. S., Baranowski, J., & Wang, D. T. (1997). Social-cognitive Predictors of Fruit and Vegetable Intake in Children. *Health Psychology, 16*(3), 272.

Rey-López, J. P., Vicente-Rodríguez, G., Biosca, M., & Moreno, L. A. (2008). Sedentary Behaviour and Obesity Development in Children and Adolescents. *Nutrition, Metabolism and Cardiovascular Diseases, 18*(3), 242-251. doi: 10.1016/j.numecd.2007.07.008.

Reynolds, K. D., Hinton, A. W., Shewchuk, R. M., & Hickey, C. A. (1999). Social Cognitive Model of Fruit and Vegetable Consumption in Elementary School Children. *Journal of Nutrition Education, 31*(1), 23-30. doi: http://dx.doi.org/10.1016/S0022-3182(99)70381-X.

Rhee, K. (2008). Childhood Overweight and the Relationship between Parent Behaviors, Parenting Style, and Family Functioning. *The ANNALS of the American Academy of Political and Social Science, 615*(1), 11-37. doi: 10.1177/0002716207308400.

Rosenberg, D. E., Sallis, J. F., Kerr, J., Maher, J., Norman, G. J., Durant, N., Saelens, B. E. (2010). Brief Scales to Assess Physical Activity and Sedentary Equipment in the Home. *Int J Behav Nutr Phys Act, 7*, 10. doi: 10.1186/1479-5868-7-10.

Rosenkranz, R. R., & Dzewaltowski, D. A. (2008). Model of the Home Food Environment Pertaining to Childhood Obesity. *Nutrition Reviews, 66*(3), 123-140. doi: 10.1111/j.1753-4887.2008.00017.x.

Rozin, P., & Vollmecke, T. (1986). Food Likes and Dislikes. *Annu Rev Nutr, 6*, 433-456.

Rudd, R., Anderson JE, Oppenheimer S, & Nath C. (2007). Health Literacy: An Update of Public Health and Medical Literature *Review of Adult Learning and Literacy* (Vol. 7, pp. 175-204). Mahway NJ: Lawrence Erlbaum Associates.

Sanjur, D., Haines, P., Travis, S., Brooks, M., Hammons, B., & Immink, M. (1979). Food Expenditures, Consumption, and Nutrient Availability among New York State EFNEP Households. *Human Ecology, 9*, 1-58.

Shim, J. S., Oh, K., & Kim, H. C. (2014). Dietary Assessment Methods in Epidemiological Studies. *Epidemiology and Health, 36*, e2014009.

Sirard, J. R., Laska, M. N., Patnode, C. D., Farbakhsh, K., & Lytle, L. A. (2010). Adolescent Physical Activity and Screen Time: Associations with the Physical Home Environment. *Int J Behav Nutr Phys Act, 7*, 82. doi: 10.1186/1479-5868-7-82.

Skelton, J. A., Buehler, C., Irby, M. B., & Grzywacz, J. G. (2012). Where are Family Theories in Family-based Obesity treatment: Conceptualizing the Study of Families in Pediatric Weight Management. *Int J Obes, 36*(7), 891-900.

Skinner, A. C., Steiner, M. J., & Perrin, E. M. (2012). Self-reported Energy Intake by Age in Overweight and Healthy-weight Children in NHANES, 2001-2008. *Pediatrics, 130*(4), e936-942. doi: 10.1542/peds.2012-0605.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Stark, L. J., Boles R.E., Kuhl E., Ratcliff, M., Scharf, C., Bolling, C., & Rausch, J.. (2010). A Pilot Randomized Controlled Trial of a Clinic and Home-based Behavioral Intervention to Decrease Obesity in Preschoolers. *Obesity, 19*, 134–141.

Stevens, J., Bryant, M., Wang, L., Borja, J., & Bentley, M. E. (2011). Exhaustive Measurement of Food Items in the Home Using a Universal Product Code Scanner. *Public Health Nutr, 14*(2), 314-318. doi: 10.1017/s1368980010001837.

Strauss, R. S., & Knight, J. (1999). Influence of the Home Environment on the Development of Obesity in Children. *Pediatrics, 103*(6), e85.

Sweeting, H., Wright, C., & Minnis, H. (2005). Psychosocial Correlates of Adolescent Obesity, 'Slimming Down' and 'Becoming Obese'. *J Adolesc Health, 37*(5), 409. doi: 10.1016/j.jadohealth.2005.01.008.

Tabak, R. G., Tate, D. F., Stevens, J., Siega-Riz, A. M., & Ward, D. S. (2012). Family Ties to Health Program: A Randomized Intervention to Improve Vegetable Intake in Children. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2011.06.009.

Tai-Seale T, C. (2003). Nutrition and Overweight Concerns in Rural Areas: A Literature Review. (Vol. 2, pp. 2). College Station, TX In Rural Healthy People 2010: A Companion Document to Healthy People 2010: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center.

Tandon, P. S., Zhou, C., Sallis, J. F., Cain, K. L., Frank, L. D., & Saelens, B. E. (2012). Home Environment Relationships with Children's Physical Activity, Sedentary Time, and Screentime by Socioeconomic Status. *Int J Behav Nutr Phys Act, 9*, 88. doi: 10.1186/1479-5868-9-88.

Templeton S.B., Marlette, M. A., & Panemangalore M. (2005). Competetive Foods Increase the Intake of Energy and Decrease the Intake of Certain Nutrients by Adolescents Consuming School Lunch. *American Dietitic Association, 105*(2), 215-220.

Townsend, M. S., Sylva, K., Martin, A., Metz, D., & Wooten-Swanson, P. (2008). Improving Readability of an Evaluation Tool for Low-income Clients Using Visual Information Processing Theories. *Journal of Nutrition Education and Behavior, 40*(3), 181-186. doi: http://dx.doi.org/10.1016/j.jneb.2007.06.011.

Turrell, G., & Kavanagh, A. M. (2006). Socio-economic Pathways to Diet: Modelling the Association between Socio-economic Position and Food Purchasing Behaviour. *Public Health Nutr, 9*(3), 375-383.

Vale, S., Silva, P., Santos, R., Soares-Miranda, L., & Mota, J. (2010). Compliance with Physical Activity Guidelines in Preschool Children. *Journal of Sports Sciences, 28*(6), 603-608.

Van Duyn, M. A., & Pivonka, E. (2000). Overview of the Health Benefits of Fruit and Vegetable Consumption for the Dietetics Professional: Selected Literature. *J Am Diet Assoc, 100*(12), 1511-1521. doi: 10.1016/s0002-8223(00)00420-x.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and Access to Healthy Food in the United States: A Review of Food Deserts Literature. *Health & Place, 16*(5), 876-884. doi: http://dx.doi.org/10.1016/j.healthplace.2010.04.013.

Wang, L., Dalton, W. T., Schetzina, K. E., Fulton-Robinson, H., Holt, N., Ho, A. L., Wu, T. (2013). Home Food Environment, Dietary Intake, and Weight among Overweight and Obese Children in Southern Appalachia. *South Med J, 106*(10), 550-557. doi: 10.1097/smj.0000000000000008.

Wang, Y. C., Bleich, S. N., & Gortmaker, S. L. (2008). Increasing Caloric Contribution from Sugar-sweetened Beverages and 100% Fruit Juices among US Children and Adolescents, 1988-2004. *Pediatrics, 121*(6), e1604-1614. doi: 10.1542/peds.2007-2834.

Weber Cullen, K., Baranowski, T., Rittenberry, L., Cosart, C., Owens, E., Hebert, D., & de Moor, C. (2000). Socioenvironmental Influences on Children's Fruit, Juice and Vegetable Consumption as Reported by Parents: Reliability and Validity of Measures. *Public Health Nutr, 3*(3), 345-356.

White J. M., K. D. M. (2008). *The Systems Framework. Family Theories* (3 ed.). Thousand Oaks, CA: Sage Publications.

Williams, C. L., Strobino, B., Bollella, M., & Brotanek, J. (2004). Body Size and Cardiovascular Risk Factors in a Preschool Population. *Prev Cardiol, 7*(3), 116-121.

Wyse, R., Campbell, E., Nathan, N., & Wolfenden, L. (2011). Associations between Characteristics of the Home Food Environment and Fruit and Vegetable Intake in Preschool Children: A Cross-sectional Study. *BMC Public Health, 11*, 938. doi: 10.1186/1471-2458-11-938.

Xie, B., Gilliland, F. D., Li, Y.-F., & Rockett, H. R. H. (2003). Effects of Ethnicity, Family Income, and Education on Dietary Intake among Adolescents. *Preventive Medicine, 36*(1), 30-40. doi: http://dx.doi.org/10.1006/pmed.2002.1131.

CHAPTER 3: THE RELATIONSHIP BETWEEN THE HOME FOOD AVAILABILITY ENVIRONMENT AND CHILD DIETARY INTAKE IN A DIVERSE, RURAL SAMPLE OF PRESCHOOL-AGED CHILDREN

SUMMARY

Purpose

Home food availability has been linked to child dietary intake. Understanding the relationship between the home food environment and child dietary intake may provide intervention targets to address nutrition in the home. In an intervention study designed to prevent early childhood obesity in rural Colorado (The Colorado LEAP Study), the relationships within the home food environment and a child's dietary intake were investigated.

Methods

Participants included preschool-aged children (n=153, 53% female; BMIz= .46± 1.1) and parents (90% mothers, 32% Hispanic, 70% below 185% poverty; BMI 26.7±5.8). Parents completed a self-report inventory of home foods (The Home Inventory Describing Eating and Activity; The Home IDEA) and child dietary intake (Block Kids Food Screener). Linear regression was used to analyze relationships between availability of home food items and child dietary intake, controlling for demographic weight status variables.

Results

Home availability of selected foods significantly predicted child intake of: fruits (R^2= .06, p=0.002), vegetables (R^2=.11, p<0.0001), whole grain (R^2=.02, p=0.05) and calories from sugar sweetened beverages (SSB) (R^2=.31, p=0.002), with an additional 6% of the variance explained by availability of SSB over and above demographic variables.

Conclusion

The availability of foods in the home food environment of rural families with young children was related to child dietary intake of key foods related to long term health—whole grains, SSB, fruits, and vegetables. These results identify areas in the home food environment that could be targeted to improve child dietary intake.

INTRODUCTION

Childhood obesity continues to be a major public health concern, disproportionally affecting minority groups and those with limited resources (Ogden et al., 2012). The reported decrease in obesity among 2-5 year old children is a mark of improvement; however, that 23% of preschool aged children are overweight or obese (>85th percentile), demonstrates the need to continue efforts to end childhood obesity (Ogden et al., 2014). The multifaceted nature of childhood obesity makes it a difficult problem to target due to the impact of various environments on child health outcomes. An ecological approach suggests that these behaviors be conceptualized in multiple environments: school, home, and community (Davison & Birch, 2001). Addressing the various environments has proven challenging as substantial changes have occurred in the built environment, favoring increased availability of energy dense foods and reduced opportunities for physical activity (Jeffery & Utter, 2003). The family home is an important environment to consider as the home is a central environment for children where family rules, preferences, and habits largely determine food availability and opportunities for physical activity (Booth, 2001; Bryant & Stevens, 2006).

Current research in the home environment has demonstrated that the availability of certain foods in the home is related to child dietary intake. Studies have shown that fruit and vegetable availability is significantly related to, and in some cases, predicts child consumption of fruits and vegetables (Befort et al., 2006; Cullen et al., 2003; Fulkerson et al., 2008; Hearn et al., 1998; Wyse et al., 2011). Other studies have expanded on fruits and vegetables by including groups such as healthy/unhealthy, fats/sweets, drinks, or snacks and found that the availability of those food groups were related to intake in children and adolescents (Campbell et al., 2007; Ding et al., 2012; Haerens et al., 2008; Spurrier et al., 2008).

In addition to home food availability, parents play a primary role in child dietary intake, as they are the gatekeepers of foods that enter the home. Not only do parents influence the home food environment through making foods available, they also impact child dietary intake through their own dietary habits and preferences, and through rules implemented about food (Birch et al., 2001; Briley & McAllaster, 2011; Gattshall et al., 2008; Ostbye et al., 2013; Spurrier et al., 2008). Moreover, geographical location, household resources, and other demographic factors also influence food availability and diet (Ding et al., 2012; Turrell & Kavanagh, 2006). Families with limited resources face challenges and struggles, such as the ability to provide healthy foods, overall poor diet quality, and consequently higher rates of obesity than their higher income counterparts (Darmon & Drewnowski, 2008; Ding et al., 2012; Kumanyika & Grier, 2006).

Despite the current knowledge of the home food environment in relation to availability, there are limitations and lack of understanding in the literature that need to be addressed. These are seen by the limited number of studies conducted with diverse populations, such as those living in rural

communities, of low socioeconomic status, or with young children. Also, there is a lack in understanding of the home food environment as it relates to a complete, representative diet of young children. The complex environment and interactions of the family and its effect on the child's diet quality have been assessed predominately though parental food and activity behaviors related to the home environment, and through limited predetermined food lists concentrating on fruits, vegetables, and snacks (high fat/sugar) (Gattshall et al., 2008; Spurrier et al., 2008; Wang et al., 2013; Wyse et al., 2011). Additionally, home food availability and dietary intake is limited regarding families with preschool-aged children, who have limited resources, and live rural areas. Utilizing a comprehensive food assessment to capture the home food environment will facilitate understanding the relationship between home food availability and child dietary intake in under-represented populations. It is important to identify which attributes to the home food environment are related to child dietary intake. Simple reliable and valid measures of the home food environment are needed to conduct high quality research to identify modifiable areas in homes that may help identify an avenue to intervene; and thus potentially improve the diet quality of young children. Therefore, to address the need to further validate and understand the home environment from a more representative sample and complete child diet, this study aimed to 1.) Identify correlations between home food group availability and child dietary intake; 2.) Predict child dietary intake from home food group availability using a validated, comprehensive home food assessment, for families with limited resources, living in rural communities.

METHODS

Participants and Procedures

The Colorado Longitudinal Eating And Physical activity Study (The LEAP Study) project is a longitudinal cohort study utilizing a controlled quasi-experimental design in 5 rural Colorado communities (Bellows et al., 2013). Families were recruited (in English or Spanish) via an informational and consent packet sent home with their preschool child and during parent information events held at the schools. All participants provided written informed consent for participation for parent and child and in some cases child only. This study was approved by the institutional review boards at Colorado State University and the University of Colorado Denver, Anschutz Medical Campus.

Data were collected at 5 preschool locations as well as through evaluation packets that were sent home with the preschool child. The evaluation packets included measures on home food and activity environment, dietary intake, weight status, and demographic characteristics and were administered in English or Spanish. Parents returned completed evaluation packets to their child's preschool teacher. All participants were compensated $20 for returning their evaluation packets.

Measures

Home food and activity environment. The Home Inventory Describing Eating and Activity (Home IDEA) was used to assess the availability and accessibility of food and activity devices in the home as a self-report questionnaire. The Home IDEA was modified from an existing measure, the Home Health Environment assessment that had previously reported reliability

(inter-rater) and validity (criterion and construct; Boles et al., 2014; Boles et al., 2013; Boles et al.,2 010; Stark et al., 2010). The Home IDEA utilizes a greater variety of foods and drinks, including foods from the Allowable Food List from the US Supplemental Nutrition Program for Women, Infants, and Children (commonly referred to as WIC). It evaluates frequency of food purchase, food availability and accessibility of food (130 items), physical activity devices (16 items), and measures the child's bedroom for electronic devices (e.g. television, video games; 12 items). Only availability of food and activity items were used for this paper's analysis. .

Dietary intake. The Block Kids Food Screener (BKFS) is a 41- item, food frequency questionnaire designed to assess dietary intake of food groups and nutrients in children 2-17 years. It is deemed a valid and user friendly dietary assessment (Block et al., 1990; Weber Cullen et al., 2008; Hunsberger et al., 2012; Marshallet al., 2008; Smith & Fila, 2006) and is used to estimate dietary intake of fruit, vegetables, whole grains, protein sources, saturated fat, and added sugars. For this study, the BKFS was completed by the parent/caregiver participant. The BKFS asked the participant to report dietary intake of foods and beverages consumed, during the previous week, by quantity ("a little" "some", or "a lot") and frequency (from "none" to "every day last week"). The BKFS was analyzed for nutrients and food group servings by NutritionQuest (Berkeley, CA).

Weight status. Children's weight and height were measured using standardized methods (Harrison, 1988) on a digital scale (Lifesource ProFit UC321; Milpitas, CA) to the nearest 0.05kg and by portable stadiometer to the nearest 0.1 cm (Seca Corp, Hamburg, Germany) by trained research staff. Body Mass Index (BMI) and sex- and age-adjusted BMIz scores were

calculated using 2000 CDC Growth Charts for the United States (Kuczmarski et al., 2002). Children's weight status was classified according to The National Center for Health Statistics (NCHS) CDC BMI categories (underweight (< 5^{th} percentile, normal (5^{th}- < 85^{th}), overweight (85^{th}- < 95^{th}), and obese (≥ 95^{th}) for age and sex (Kuczmarski et al., 2002). Parent BMI was calculated from self-reported height and weight with the Center for Disease Control adult BMI equation, weight (kg) / [height (m)]^2 (CDC, 2011).

Demographic characteristics. The demographic questionnaire included participants' age, race/ethnicity, education, work status, and income.

Statistical Analysis

Food groups were created for the Home IDEA by grouping individual items (e.g. apple, banana, orange, pear) to create a group (e.g. fruit). These groups were developed to match those from the BKFS- fruit, vegetables, potatoes, whole grains, meat, dairy, legumes, and sugar sweetened beverages (SSB). Data were examined for normality of distributions, skewness, kurtosis, and outliers using tests for normality, boxplots, and the normalized z scores. Outliers were adjusted to lessen the impact of extreme scores (Tabachnick & Fidell, 2007). Child dietary intake variables were not normally distributed and were log transformed to improve their characteristics. Descriptive statistics (mean, standard deviation, and frequencies) were calculated for all variables. Differences were considered significant at a $p \leq 0.05$. Because the data were not normally distributed, Spearman correlations were used to analyze relationships among home food availability, dietary intake, weight status and demographic variables. Correlations were considered significant at a $p \leq 0.01$ to decrease the chance of type 1 error.

Significant relationships between home food availability and child dietary intake were included in models for linear and hierarchical linear regression models.

Linear regression models were used to test whether home food availability could predict child dietary intake. Predictor variables consisted of food groups calculated from the Home IDEA (food availability) and outcome variables were food groups from the BKFS (child dietary intake). BKFS variables were not normal and were log transformed. Predictor variables were examined for multicollinearity using the r_s value. Models for predicting dietary intake of different food groups were independently tested.

Hierarchical linear regression models were used to test construct validity and whether food availability home could predict child dietary intake when controlling for demographic characteristics and weight status. Demographic characteristics that significantly correlated with dietary intake food groups were used in the hierarchical linear regression models to improve parsimony for the model. Our predictor variables included demographic characteristics, parent BMI, child weight status, and food groups calculated from the Home IDEA and outcome variables were food groups from the BKFS. Demographic variables were entered as step 1 and home food group availability was entered as step 2. Regression models were 2-tailed ($p \leq 0.05$). All statistical analyses were conducted using Statistical Package for the Social Sciences (version 21.0, IBM SPSS Statistics, Inc., Chicago, IL).

RESULTS

Participant Characteristics

Demographic information is presented in Table 3-1. Complete data were collected from 153 parent/child participants (89.8% mothers, 58.9% were between the ages of 30-49 years). About one third (32%) were Hispanic, 90.8% had a high school education or less, and 70.3% were considered low-income (< 185% poverty; HHS, 2014). The average parent BMI was in the overweight category (26.7 $\pm$ 5.8; CDC, 2011). Twenty seven percent of the 153 children (53% female) were considered overweight or obese (BMI > 85th percentile) (Kuczmarski et al., 2002).

Home Food Environment

Participants reported a high percentage of availability of full fat dairy and meat product items (> 80% availability; see Table 3-2). Eighty-six percent of the homes reported availability of 100% fruit juice, 47% other fruit drinks, 52% regular soda, and 41% sport drinks. Fruit and vegetable item availability ranged from 3-86%. Apples, carrots, corn, bananas, and tomatoes represented the most reported fruit and vegetable items, with each food being present in >75% of homes. When analyzing the Home IDEA by food group, a majority of the families reported having only half of the food items for dairy, whole grains, fruit and vegetable (100%, 79%, 76%, and 78% of families, respectively). Forty-one percent of families reported having greater than half of the SSB items and another 34% of homes had at least 1 SSB.

Child Dietary Intake

The mean child dietary intakes in servings per day for food groups are presented in Table 3-3. Parent reports of child dietary intake indicated that the mean daily consumption of vegetables,

whole grains, protein, and dairy, did not meet USDA dietary recommendations for this age. Recommendations were met for fruit and average daily calories (USDA, 2010).

Relationships between Home Food Availability and Child Dietary Intake

The availability of fruits, vegetables, and whole grains was significantly and positively correlated with the intake of these items, with vegetable intake having the strongest relationship with availability (r_s= 0.36, p=<0.0001; see Table 3-4). The availability of SSB was positively correlated with kcal ingested from SSB (p<0.0001) and negatively correlated with whole grain (p<0.0001) and legume (p<0.0001) availability. There was no significant relationship identified for number of foods available and child total daily calories.

Demographic and weight status characteristics that significantly correlated with home food availability and dietary intake were noted for parent BMI, preschool location, child BMI classification, ethnicity, parent age, and income (p <0.01; see Table 3-5). The strongest relationships were seen in whole grain availability with location, ethnicity and income (p <0.001) and kcal from SSB and location (p =0.006). No significant relationships were identified for education.

Predictions between Home Food Availability and Child Dietary Intake

In multiple, independently tested linear regression models the availability of fruits predicted fruit intake (fruits β=0.25, t (149) = 3.2, p=0.002); vegetable availability predicted vegetable intake (β=0.33, t (148) = 4.3, p <0.0001); and whole grain availability predicted whole grain intake (β=0.16, t (150) = 1.9, p=0.05). Fruit, vegetable, and whole grain availability also explained a

significant proportion of the variance for child dietary intake of fruit (R^2=0.06, F (1, 150) =10.3, p=0.002); vegetable (R^2=0.11, F (1, 149) =18.8 p<0.0001); and whole grains (R^2=0.02, F (1, 151) =3.8, p=0.05). Additionally, the availability of fruit and vegetables, which were included together in a model due to the significant relationship they shared with vegetable intake, predicted dietary intake of vegetables. The model was significant (R^2=0.11, F (2, 148) = 9.5, p<0.0001), however, the significant relationship was only seen in vegetable availability and not in fruit availability (β=0.37, t (148) = 3.7, p<0.0001).

The hierarchical linear regression model for kcals from SSB included demographic predictors (child BMI classification, ethnicity, location, parent age, and income) and home availability of SSB. Step 1 included demographic characteristics and weight status as predictors (child BMI classification, ethnicity, location, parent age, and income), which explained a significant amount of the variance (R^2=0.25, F (5, 123) =8.2, p<0.0001). After controlling for these demographic variables, step 2 showed that SSB availability significantly predicted kcal from SSB, explaining an additional 6.0% of the variance, (R^2=0.31, F (6, 122) = 9.0, p=0.002), (See Table 3-6).

Construct Validity

Based on parent report of home fruit, vegetable, and whole grain availability were positively related to child dietary intake of fruit, vegetable, and whole grain, respectively (See results above). The availability of SSB was significantly and inversely related to kcals from SSB ingested (See Table 3-6).

DISCUSSION

In this study, home food availability predicted child dietary intake for key food groups known to impact childhood obesity- SSB, whole grains, fruits, and vegetables. These results are consistent with previous research investigating the home food environment and child dietary intake, as related to the association of home fruit and vegetable availability and dietary intake of fruits and vegetables (Cullen et al., 2003; Hanson et al., 2005; Nanney et al.,2007; Neumark-Sztainer et al., 2003). This study adds to the literature in that a more complete representation of food groups were assessed, as well as, inclusion of a diverse sample of under-represented families with preschool-aged children. Currently, home food environment studies are representative of older children and adolescents, and well educated, middle to upper income, white families with fruit and vegetable availability and intake the most reported outcomes (Blanchette & Brug, 2005; Campbell et al., 2007; Cullen et al., 2003; Hanson et al., 2005; Nanney et al., 2007; Neumark-Sztainer et al., 2003).

Early childhood is a critical period when proper nutrition is necessary for healthy growth. Nationally, children consistently have been reported to fall below the recommendations for the intake of fruits, vegetables, and whole grains (Guenther et al., 2006; Reicks et al., 2014). The health benefits associated with each of these food groups and the relationship they share with child weight status make them vital areas to understand, particularly in relation to young children's diets (Chatenoud et al., 1998; Jacobs et al., 1998; Montonen et al., 2003; Van Duyn & Pivonka, 2000). Fruit and vegetables are not the only important components to a child's diet; yet home food environment studies have been limited in representation of other food groups. Classifications have been created for total home food availability such as healthy, unhealthy, or

obesogenic favoring categories (Boles et al., 2013; Chi-Ming et al., 2007; Ding et al., 2012; Fulkerson et al., 2008; Haerens et al., 2008). The availability of healthy foods has been associated with the intake of healthy foods and snacks, fruits and vegetables (Chi-Ming et al., 2007; Ding et al., 2012) and homes that are more obesogenic are associated with a higher daily energy intake (Fulkerson et al., 2008). While this exploration of food classification has provided insight into types of foods that impact dietary intake, it has does not provided information about specific food groups, like vegetables, whole grains, or SSB. Understanding the home by food group availability will help identify problematic and modifiable areas in a home, which could positively impact child dietary intake. This study provides additional insight and validity into the relationship of food group availability and child dietary intake, through whole grains, SSB, fruits, and vegetables.

Whole grain consumption in children falls below recommendations with the average daily intake for children being 0.57 ounces a day (Reicks et al., 2014). Within our sample, home whole grain availability was low and child dietary intake of whole grains, while slightly higher than the national average, fell short of recommendations. Whole grain intake is associated with a decreased risk for type 2 diabetes, cancer, and heart disease (Chatenoud et al., 1998; Jacobs et al., 1998; Montonen et al., 2003). The impact whole grain has on health in conjunction with the limited research on the relationship between whole grain home food availability and child dietary intake make it an important food group to further understand.

Previous studies did not explore the relationship between whole grain availability and child dietary intake of whole grains. We identified several demographic and weight status variables

that were significantly associated with home whole grain availability (parent and child weight status, location, ethnicity, income, and parent age) but no such relationships were identified for whole grain intake. In a review of whole grain consumers, Lang et al (2003) reported that while intake of whole grains falls below the recommendations, consumers of whole grains are more likely to be older, from a higher socioeconomic status, less likely to smoke, and more likely to exercise (Lang & Jebb, 2003).Although we did not find any associations with child dietary intake demographic, and weight status characteristics, the characteristics associated with whole grain consumers in Lang et al (2003) are similar to our demographic associations for home whole grain availability as seen in socioeconomic status and age. More home whole grain availability was associated with older, non-Hispanic white families with more income, lower parent and child weight status, living in mountain communities as opposed to the plains. The difference noted for location was assessed due to the significant difference between the 2 rural locations. Families living in the plain communities were more likely to have a higher weight status, as well as, lower income and parent age. Culture, as seen in typical grains consumed (Sharma et al., 2013), could play a role in the relationship identified for ethnicity and WG availability , as well as, weight status (Ogden et al. 2014). Sharma et al. (2013) identified grain (whole and refined) consumption differences in ethnic groups in the US. Hispanic men and women were more likely to consume corn tortillas, rolls, and whole grain cooked cereals when compared to other ethnic groups who were more likely to consume white rice and whole grain bread (Sharma et al., 2013). Further, Hispanic youth have a higher prevalence of obesity when compared to their non-Hispanic white counter parts (Ogden et al., 2014). These differences in dietary consumption of grains and weight status seen in the Hispanic population suggest that these elements could contribute to the differences identified in our sample between Hispanic and non-Hispanic

children. Given the limited research related to home whole grain availability, the complex demographic relationships, and daily whole grain deficits, more research is needed to better understand the factors associated with young children's whole grain intake.

While it is important to understand foods in the home that favor health, it is also important to identify and understand foods in the home that do not support healthy intake, and to determine the relationship those items share with child dietary intake. Contrary to what was found in relation to home whole grain availability, there was a high availability of SSB in a majority of the homes. Regular intake of SSB is associated with an increased risk of weight gain, has a negative impact on milk consumption, and contributes to higher daily energy intake in children (Dubois et al., 2007; Marshall et al., 2005; Mathias et al., 2013). Further, 55-70% of all SSB calories are consumed in the home environment while only 7-15% are consumed at school (Wang et al., 2013) making the home the ideal environment to target to reduce availability and consumption of SSB.

Studies have demonstrated that children who have soft drinks available at home or drink soft drinks with meals are more likely to be high consumers of SSB (Hebden et al., 2013; Downs et al, 2009). Supporting this research, we found that the availability of SSB was associated with increased kcals from SSB in young children. Demographic variables also contribute to SSB intake, as lower socioeconomic status and Hispanic populations have been shown to have higher energy intake from SSB (Haerens et al., 2008; Kant & Graubard, 2011). This study identified high consumers of SSB were more likely to be Hispanic, have a higher weight status and have younger parents with lower income living in the plain communities. While we found significant

relationships in child weight status, income, location, ethnicity, and parent age with SSB availability; only ethnicity and location were identified as the variables predictive to ingestion of kcals from SSB. This finding is consistent with research related to ethnicity and SSB intake and also demonstrates that location plays a role in intake, more than likely due to the other demographic factors associated with location such as weight status, income, and parent age. Despite the significant demographic relationships, SSB availability predicted kcals from SSB, which demonstrates the significant and unique variance SSB availability has on child dietary intake. The relationships identified among demographic variables, home food availability, and dietary intake highlight the important role that resources and culture play in diet quality.

While this study provides additional insight into the home food environment and its relation to children's dietary intake, there are limitations. The cross-sectional study design of this study does not allow for determination of causality. Further, dietary intake for the child participant was reported by the child's parent/caregiver and is subject to self-report bias. Similarly, self-report bias could impact parent response to the Home IDEA. Parents may have under-reported or over-reported home food availability (Home IDEA) and child dietary intake (BKFS). Given the amount of time spent away from home and the different environments in which preschool children eat, memory recall and meals eaten away from parents could have impacted reported child dietary intake.

This study demonstrated that food availability in the home environment is an important factor related to child dietary intake. It also reinforced current home environment literature that suggests that fruit and vegetable availability are related to and predictive of child dietary intake.

Several studies have also found similar relationships between fruit and vegetable availability but most have been in older children and adolescents (Cullen et al., 2001; Cullen et al., 2003; Hearn et al., 1998; Neumark-Sztainer et al., 2003; Wyse et al., 2011). Therefore, this study's findings affirm that, like older children and adolescents, home fruit and vegetable availability is an important factor for dietary intake in young children. The consistent patterns identified for the relationship between home food availability and child dietary intake also support construct validity. The relationship suggests the presence or absence of fruit, vegetable, whole grain, and SSB could facilitate or impede consumption of those foods. Future studies using larger samples will be important to replicate the findings and to address generalizability. Lastly, this study supports the need for further investigations into the home availability of healthful and unhealthful foods which could provide additional insight into the home food environment of young children.

There are limited studies that target samples including families with limited resources, low levels of education, and living in rural communities. Families with limited resources are less likely to meet dietary recommendations and have a poor diet quality when compared to higher income populations (Darmon & Drewnowski, 2008; Kirkpatrick et al., 2012). Additionally, they are more likely to consume refined starches, potatoes, and less fruits and vegetables (Darmon & Drewnowski, 2008) and have less availability of fruits and vegetables (Rosenkranz & Dzewaltowski, 2008). The majority of the families in our sample have lower levels of education and available resources and we demonstrated similar patterns in child dietary intake and home food availability. Ding et al reported that income was a significant predictor for the availability of healthy food but not a significant predictor for unhealthy food in homes with adolescents

(Ding et al., 2012). Our findings suggest that income was associated with a more healthful home food environment (whole grain, diary, and legume) but no association with less healthful items (SSB) was identified. Finally, as previously mentioned, differences were identified in the home environment and child dietary intake between geographical locations. Additional studies should aim to further understand the most at risk and vulnerable populations to enhance efforts to target the home environment to positively impact childhood obesity.

CONCLUSIONS

The present study demonstrated, through the use of a previously validated home assessment, the significant impact of home food availability on dietary intake of preschool-aged children from families with limited resources living in rural locations. It further expanded knowledge about home food group availability in relation to child dietary intake with the inclusion of food groups more representative of a child's diet. These findings provide insight on foods available in the home which can aid in intervention development to intervene and positively impact the health of preschool-aged children. Additionally, other factors, such as SES and parenting behaviors related to the home and child's health, remain important to explore to identify relationships in the home environment that directly impact the health and wellbeing of young children.

Table 3-1: Participant Characteristics for the Colorado LEAP Study (n=153)
[a] Less than $41,000 is a proxy for <185% of poverty (HHS, 2014)

	Parent	**Child**
Anthropometric (m ± sd)		
BMI/BMIz	26.7 ± 5.8	0.46 ± 1.1
Geographic location n (%)		
Mountains	77 (50.3)	
Plains	76 (49.7)	
Demographic variable n (%)		
Relationship to child		
Mother	132 (89.8%)	
Ethnicity		
Hispanic	47 (32.0%)	49 (33.3%)
Race		
American Indian/Alaska Native	6(4.3%)	6 (4.3%)
White	115(82.7%)	116 (82.9%)
Other	15(10.8%)	15(10.7%)
Parent age		
18-29	60 (39.7%)	
30-49	89 (58.9%)	
50-64	3 (1.3%)	
Education		
Some high school	32 (22.7%)	
High school	96 (68.1%)	
College graduate	12 (8.5%)	
Work status		
Not employed	52 (36.4%)	
Part-time	32 (22.4%)	
Full-time	59 (41.3%)	
Income		
< $41,000[a]	99 (70.3%)	
$41,001-$62,000	19 (13.0%)	
Greater than $62,001	23 (16.2%)	

Table 3-2: Parent Reported Home Food Group Availability for Families in the Colorado LEAP Study (n=153)

Food Groups (Total Number of Items)	**Parent Reported Home Food Group Availability (Mean ± SD)**	**Range**
Fruit (27)	8.9 ± 5.2	0-26

Vegetable (26)	9.5 ± 4.5	1-24
Potato (3)	1.6 ± 0.8	0-3
Whole grains (7)	3.0 ± 1.7	0-7
Meat (4)	2.4 ± 0.8	0-4
Dairy (12)	3.4 ± 1.0	0-6
Legumes (5)	2.3 ± 1.2	0-5
Sugar Sweetened Beverages (3)	1.3 ± 1.0	0-3

Table 3-3: Parent Reports of Child Dietary Intake of Preschool Children Enrolled in the Colorado LEAP Study (n=153)

[a] Data is from the Block Kids Food Screener for daily intake reported in cups, ounces, and kcalories.

[b] Recommendations are based on the USDA 2010 Dietary Recommendations (USDA, 2010)

Food Groups and Energy	**Children's Reported Dietary Intake (Mean ± SD)[a]**	**Recommended[b] Food Groups and Energy Intakes for Children (4 y)**
Fruit (cup)	1.6 ± 0.9	1.5
Vegetable (cup)		1.5
Vegetable (cup)	0.7 ± 0.4	
Potato (cup)	0.2 ± 0.2	
Whole grains (oz)	0.7 ± 0.4	2.5
Protein (oz)		4
Meat (oz)	2.2 ±1.2	
Legume (oz)	0.1 ± 0.1	
Dairy (cup)	2.2 ± 0.9	2.5
Sugar Sweetened Beverages (kcals)	17.2 ± 26.8	Limit
Average daily kcals	1205.3 ± 461.6	1200-1400

Table 3-4: Correlations between Home Food Group Availability and Block Kids Food Screener Food Group for Child Dietary Intake

*p < 0.05

**p<0.01

Note. Values represent r value from Spearman Correlations

Note. Home IDEA food items were summed to create food groups

Note. SSB=Sugar Sweetened Beverage; Veg.= Vegetable

BKFS Food Group	Home IDEA Fruit	Home IDEA Veg.	Home IDEA Potato	Home IDEA Whole Grain	Home IDEA Meat	Home IDEA Dairy	Home IDEA Legume	Home IDEA SSB
Fruit	**0.27****	0.13	-0.07	-0.04	0.08	0.04	-0.08	0.03
Veg.	**0.24****	**0.36****	0.09	0.08	**0.16***	0.04	0.09	0.01
Potato	0.05	0.02	0.13	-0.07	0.03	-0.05	**-0.18***	**0.20***
Whole Grain	**0.16***	0.13	-0.00	**0.27****	0.11	0.10	0.05	0.02
Meat	**0.17***	0.08	0.06	0.02	0.16	-0.09	-0.03	**0.23****
Dairy	0.05	0.04	0.07	-0.06	0.08	0.06	0.02	-0.08
Legume	**0.16***	0.04	-0.06	-0.14	-0.07	-0.03	0.00	0.02
Daily kcal from SSB[a]	0.19	**-0.19***	-0.01	**-0.34****	-0.08	**-0.2***	**-0.29****	**0.28****

Table 3-5: Significant Spearman Correlations for Demographic and Weight Status Correlations between Home Food Availability and Child Dietary Intake

Note. Home food group availability is from the Home IDEA and child dietary intake is from the Block Kids Food Screener.

Note: All values reported are significant at $p < 0.01$

[a] Location is defined as the 2 rural locations assessed (Mountains=0, Plains=1)

[b] Ethnicity is defined as Hispanic=0 and Non-Hispanic=1

Demographic &Weight Status	**Home Food Group Availability**		**Child Dietary Intake Food Group**	
Parent BMI	Whole grain	$r_{s=}$ -0.22		
	Legume	$r_{s=}$ -0.25		
Location[a]	Whole grain	$r_{s=}$ -0.41	Potato	$r_{s=}$ 0.27
	Legume	$r_{s=}$ -0.35	Daily kcals from SSB	$r_{s=}$ 0.44
Child BMI Classification	Whole grain	$r_{s=}$ -0.33	Daily kcals from SSB	$r_{s=}$ 0.26
Parent Ethnicity[b]	Whole grain	$r_{s=}$ 0.36	Legume	$r_{s=}$ -0.40
	Meat	$r_{s=}$ 0.29	Daily kcals from SSB	$r_{s=}$ -0.29
Parent Age	Whole grain	$r_{s=}$ 0.25	Daily kcals from SSB	$r_{s=}$ -0.25
	Legume	$r_{s=}$ 0.36		
Income	Whole grain	$r_{s=}$ 0.33	Potato	$r_{s=}$ -0.26
	Dairy	$r_{s=}$ 0.22	Daily kcals from SSB	$r_{s=}$ -0.23
	Legume	$r_{s=}$ 0.29		

Table 3-6: Hierarchical Linear Regression Model to Predict Kcals from Sugar Sweetened Beverage (SSB) by Home Food Sugar Sweetened Beverage (SSB) Availability

**p <0.01

Note. SSB=Sugar Sweetened Beverages

[a] Location is defined as the 2 rural locations assessed (Mountains=0, Plains=1)

[b] Ethnicity is defined as Hispanic=0 and Non-Hispanic=1

Criterion	R^2	B	SE B	B	CI
Kcals from SSB					
Step 1	0.25				
Child BMI classification		0.20	0.38	0.04	(-0.55, 0.95)
Location [a]		2.01	0.56	0.31**	(0.90, 3.10)
Parent Ethnicity [b]		-2.01	0.58	-0.28**	(-3.15, -0.87)
Parent age		-0.64	0.51	-0.10	(-1.65, 0.36)
Income		-0.05	0.11	-0.04	(-0.26, 0.16)
Step 2	0.31				
SSB availability		0.80	0.25	0.24**	(0.29, 1.30)
R^2 Change	0.06**				

REFERENCES

Center for Disease Control and Prevention. (2011). Healthy Weight- It's Not a Diet, it's a Lifestyle. *About BMI for Adults.* Retrieved June 2014, 2014, from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html?s_cid=tw_ob064

Befort, C., Kaur, H., Nollen, N., Sullivan, D. K., Nazir, N., Choi, W. S., Ahluwalia, J. S. (2006). Fruit, Vegetable, and Fat Intake among Non-Hispanic Black and Non-Hispanic White Adolescents: Associations with Home Availability and Food Consumption Settings. *J Am Diet Assoc, 106*(3), 367-373. doi: 10.1016/j.jada.2005.12.001.

Bellows, L. L., Johnson, S. L., Davies, P. L., Anderson, J., Gavin, W. J., & Boles, R. E. (2013). The Colorado LEAP Study: Rationale and Design of a Study to Assess the Short Term Longitudinal Effectiveness of a Preschool Nutrition and Physical Activity Program. *BMC Public Health, 13*, 1146. doi: 10.1186/1471-2458-13-1146.

Birch L.L., Davison, K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America, 48*(4), 893-907.

Blanchette, L., & Brug, J. (2005). Determinants of Fruit and Vegetable Consumption among 6-12-year-old Children and Effective Interventions to Increase Consumption. *J Hum Nutr Diet, 18*(6), 431-443. doi: 10.1111/j.1365-277X.2005.00648.x.

Block, G., Woods, M., Potosky, A., & Clifford, C. (1990). Validation of a Self-administered Diet History Questionnaire Using Multiple Diet Records. *J Clin Epidemiol, 43*(12), 1327-1335.

Boles, R. E., Burdell, A. C., Johnson, S. L., Gavin, W. J., Davies, P. L., & Bellows, L. L. (2014). Home Food and Activity Assessment: Development and Validation of an Instrument for Diverse Families of Young Children. *Appetite*(0). doi: http://dx.doi.org/10.1016/j.appet.2014.04.026.

Boles, R. E., Scharf, C., Filigno, S. S., Saelens, B. E., & Stark, L. J. (2013). Differences in Home Food and Activity Environments between Obese and Healthy Weight Families of Preschool Children. *Journal of Nutrition Education and Behavior, 45*(3), 222-231. doi: http://dx.doi.org/10.1016/j.jneb.2012.09.012.

Boles, R. E., Scharf, C., & Stark, L. J. (2010). Developing a Treatment Program for Obesity in Preschool-Age Children: Preliminary Data. *Children's Health Care, 39*(1), 34-58. doi: 10.1080/02739610903455137.

Booth, S. L., Sallis, J. F., Ritenbaugh, C., Hill, J. O., Birch, L. L., Frank, L. D., Glanz, K., Himmelgreen, D. A., Mudd, M., Popkin, B. M., Richard, K. A., St Jeor, S., & Hays, N. P. (2001). Environmental and Societal Factors that Affect Food Choice and Physical

Activity: Rationale, Influences and Leverage Points. *Nutrition Revue 2001, 59*(3), S21-S39.

Briley, M., & McAllaster, M. (2011). Nutrition and the Child-care Setting. *J Am Diet Assoc, 111*(9), 1298-1300. doi: 10.1016/j.jada.2011.06.012.

Bryant, M., & Stevens, J. (2006). Measurement of Food Availability in the Home. *Nutrition Reviews, 64*(2), 67-76. doi: 10.1301/nr.2006.feb.67-76.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations Between the Home Food Environment and Obesity-promoting Eating Behaviors in Adolescence. *Obesity, 15*(3), 719-730. doi: 10.1038/oby.2007.553.

Chatenoud, L., Tavani, A., La Vecchia, C., Jacobs, D. R., Jr., Negri, E., Levi, F., & Franceschi, S. (1998). Whole Grain Food Intake and Cancer Risk. *Int J Cancer, 77*(1), 24-28.

Chi-Ming, H., Wei, L., Hsiao-Chi, Y., & Wen-Harn, P. (2007). The Relationship between Snack Intake and its Availability of 4th-6th graders in Taiwan. *Asia Pacific Journal of Clinical Nutrition, 16*, 547-552.

Cullen, K. W., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & de Moor, C. (2001). Child-reported Family and Peer Influences on Fruit, Juice and Vegetable Consumption: Reliability and Validity of Measures. *Health Educ Res, 16*(2), 187-200.

Cullen, K.W., Baranowski, T., Owens E, Marsh T, Rittenberry L, De Moor C. (2003). Availability, Accessibility, and Preferences for Fruit, 100% Fruit Juice, and Vegetables influence children's dietary behavior. *Health Education and Behavior, 30*(5), 615-626. doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14582601.

Cullen, K. W., Watson, K., & Zakeri, I. (2008). Relative Reliability and Validity of the Block Kids Questionnaire among Youth Aged 10 to 17 Years. *Journal of the American Dietetic Association, 108*(5), 862-866. doi: http://dx.doi.org/10.1016/j.jada.2008.02.015.

Darmon, N., & Drewnowski, A. (2008). Does social class predict diet quality? *Am J Clin Nutr, 87*(5), 1107-1117.

Davison, K. K., & Birch, L. L. (2001). Childhood overweight: A Contextual Model and Recommendations for Future Research. *Obes Rev, 2*(3), 159-171.

Ding, D., Sallis, J. F., Norman, G. J., Saelens, B. E., Harris, S. K., Kerr, J., Glanz, K. (2012). Community Food Environment, Home Food Environment, and Fruit and Vegetable Intake of Children and Adolescents. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2010.07.003.

Downs, S. M., Arnold, A., Marshall, D., McCargar, L. J., Raine, K. D., & Willows, N. D. (2009). Associations among the Food Environment, Diet Quality and Weight Status in Cree Children in Québec. *Public Health Nutrition, 12*(9), 1504-1511. doi: 10.1017/s1368980008004515.

Dubois, L., Farmer, A., Girard, M., & Peterson, K. (2007). Regular Sugar-sweetened Beverage Consumption between Meals Increases Risk of Overweight among Preschool-aged Children. *J Am Diet Assoc, 107*(6), 924-934; discussion 934-925. doi: 10.1016/j.jada.2007.03.004.

Fulkerson, J. A., Nelson, M. C., Lytle, L., Moe, S., Heitzler, C., & Pasch, K. E. (2008). The Validation of a Home Food Inventory. *Int J Behav Nutr Phys Act, 5*, 55. doi: 10.1186/1479-5868-5-55.

Gattshall, M. L., Shoup, J. A., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of a Survey Instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *Int J Behav Nutr Phys Act, 5*, 3. doi: 10.1186/1479-5868-5-3.

Guenther, P. M., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2006). Most Americans Eat much Less than Recommended Amounts of Fruits and Vegetables. *J Am Diet Assoc, 106*(9), 1371-1379. doi: 10.1016/j.jada.2006.06.002.

Haerens, L., Craeynest, M., Deforche, B., Maes, L., Cardon, G., & De Bourdeaudhuij, I. (2008). The Contribution of Psychosocial and Home Environmental Factors in Explaining Eating Behaviours in Adolescents. *Eur J Clin Nutr, 62*(1), 51-59. doi: 10.1038/sj.ejcn.1602681.

Hanson, N. I., Neumark-Sztainer, D., Eisenberg, M. E., Story, M., & Wall, M. (2005). Associations between Parental Report of the Home Food Environment and Adolescent Intakes of Fruits, Vegetables and Dairy Foods. *Public Health Nutr, 8*(1), 77-85.

Harrison, G., Buskirk, E., Carter, J. (1988). *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics Books.

Hearn, M. D., Baranowski, T., Baranowski J, Doyle C, Smith M, Lin LS, Resnicow K. (1998). Environmental Influences on Dietary Behavior among Children：Availability and Accessibility of Fruit and Vegetables Enable Consumption. *J Health Education, 29*(1), 26-32.

Hebden, L., Hector, D., Hardy, L. L., & King, L. (2013). A Fizzy Environment: Availability and Consumption of Sugar-sweetened Beverages among School Students. *Preventive Medicine, 56*(6), 416-418. doi: http://dx.doi.org/10.1016/j.ypmed.2013.02.017.

Hunsberger, M., O'Malley, J., Block, T., & Norris, J. C. (2012). Relative Validation of Block Kids Food Screener for Dietary Assessment in Children and Adolescents. *Matern Child Nutr*. doi: 10.1111/j.1740-8709.2012.00446.x.

Jacobs, D. R., Jr., Meyer, K. A., Kushi, L. H., & Folsom, A. R. (1998). Whole-grain Intake May Reduce the Risk of Ischemic Heart Disease Death in Postmenopausal Women: The Iowa Women's Health Study. *Am J Clin Nutr, 68*(2), 248-257.

Jeffery, R. W., & Utter, J. (2003). The Changing Environment and Population Obesity in the United States. *Obesity Research, 11*(S10), 12S-22S. doi: 10.1038/oby.2003.221.

Kant, A. K., & Graubard, B. I. (2011). 20-Year Trends in Dietary and Meal Behaviors were Similar in U.S. Children and Adolescents of Different Race/Ethnicity. *J Nutr, 141*(10), 1880-1888. doi: 10.3945/jn.111.144915.

Kirkpatrick, S. I., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2012). Income and Race/Ethnicity are Associated with Adherence to Food-based Dietary Guidance among US Adults and Children. *J Acad Nutr Diet, 112*(5), 624-635.e626. doi: 10.1016/j.jand.2011.11.012.

Kuczmarski, R. J., Ogden, C. L., Guo, S. S., Grummer-Strawn, L. M., Flegal, K. M., Mei, Z., Johnson, C. L. (2002). 2000 CDC Growth Charts for the United States: Methods and Development. *Vital and Health Statistics. Series 11, Data from the National Health Survey*(246), 1-190.

Kumanyika, S., & Grier, S. (2006). Targeting Interventions for Ethnic Minority and Low-Income Populations. *The Future Of Children / Center For The Future Of Children, The David And Lucile Packard Foundation, 16*(1), 187-207.

Lang, R., & Jebb, S. A. (2003). Who Consumes Whole Grains, and How Much? *Proc Nutr Soc, 62*(1), 123-127.

Stark, L. J., Boles R.E., Kuhl E., Ratcliff, M., Scharf, C., Bolling, C., & Rausch, J.. (2010). A Pilot Randomized Controlled Trial of a Clinic and Home-based Behavioral Intervention to Decrease Obesity in Preschoolers. *Obesity, 19*, 134–141.

Marshall, T. A., Eichenberger Gilmore, J. M., Broffitt, B., Stumbo, P. J., & Levy, S. M. (2005). Diet Quality in Young Children is Influenced by Beverage Consumption. *J Am Coll Nutr, 24*(1), 65-75.

Marshall, T. A., Eichenberger Gilmore, J. M., Broffitt, B., Stumbo, P. J., & Levy, S. M. (2008). Relative Validity of the Iowa Fluoride Study Targeted Nutrient Semi-quantitative Questionnaire and the Block Kids' Food Questionnaire for Estimating Beverage, Calcium, and Vitamin D Intakes by Children. *J Am Diet Assoc, 108*(3), 465-472. doi: 10.1016/j.jada.2007.12.002.

Mathias, K. C., Slining, M. M., & Popkin, B. M. (2013). Foods and Beverages Associated with Higher Intake of Sugar-Sweetened Beverages. *American Journal of Preventive Medicine, 44*(4), 351-357. doi: http://dx.doi.org/10.1016/j.amepre.2012.11.036.

Montonen, J., Knekt, P., Jarvinen, R., Aromaa, A., & Reunanen, A. (2003). Whole-grain and Fiber Intake and the Incidence of Type 2 Diabetes. *Am J Clin Nutr, 77*(3), 622-629.

Nanney, M. S., Johnson, S., Elliott, M., & Haire-Joshu, D. (2007). Frequency of Eating Homegrown Produce Is Associated with Higher Intake among Parents and Their Preschool-Aged Children in Rural Missouri. *Journal of the American Dietetic Association, 107*(4), 577-584. doi: 10.1016/j.jada.2007.01.009.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of Fruit and Vegetable Intake among Adolescents: Findings from Project EAT. *Preventive Medicine, 37*(3), 198-208. doi: http://dx.doi.org/10.1016/S0091-7435(03)00114-2.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA, 311*(8), 806-814. doi: 10.1001/jama.2014.732.

Ogden, C. L, Carroll, M., Kit B. K., Flegal, K. M. (2012). Prevalence of Obesity and Trends in Body Mass Index among US Children and Adolescents, 1999-2010. *JAMA, 307*(5), 483-490.

Ostbye, T., Malhotra, R., Stroo, M., Lovelady, C., Brouwer, R., Zucker, N., & Fuemmeler, B. (2013). The Effect of the Home Environment on Physical Activity and Dietary Intake in Preschool Children. *Int J Obes (Lond), 37*(10), 1314-1321. doi: 10.1038/ijo.2013.76.

Reicks, M., Jonnalagadda, S., Albertson, A. M., & Joshi, N. (2014). Total Dietary Fiber Intakes in the US Population are Related to Whole Grain Consumption: Results from the National Health and Nutrition Examination Survey 2009 to 2010. *Nutrition Research*(0). doi: http://dx.doi.org/10.1016/j.nutres.2014.01.002.

Rosenkranz, R. R., & Dzewaltowski, D. A. (2008). Model of the Home Food Environment Pertaining to Childhood Obesity. *Nutrition Reviews, 66*(3), 123-140. doi: 10.1111/j.1753-4887.2008.00017.x.

Sharma, S., Sheehy, T., & Kolonel, L. N. (2013). Ethnic Differences in Grains Consumption and their Contribution to Intake of B-vitamins: Results of the Multiethnic Cohort Study. *Nutr J, 12*, 65. doi: 10.1186/1475-2891-12-65.

Smith, C., & Fila, S. (2006). Comparison of the Kid's Block Food Frequency Questionnaire to the 24-hour Recall in Urban Native American Youth. *Am J Hum Biol, 18*(5), 706-709. doi: 10.1002/ajhb.20475.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Tabachnick, B. G., & Fidell, L. S. (2007). Using Multivariate Statistics (6th ed.). Boston: Pearson/Allyn & Bacon.

Turrell, G., & Kavanagh, A. M. (2006). Socio-economic Pathways to Diet: Modelling the Association between Socio-economic Position and Food Purchasing Behaviour. *Public Health Nutr, 9*(3), 375-383.

United States Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. (2014). *2014 Poverty Guidelines.* Retrieved September 3, 2014 http://aspe.hhs.gov/poverty/14poverty.cfm.

USDA and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC: U.S. Government Printing Office; 2010.

Van Duyn, M. A., & Pivonka, E. (2000). Overview of the Health Benefits of Fruit and Vegetable Consumption for the Dietetics Professional: Selected Literature. *J Am Diet Assoc, 100*(12), 1511-1521. doi: 10.1016/s0002-8223(00)00420-x.

Wang, Y. C., Bleich, S. N., & Gortmaker, S. L. (2008). Increasing Caloric Contribution from Sugar-sweetened Beverages and 100% Fruit Juices among US Children and Adolescents, 1988-2004. *Pediatrics, 121*(6), e1604-1614. doi: 10.1542/peds.2007-2834.

Wyse, R., Campbell, E., Nathan, N., & Wolfenden, L. (2011). Associations between Characteristics of the Home Food Environment and Fruit and Vegetable Intake in Preschool Children: A Cross-sectional Study. *BMC Public Health, 11*, 938. doi: 10.1186/1471-2458-11-938.

CHAPTER 4: A MULTIPLE METHODS APPROACH TO THE MODIFICATION OF A HOME FOOD AND ACTIVITY ASSESSMENT TOOL FOR FAMILIES WITH YOUNG CHILDREN

SUMMARY

Objective

The physical home environment has been linked with health behaviors and outcomes. Home environment assessments rarely have been psychometrically tested with families of geographical and economic diversity. This study aimed to use qualitative and quantitative methods to modify and psychometrically test a home environment assessment with families of preschool-aged children.

Methods

Rural families of children attending preschool participated in separate qualitative (n=11) and quantitative (n=28) studies. The Home IDEA (Inventory Describing Eating and Activity) is a self-report questionnaire that assesses the physical home environment for food and activity items, including food/drinks, physical activity (PA) devices, and electronic devices. In-home interviews were conducted to inform instrument design, followed by modifications and the completion of the modified Home IDEA (Home IDEA-2) by additional parents and independent raters to establish additional psychometric validation.

Results

Qualitative home interviews identified a need for clearer instructions; more detailed description and reorganization of foods; and reduction of food and activity items (159 to 138). Inter-reliability testing of the modified assessment resulted in kappa statistics that were high (0.6-1.0)

for 87 items (63 food, 16 PA, 8 sedentary), moderate (0.4-0.5) for 38 items (37 food, 1 PA), and poor for 16 items ($\leq$0.3) (15 food, 1 sedentary). Overall reliability improved from 53% of original items to 64% of modified items.

Conclusions

Using multiple methods, the psychometric properties for the Home IDEA were established and improved with rural families of preschool-aged children. Based on rigorous tool development methods, our findings fill a significant gap in the literature by providing a validated self-report measurement tool for the home food and activity environment for families with young children.

INTRODUCTION

The home food environment plays an important role in food choices and is a key influencer of food intake for children (Bryant & Stevens, 2006), with the most important determinant of food intake being availability (Cullen et al., 2001; Cullen et al., 2003; Nanney et al., 2007). The complexities in the home environment, including the dynamic availability of food, physical and electronic activity devices, as well as, other societal factors, make it a challenging environment to measure and understand. Accurately assessing the home food and activity environment is critical for identifying factors within the home environment that are related to child dietary intake, physical activity, and sedentary behaviors.

Current methods to assess the home food environment range from nutrient profiling through the use of electronic scanning, shelf inventories, checklists, annotated receipts, and subjective self-report questionnaires (Bryant et al., 2008; Byrd-Bredbenner & Abbot, 2009; French et al., 2008;

French et al., 2009; Gattshall et al., 2008; Dwyer et al., 2011; Hales et al., 2013; Miller & Edwards, 2002; Patterson et al., 1997; Spurrier et al., 2008; Tabak et al., 2012). These methods of evaluation have limitations in understanding of the home food environment through a lack of diversity in ethnicity, socioeconomic status, and child characteristics such as age and weight status. A review by Pinard et al. (2012) examined home environment measures and concluded that there is a lack of psychometrically tested home environment evaluations and a lack of transparency in the psychometric properties of these measures. These limitations limit the quality, generalizability, confidence in findings, and use of current home measures. Thus, there is an identified need for a complete, psychometrically tested home food and activity environment assessment for families with limited resources (Hales et al., 2013; Pinard et al., 2012).

Recent research on a home food and activity environment assessment utilizing the Home Inventory Describing Eating and Activity (The Home IDEA), addressed a gap in the literature in home environment evaluations with limited resource families of young children living in rural communities. This measure was modified from an existing measure, the Home Health Environment assessment (HHE), with established reliability and validity (Boles et al., 2014; Boles et al., 2013), to be more inclusive of families with low socio-economic status. While the Home IDEA demonstrated adequate reliability for food and activity items (Boles et al., 2014), there were areas of concern that warranted the need for further investigation. This study aimed to enhance validity (face, content, and criterion) and reliability (inter-rater reliability) of the Home IDEA for families with young children.

METHODS

A multi-method approach was utilized across two phases: qualitative home interviews (Phase 1) and psychometric testing (Phase 2). These phases were completed at different times with independent samples of parent participants. All participants provided written informed consent. This study was approved by the institutional review board at Colorado State University.

Participants

Families were recruited from 6 rural Colorado Head Start/preschool locations. Interest flyers were sent home with children from preschool and interested parents returned a form to the child's teacher (n=27 Phase 1; n=37 Phase 2). Eligibility for this project included English-speaking families with a child enrolled at the targeted preschools. Interested families were contacted via phone to explain the home research process, verify mailing address, and to schedule a home visit. Once the home visit was scheduled a packet containing a consent form and questionnaires was mailed to the participant. Parents were asked to complete all study questionnaires prior to the home visit. Participants received $20 for their participation.

Measures

Home food and activity assessment. The Home IDEA assessed the availability of food and activity devices in the home as a self-report questionnaire. It evaluated 126 food and drink items (snacks/treats/nuts; cereal; drinks; meat/poultry/fish; dairy; breads/beans/pasta/grains; ready to eat meals; other foods; fruits and vegetables), 16 physical activity devices (e.g. bike, jump rope, sports equipment) and measured the child's bedroom for 12 electronic devices (e.g. TV, computer, Video game player). This version of the Home IDEA was used in Phase 1. For Phase

2, the modified Home IDEA (Home IDEA-2) was used. It included 110 food and drink items (snacks and sweet treats; cereal; child friendly; other foods; beverages; beans and grains; meat; dairy; vegetarian foods; and fruits and vegetables) 17 physical activity devices, and measured the child's bedroom for 9 electronic devices (items for physical activity and electronic devices on the modified Home IDEA (Home IDEA-2) were similar to Home IDEA).

Demographic questionnaire. A demographic questionnaire was used in both Phase 1 and Phase 2. The questionnaire contained items such as race/ethnicity, income, and education.

Procedures

Phase 1: qualitative home interviews. Qualitative home interviews were conducted to further understand participants': 1) process for completing the questionnaire; 2) thoughts about food groupings; 3) usage of nutrition labels; 4) comprehension of questionnaire instructions and; 5) overall experience of completing the Home IDEA.

Interview questions. Development of interview questions were based on results of previous psychometric testing of the Home IDEA (Boles et al., 2014), which included items and sections identified as problematic through reliability testing, as well as, observations made during home visits. The question set was tested for face and content validity with experts in the fields of nutrition, qualitative research methodology, physical activity, and public health to ensure acceptability and understandability of the question set (Trochim & Donnelly, 2006). The final set of interview questions contained 6 open ended questions with multiple probes.

Home interviews. Prior to the home interview, participants completed the Home IDEA and a demographic questionnaire. Home interviews (n=11) were conducted in the participant's home by a trained researcher. Interviews were conducted until theoretical saturation was achieved (Glaser & Strauss, 1967). All interviews were audio recorded and hand written notes were taken by a second researcher to verify audio recordings. Audio recordings were later transcribed and checked against hand written notes. Transcribed interviews underwent investigator triangulation analysis. This method involved the use of 3 different investigators to examine the same qualitative method (transcribed home interviews). The findings from each evaluator were then compared to develop a more complete understanding of how the different investigators viewed the interview responses. Findings were then discussed and agreement for common responses and themes for each question was established (Denzin, 1970; Patton, 1999; Stake, 1995).

Tool modifications. Modifications to the Home IDEA were made based on preliminary testing with the target audience and themes identified from the home interviews. Further, an extensive review of the literature in tool development and the home environment with respect to current evaluations was conducted to identify influential foods related to child health, areas for improvement, and overall format. Finally, input was sought from experts in the fields of nutrition, psychology and public health to ensure content of material was appropriate.

Phase 2: psychometric testing. This step was conducted through concurrent administration of the Home IDEA-2 between researcher and parent (inter-rater reliability) to achieve criterion validity. Testing for food and activity availability of the modified Home IDEA (referred to now

as Home IDEA-2) was conducted to test the modifications that were made to the Home IDEA based on Phase 1 results.

Home visits. Home visits were conducted at a time that was convenient for the participant by two researchers trained in administration of the Home IDEA-2. Participants were instructed to complete the Home IDEA-2 as if the research staff were not in the home. To ensure that the researcher did not influence parent report, researcher completed sections on the Home IDEA that did not overlap with the parent participant. One research team member concurrently filled out the Home IDEA-2, while the second research staff member took hand written notes.

Independent rater and parent rater reliability. Data from the concurrent administration between parent participant and trained research staff were compared to establish criterion validity. Agreement statistics were calculated on the item level using Cohen's kappa coefficient. A kappa statistic of 0.6 or greater was deemed to meet the standard for reliability (Landis & Koch, 1977). Descriptive statistics, frequencies, means and standard deviations, for home food, electronic and physical activity items were conducted. Analyses were conducted using Statistical Packaging for the Social Sciences (version 21.0 IBM SPSS Statistics Inc.,Chicago, IL).

RESULTS

Participant Characteristics

Phase 1: qualitative interviews. Of the 27 participants recruited for the qualitative study, 11 (41%) participated in the home interviews. All of the participants were mothers and mostly white

(91% non-Hispanic). A third (30%) of participants were below 185% poverty level (HHS, 2014) and a majority had a college education (64%).

Phase 2: psychometric testing. Thirty-seven participants were recruited for this phase of which 28 (75%) families participated in the home visits. Ninety percent were mothers and mostly white (21% Hispanic). About half had at least a high school education (57%), a third participated in The Supplemental Nutrition Program for Women, Infants, and Children (WIC) participants (33%), and 54% had incomes below 185% of poverty (HHS, 2014). See Table 4-1 for additional participant characteristics.

Phase 1: Qualitative Home Interviews

Interviews ranged from 25-60 minutes. The results of the home interviews identified the process in which the majority of the parents completed the Home IDEA in order, first page to the last. Despite the design of the Home IDEA, an inventory which requires the participant to physically identify the food or activity items, a majority of the parents relied on their memory to complete the assessment. Parents also identified areas that were confusing or difficult to complete, for example, the child's electronic bedroom environment and the areas in which they needed to refer back to the instructions. These areas were deemed difficult due to wording of instructions and length of sections. Lastly, participants provided insight for additions to enhance the comprehension and overall acceptability of the Home IDEA by including reminders and pictures. Table 4-2 displays the results from the investigator triangulation analysis.

Tool modifications. From prior testing of the Home IDEA, high frequency food and activity items were retained, whereas, low frequency and low reliable items were deleted or incorporated through a different format. Specific themes from the qualitative home interviews were incorporated through the use of pictures, more detailed food item descriptions, frequent reminders, and helpful hints. Additionally, elements of questionnaire design were incorporated through questionnaire format, such as basic page layout, information organization, and task completion (Dillman, 2006). Other elements utilized in questionnaire design included clearer and more direct instructions; an increase in white space; and a decrease in readability score by Flesch-Kincaid Grade Level. Finally, modifications of the Home IDEA resulted in food items being reduced from 131 items to 110 items and electronic devices being reduced from 12 to 9 while the number of items for physical activity devices increased from 16 to 17.

Phase 2: Psychometric Testing

The home visits ranged from 45-90 minutes. Reliability testing resulted in high kappa statistics (0.6-1.0) for 87 items (63 food, 16 PA, 8 sedentary), moderate (0.4-0.5) for 38 items (37 food, 1 PA), and poor for 16 items ($\leq$0.3) (15 food, 1 sedentary). There was high variability within the food items (kappa range from -0.12-1.00) and high reliability for the child's electronic bedroom environment and the physical activity devices, which had kappa statistics greater than 0.6 for all but 1 item in each section (radio (0.3) and jump rope (0.4)). The modifications made to the Home IDEA improved item reliability for food and activity items.Overall reliability increased from 53% of the items for original Home IDEA to 64% of the items for the Home IDEA-2. Kappa statistics and percent availability for each item on the Home IDEA- 2 are presented in Tables (4-3)-(4-8).

Home food and activity availability. Overall, parents reported that there was a high percentage of protein foods (67%), condiments (60%), and convenient style foods (56%) available in the home. The food group with the lowest presence in the home was dairy, with only 26% of the dairy items reported as present in the homes. For the remaining food groups, families reported 30-45% availability of items within each food group - vegetables (35%), sugar sweetened beverages (37%), whole grains (40%), refined grains (43%), and fruits (44%), respectively. Parents reported on average they had 3 boxes of sweetened breakfast cereal (>6 grams of sugar per serving) and 2 boxes of unsweetened breakfast cereal (≤6 grams per serving). When asked about their recent shopping trip, 96% reported a recent trip to the grocery store and only 30% reported having a less than usual amount of food in their home. Within the child's bedroom, 18% of the homes had a TV in the child's bedroom and 21% reported having a tablet. All other electronic item availability was low. In contrast, 11 of the 16 physical activity items reported at greater than 50% availability.

DISCUSSION

The purpose of this study was to utilize a multi-methods approach to enhance the psychometric properties of a self-report home assessment for the availability of food and activity items, the Home IDEA. Results from this study show that formative work, audience driven modifications, and questionnaire design best practices can improve the psychometric properties. This study fills a gap in the literature by providing a complete home assessment - with items addressing nutrition, physical activity and sedentary devices - that has undergone comprehensive formative work and rigorous psychometric testing, with an underrepresented sample (low income and education, rural, and young children with mixed BMI) (Pinard et al., 2012). Prior to this study,

psychometric testing of the Home IDEA with parent participants revealed several areas for improvement both through reliability testing, as well as, researcher observations during home visits (Boles et al., 2014). Using these preliminary results as the framework for the development of the home interview question set further strengthened our results and ensured that the necessary information was garnered to make appropriate modifications.

Qualitative home interviews revealed the diversity of parent's thoughts about their home food environment and provided valuable insight into how the target audience went about completing this assessment. Studies have shown that perception of food and the home food environment is different between parents and children (Kristjansdottir et al., 2009; Van Assema et al., 2007), particularly in regards to food availability. Kristjansdottir et al. (2009) found that child report of fruit availability and accessibility was lower than what was reported by the parent and child perception was a more important determinant of intake than parent reported perception. Results from the interviews showed that parents think about their home food environment differently than nutrition researchers. Parents do not think about foods in groups (e.g. protein, dairy, whole grain) or categories (e.g. fresh, frozen, or canned), like nutrition researchers, they think of foods as how they purchase them (e.g. bread for sandwiches) (See Appendix L).

The process in which parents completed the assessment was also different than the nutrition researcher; they reported that they relied on their memory to complete the assessment. This was consistent with what was observed in the initial testing of the Home IDEA and again with the Home IDEA- 2. Published data on the reliability of self-report measures for the home environment include test-retest (Cullen et al., 2001; Wilson et al., 2008) and inter-rater reliability

(Boles et al., 2014; Hales et al., 2013; Rosno et al., 2008). Both methods can be limited by the dynamic food environment for test-retest and differences between different raters for inter-rater reliability. In our sample, parents reported that they knew what they had in their home since they did all the shopping but some reported when they went to check, the item was absent or there were additional items present. Given the nature of reliability testing, the lack of physical assessment of the home food and activity environment by the parent negatively impacted the reliability results.

Sections that parents reported as problematic were areas that were consistently observed as difficult in our initial work in the home environment (Boles et al., 2014) and with this study (Home IDEA-2) , including, fat percentage in meat and dairy items, sugar content in cereal, and all items that require the use of a nutrition label. Use of the nutrition label is often misinterpreted by adults aged 18-65 (Pelletier et al., 2004) and higher comprehension of the nutrition label has been shown to be related to higher income, education, literacy, and numeracy skills (Rothman et al., 2006). In our sample, home interviews revealed that parents use the nutrition label, primarily in the store before purchase, but did not use it to help them complete the Home IDEA, in phase 1. Based on issues of nutrition label use, the meat and dairy section were modified to eliminate the use of the label, while the use of the nutrition label for grams of sugar on cereal was retained. When Home IDEA-2 testing was conducted, the meat and dairy section were completed with ease while the use of the nutrition label for sugar content of cereal remained problematic for a majority of parent participants, as noted by low reliability and researcher observation. The discordance between perceived knowledge and application of the food label highlights an area that could be addressed in intervention development and future tool testing.

The Home IDEA-2 provides a snap shot of the home food and activity environment. Parents reported having a high percentage of food items in the home that are recommended by the United States 2010 Dietary Guidelines as targets to reduce (less of, such as convenient style foods). In contrast, items that are recommended to increase (fruits, vegetables, whole grains and low-fat dairy) were less available. Availability of food items in the home is important to note due to the relationship food availability shares with child dietary intake. Research has demonstrated, the availability of food items in the home is positively related to dietary intake of those items (Chapter 3; Cullen et al., 2001; Downs et al., 2009; Gross et al., 2010) and the lack of availability of healthful items results in diets higher in fat and soda (Downs et al., 2009). The use of the Home IDEA to identify availability of foods in the home can help to highlight areas or foods in the home to inform messages and strategies to improve diet quality of young children.

In contrast to food availability, parents reported a high percentage of physical activity items and 18% availability of a TV in the child's bedroom. The high percentage of physical activity items present in the home was consistent with previously reported data from the Home IDEA but the availability of TV's in the child's bedroom is in contrast from what was previously reported, which found 51% availability of TV's in the child's bedroom (Boles et al., 2014). This could be due to the higher education level and income level in this sample when compared to Boles et al findings. Studies have shown a positive relationship with physical activity devices such as swing sets and jungle gyms on the physical activity levels of children (Davison & Lawson, 2006; Spurrier et al., 2008) and a negative impact on physical activity and child weight status with the presence of a TV in the child's bedroom (Campbell et al., 2007; Dennison et al., 2002). Given the important relationship with activity availability and child physical activity level, as well as

food availability and child dietary intake, targeting the home food and activity environment could have a positive impact on child health by setting an environment that is conducive to better nutrition and opportunities for physical activity.

The results of this study are subject to several limitations. First, selection bias may have occurred as only those parents who were interested in the topic or motivated to participate took part in this study. Further, for reliability testing, results may have been limited by a small sample size. The samples for both phase I and phase II consisted of parents with higher education and a range of income levels which could have impacted the results of this study. Lastly, the majority of participants in this study were white and non-Hispanic and therefore the results of this study are not generalizable to all parents with preschool-aged children.

No evaluation tool can provide a perfect measure and account for all sources of measurement error. Food is a personal experience and each individual may describe their home food environment differently, making reliability for this type of an assessment challenging. However, there are still areas for improvement, as seen during home visits and reliability testing. Items in the food section still prove to be challenging, this could be due to parents relying on memory, misinterpretation of food items, or lack of knowledge needed to use the nutrition label. The time spent in the homes with parent participants, both in phase I and phase II, allowed for observation and parent comments that further supplement these findings. Parents reported that the Home IDEA made them think about what they have in their home. They viewed it as a health check list, with great excitement when they had the items that they knew they should have, and frustration or justification when they had everything in a section that they deemed not as good. This simple

idea of a health check list that parents can reliably fill out can aid in the development of messages and strategies for home environment interventions.

CONCLUSION

This present study describes the modification and validation of the Home IDEA-2 which is designed to be inclusive of a wide range of foods, physical activity and electronic devices. Using a multi-methods approach, the psychometric properties for the Home IDEA were established with rural families of preschool-aged children. Based on rigorous tool development methods, our findings fill a significant gap in the literature by providing a measurement tool for the home food and activity environment for families with young children. Future investigations should test the Home IDEA with other populations such as different ethnicities, age groups, and geographic locations.

Table 4-1: Participant Demographics for Phase 1: Qualitative Interviews and Phase 2: Psychometric Testing

[a] Less than $41,000 is a proxy for <185% of poverty (HHS 2014)

	Qualitative n=11 (%)	Quantitative n=28 (%)
Gender		
Female	100.0	96.4
Age		
18-29	18.0	25.9
30-49	82.0	70.4
50-64	0.0	3.7
Ethnicity		
Hispanic	9.1	21.4
Education		
Some high school	18.2	7.1
High school graduate	9.1	25.0
Some college	9.1	25.0
College graduate	63.6	39.3
Income (US Dollars)		
<$41,000[a]	30.0	53.8
$41,001-69,000	40.0	11.4
Greater than $69,000	30.0	34.6

Table 4-2: Results from Phase 1: Qualitative Interviews

Question Topic	Parent's Report (n=11)
Process they used to fill out the Home IDEA	• Started at the first page and worked their way through to the last page. • Relied on their memory to complete the Home IDEA.
A walk through of each section and how they think about foods in each section	• The food section proved to be the most difficult for the participants. Particularly meat, fruit and vegetable (due to the lack of understanding about fat content and classification misunderstanding for the fruit and vegetable section). • The child's electronic bedroom environment also proved to be a difficult area for the participants. This was seen in the instructions and the layout of the form. • Viewed the physical activity environment as easy to complete.
Using a nutrition label- in general as well as for completion of the Home IDEA	• Had knowledge of the nutrition label and how to use it. • Used nutrition label mostly in the store for sugar, fat, and calories. • Did not use the label to help them complete the Home IDEA. • Felt that we should provide a reminder for them to use it.
Instructions- the use and comprehension	• Read the instructions before completing the assessment but had to refer back, specifically, for the child accessibility question, child's electronic bedroom, and the fruit and vegetable section (referring back to instructions was due to the length of the questionnaire). • Found the instructions helpful but suggested breaking them into smaller sections, bolding or underlining items, and providing reminders.
Overall experience of completing the Home IDEA	• Found the length ok for everything we were asking. • Liked the font. • Prefer paper over anything electronic. • Viewed this questionnaire as a check list of what they had in their home and thought of their health while filling out the questionnaire.
Additions and suggestions	• Did not like and found the child accessibility question confusing. • Have food item counts or involve the child to facilitate physically checking items within the home. • Include something about garden, seasonality, and grocery shopping. • Add more reminders, color, and explanations to items.

Table 4-3: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Grain and Bean Food Items

Food Item	Kappa	n (% Availability)
Grains and Beans		
Other tortillas	1.0	3 (15.0)
Beans-canned or dried	0.8	25 (89.3)
Quinoa, barley, or couscous	0.8	13 (50.0)
Whole wheat bagel	0.8	2 (7.4)
Refried Beans	0.7	17 (60.7)
White bagel	0.7	5 (19.2)
White rice	0.7	24 (85.7)
Brown rice	0.7	16 (59.3)
White bread	0.6	8 (29.6)
Whole wheat pasta	0.6	14 (51.9)
Whole wheat bread	0.5	19 (70.4)
Other pasta	0.5	6 (30.0)
White flour tortillas	0.5	15 (53.6)
Other bread	0.4	8 (36.4)
Corn tortillas	0.4	14 (50.0)
Other bagel	0.3	4 (17.4)
Regular pasta	0.3	20 (76.9)
Whole wheat tortillas	0.3	5 (17.9)
Cereal		
Unsweetened breakfast cereal (less than or equal to 6g per serving)	0.4	22 (78.6)
Sweetened breakfast cereal (more than 6g per serving)	0.2	23 (82.1)

Table 4-4: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Fruit and Vegetable Food Items

Food Item: Fruit and Vegetable	Kappa	n (% Availability)
Avocado	1.0	5 (18.5)
Apple	0.9	22 (81.5)
Banana	0.8	15 (55.6)
Bell pepper	0.8	10 (40.0)
Butternut, acorn, or spaghetti squash	0.8	3 (11.1)
Raw/unpeeled potato	0.8	15 (55.6)
Watermelon, cantaloupe, or honeydew	0.8	6 (23.1)
Yellow squash or zucchini	0.8	6 (22.2)
Carrot	0.7	23 (85.2)
Cauliflower, cabbage, or brussel sprouts	0.7	11 (40.7)
Grapes	0.7	8 (29.6)
Green beans	0.7	21 (77.8)
Orange, tangerine, grapefruit, or clementine/cuties	0.7	15 (55.6)
Pear	0.7	9 (33.3)
Beets, radish, turnips, jicama, daikon radish, or parsnip	0.6	5 (18.5)
Sweet potato	0.6	8 (30.8)
Asparagus	0.5	1 (3.8)
Blueberries, strawberries, blackberries, or raspberries	0.5	11 (40.7)
Broccoli	0.5	12 (46.2)
Celery	0.5	8 (29.6)
Corn	0.5	21 (77.8)
Lettuce, spinach, collards, kale, chard, or turnip greens	0.5	17 (63.0)
Mushrooms	0.5	10 (37.0)
Pineapple, mango, kiwi , guava, or papaya	0.5	13 (48.1)
Plums, peaches, nectarine, or cherries	0.5	9 (33.3)
Cucumber	0.4	8 (29.6)
Tomatoes	0.3	17 (63.0)
Peas, snap peas, or edamame	0.2	19 (70.4)

Table 4-5: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Protein and Dairy Food Items

Food item	Kappa	% Availability
Meat		
Game	0.8	7 (25.0)
Regular meat	0.6	25 (89.3)
Deli meat	0.6	17 (63.0)
Fish	0.5	20 (71.4)
Shellfish	0.5	8 (28.6)
Lean Meat	0.4	19 (70.4)
Breakfast meat	0.3	18 (64.3)
Vegetarian products		
Soy Products	1.0	4 (14.3)
Eggs	1.0	26 (92.9)
Cheese Alternatives	-0.1	2 (7.1)
Dairy		
Regular cottage cheese	1.0	3 (10.7)
Reduced fat or fat free/lite cottage cheese	1.0	1 (3.6)
Regular yogurt	0.9	14 (50.0)
Reduced fat or fat free/lite yogurt	0.9	6 (21.4)
Regular cheese	0.5	25 (92.6)
Reduced fat or fat free/lite cheese	0.1	5 (17.9)
Skim/fat free milk	0.6	3 (11.1)
1% milk	0.9	7 (25.0)
2% milk	0.8	15 (55.6)
Whole milk (Vitamin D milk)	0.7	9 (32.1)
Other milks	0.3	6 (22.2)
Chocolate milk	-0.1	2 (7.1)

Table 4-6: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Snacks and Sweet Treats and Beverage Items

Food Item	Kappa	n (% Availability)
Snacks and Sweet Treats		
Rice cakes	0.8	5 (17.9)
Nuts	0.8	20 (71.4)
Frozen sweets	0.8	19 (70.4)
Dried fruit	0.7	11 (42.3)
Chips	0.6	24 (88.9)
Saltine crackers	0.6	16 (57.1)
Gummy fruit snacks	0.6	17 (63.0)
Chocolate and candy	0.4	23 (82.1)
Whole grain crackers	0.4	18 (64.3)
Unprepared mixes	0.3	24 (85.7)
Beverages		
Milk alternatives	1.0	9 (32.1)
Regular soda	0.7	15 (53.6)
Diet soda	0.7	5 (17.9)
Sports Drinks	0.7	13 (48.1)
Bottled water	0.7	13 (48.1)
100% Fruit Juice	0.6	19 (67.9)
Drink mixes	0.6	19 (70.4)
Sugar free drink mixes	0.6	6 (22.2)
Fruit juice/drinks	0.4	11 (39.3)

Table 4-7: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Child Friendly and Other Food Items

Food Items	Kappa	n (% Availability)
Child Friendly		
Instant Noodles	0.8	16 (57.1)
Apple sauce	0.8	17 (60.7)
Chicken nuggets, fish sticks, corn dogs, or hot dogs	0.8	15 (53.6)
Pizza	0.7	10 (35.7)
Mac and cheese	0.7	22 (81.5)
Packaged child's meals	0.5	7 (25.9)
Packaged dinners	0.4	14 (50.0)
French fries, tater tots, or hash browns	0.4	20 (71.4)
Other Foods		
Jam, jelly, syrup, or honey	1.0	28 (100.0)
Reduced fat or fat free/lite margarine	0.8	3 (10.7)
Reduced fat or fat free/lite mayonnaise	0.6	6 (21.4)
Shortening (like Crisco®) or lard	0.6	12 (42.9)
Reduced fat or fat free/lite dressing	0.5	10 (35.7)
Nut butters	0.4	20 (74.1)
Regular dressing	0.4	24 (85.7)
Regular mayonnaise	0.4	16 (57.1)
Regular margarine	0.3	10 (35.7)
Butter	0.2	22 (78.6)
Cooking oil	-0.1	12 (92.6)

Table 4-8: Results from Phase 2: Psychometric Testing Kappa Statistic and Percent Availability for Child's Electronic Bedroom Environment Devices and Physical Activity Items

Activity Device	Kappa	n (% Availability)
Electronic		
TV	1.0	5 (18.5)
Digital TV recorder (TIVO)	1.0	0 (0.0)
Video game player	1.0	1 (3.6)
Other	0.9	0 (0.0)
Computer	0.8	3 (10.7)
Music devices	0.8	4 (14.3)
DVD player, Blu-ray player, or VCR	0.6	4 (14.3)
Tablet, IPAD, Kindle, or LEAP Pad	0.6	6 (21.4)
Radio	0.3	5 (17.9)
Physical Activity		
Bike/trike/3-wheeler	1.0	22 (84.6)
Trampoline	0.9	9 (32.1)
Home aerobic equipment	0.9	8 (28.6)
Workout DVD	0.9	14 (50.0)
Outdoor equipment	0.8	18 (64.3)
Hula hoop	0.8	8 (28.6)
Seated toy cars powered by child's feet	0.8	15 (53.6)
Roller skates, skateboard, or scooter	0.8	15 (53.6)
Yoga/exercise mats	0.8	15 (53.6)
Snow equipment	0.8	11 (39.3)
Water equipment	0.8	16 (59.3)
Basketball hoop	0.7	12 (42.9)
Swing set, play house, or jungle gym	0.7	16 (57.1)
Weight lifting equipment/Toning devices	0.6	14(50.0)
Exercise, play, recreation room	0.6	15 (53.6)
Sports equipment	0.6	22 (78.6)
Jump rope	0.5	7 (25.0)

REFERENCES

Boles, R. E., Burdell, A. C., Johnson, S. L., Gavin, W. J., Davies, P. L., & Bellows, L. L. (2014). Home food and activity assessment. Development and Validation of an Instrument for Diverse Families of Young Children. *Appetite*(0). doi: http://dx.doi.org/10.1016/j.appet.2014.04.026.

Boles, R. E., Scharf, C., Filigno, S. S., Saelens, B. E., & Stark, L. J. (2013). Differences in Home Food and Activity Environments between Obese and Healthy Weight Families of Preschool Children. *Journal of Nutrition Education and Behavior, 45*(3), 222-231. doi: http://dx.doi.org/10.1016/j.jneb.2012.09.012.

Bryant, M., & Stevens, J. (2006). Measurement of Food Availability in the Home. *Nutrition Reviews, 64*(2), 67-76. doi: 10.1301/nr.2006.feb.67-76.

Bryant, M. J., Ward, D. S., Hales, D., Vaughn, A., Tabak, R. G., & Stevens, J. (2008). Reliability and Validity of the Healthy Home Survey: A Tool to Measure Factors within Homes Hypothesized to Relate to Overweight in Children. *Int J Behav Nutr Phys Act, 5*, 23. doi: 10.1186/1479-5868-5-23.

Byrd-Bredbenner, C., & Abbot, J. M. (2009). Differences in Food Supplies of U.S. Households with and without Overweight Individuals. *Appetite, 52*(2), 479-484. doi: 10.1016/j.appet.2008.12.011.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations Between the Home Food Environment and Obesity-promoting Eating Behaviors in Adolescence. *Obesity, 15*(3), 719-730. doi: 10.1038/oby.2007.553.

Cullen, K. W., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & de Moor, C. (2001). Child-reported Family and Peer Influences on Fruit, Juice and Vegetable Consumption: Reliability and Validity of Measures. *Health Educ Res, 16*(2), 187-200.

Cullen, K. W., Baranowski, T., Owens E, Marsh T, Rittenberry L, de Moor C. (2003). Availability, Accessibility, and Preferences for Fruit, 100% Fruit Juice, and Vegetables Influence Children's Dietary Behavior. *Health Education and Behavior, 30*(5), 615-626. doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14582601.

Davison, K. K., & Lawson C. (2006). Do attributes in the Physical Environment Influence Children's Physical Activity? A Review of the Literature. *International Journal of Behavior Nutrition and Physical Activity 3*(19). doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=16872543.

Dennison, B. A., Erb, T. A., & Jenkins, P. L. (2002). Television Viewing and Television in Bedroom Associated with Overweight Risk among Low-income Preschool Children. *Pediatrics, 109*(6), 1028-1035.

Denzin, N. K. (1970). *The Research Act: A Theoretical Introduction to Socialogical Methods.* Livingston, NJ: Transaction Publishers.

Dillman, D. A., Smyth, J. D., Christian, L. M. (2006). *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method* (3 ed.). Hoboken, NJ: Wiley, John & Sons, Incorporated.

Downs, S. M., Arnold, A., Marshall, D., McCargar, L. J., Raine, K. D., & Willows, N. D. (2009). Associations among the Food environment, Diet Quality and Weight Status in Cree Children in Québec. *Public Health Nutrition, 12*(9), 1504-1511. doi: 10.1017/s1368980008004515.

Dwyer G. M., Hardy L. H., Peat J. K., & Baur L. A. (2011). The Validity and Reliability of a Home Environment Preschool-age Physical Activity Questionnaire (Pre-PAQ). *International Journal of Behavioral Nutrition and Physical Activity, 8*(86).

French, S. A., Shimotsu, S. T., Wall, M., & Gerlach, A. F. (2008). Capturing the Spectrum of Household Food and Beverage Purchasing Behavior: A Review. *Journal of the American Dietetic Association, 108*(12), 2051-2058. doi: http://dx.doi.org/10.1016/j.jada.2008.09.001.

French, S. A., Wall, M., Mitchell, N. R., Shimotsu, S. T., & Welsh, E. (2009). Annotated Receipts Capture Household Food Purchases from a Broad Range of Sources. *Int J Behav Nutr Phys Act, 6*, 37. doi: 10.1186/1479-5868-6-37.

Gattshall, M. L., Shoup, J. A., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of a Survey Instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *Int J Behav Nutr Phys Act, 5*, 3. doi: 10.1186/1479-5868-5-3.

Glaser, B. G. & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Hawthorne, NY: Aldine Publiching Company.

Gross, S. M., Pollock, E. D., & Braun, B. (2010). Family Influence: Key to Fruit and Vegetable Consumption among Fourth- and Fifth-grade Students. *Journal of Nutrition Education & Behavior, 42*(4), 235-241. doi: 10.1016/j.jneb.2009.05.007.

Hales, D., Vaughn, A. E., Mazzucca, S., Bryant, M. J., Tabak, R. G., McWilliams, C., Ward, D. S. (2013). Development of HomeSTEAD's Physical Activity and Screen Time Physical Environment Inventory. *Int J Behav Nutr Phys Act, 10*, 132. doi: 10.1186/1479-5868-10-132.

Kristjansdottir, A. G., De Bourdeaudhuij, I., Klepp, K.-I., & Thorsdottir, I. (2009). Children's and parents' perceptions of the determinants of children's fruit and vegetable intake in a low-intake population. *Public Health Nutrition, 12*(8), 1224-1233. doi: 10.1017/s1368980008004254.

Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. *Biometrics, 33*(1), 159-174.

Miller, C., & Edwards, L. (2002). Development and Validation of a Shelf Inventory to Evaluate Household Food Purchases Among Older Adults with Diabetes Mellitus. *Journal of Nutrition Education and Behavior, 34*(5), 261-267. doi: Doi: 10.1016/s1499-4046(06)60104-8.

Nanney, M. S., Johnson, S., Elliott, M., & Haire-Joshu, D. (2007). Frequency of Eating Homegrown Produce Is Associated with Higher Intake among Parents and Their Preschool-Aged Children in Rural Missouri. *Journal of the American Dietetic Association, 107*(4), 577-584. doi: 10.1016/j.jada.2007.01.009.

Patterson, R. E., Kristal, A. R., Shannon, J., Hunt, J. R., & White, E. (1997). Using a Brief Household Food Inventory as an Environmental Indicator of Individual Dietary Practices. *Am J Public Health, 87*(2), 272-275.

Patton, M. Q. (1999). Enhancing the Quality and Credibility of Qualitative Analysis. *Health Services Research*. 34(5 Pt 2):1189-208.

Pelletier, A. L., Chang, W. W., Delzell, J. E., Jr., & McCall, J. W. (2004). Patients' Understanding and Use of Snack Food Package Nutrition Labels. *J Am Board Fam Pract, 17*(5), 319-323.

Pinard, C. A., Yaroch, A. L., Hart, M. H., Serrano, E. L., McFerren, M. M., & Estabrooks, P. A. (2012). Measures of the Home Environment Related to Childhood Obesity: A Systematic Review. *Public Health Nutr, 15*(1), 97-109. doi: 10.1017/s1368980011002059.

Rosno, E. A., Steele, R. G., Johnston, C. A., & Aylward, B. S. (2008). Parental Locus of Control: Associations to Adherence and Outcomes in the Treatment of Pediatric Overweight. *Children's Health Care, 37*(2), 126-144. doi: 10.1080/02739610802006544.

Rothman, R. L., Housam, R., Weiss, H., Davis, D., Gregory, R., Gebretsadik, T., Elasy, T. A. (2006). Patient Understanding of Food Labels: The Role of Literacy and Numeracy. *American Journal of Preventive Medicine, 31*(5), 391-398. doi: http://dx.doi.org/10.1016/j.amepre.2006.07.025.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Stake, R. E. (1995). *The Art of Case Study Research.* Thousand Oaks, CA: Sage Publications, INC.

Stark, L. J., Boles R.E., Kuhl E., Ratcliff, M., Scharf, C., Bolling, C., & Rausch, J.. (2010). A Pilot Randomized Controlled Trial of a Clinic and Home-based Behavioral Intervention to Decrease Obesity in Preschoolers. *Obesity*, *19*, 134–141.

Tabak, R. G., Tate, D. F., Stevens, J., Siega-Riz, A. M., & Ward, D. S. (2012). Family Ties to Health Program: A Randomized Intervention to Improve Vegetable Intake in Children. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2011.06.009.

Trochim, W. K. & Donnelly, J. P. (2006). *The Research Methods Knowledgebase (3rd Edition).* Cincinnati, OH: Atomic Dog Publishing.

United States Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. (2014). *2014 Poverty Guidelines.* Retrieved September 3, 2014 http://aspe.hhs.gov/poverty/14poverty.cfm.

Van Assema, P., Glanz, K., Martens, M., & Brug, J. (2007). Differences Between Parents' and Adolescents' Perceptions of Family Food Rules and Availability. *Journal of Nutrition Education and Behavior, 39*(2), 84-89. doi: http://dx.doi.org/10.1016/j.jneb.2006.08.031.

Wilson, A. M., Magarey, A. M., & Mastersson, N. (2008). Reliability and Relative Validity of a Child Nutrition Questionnaire to Simultaneously Assess Dietary Patterns Associated with Positive Energy Balance and Food Behaviours, Attitudes, Knowledge and Environments Associated with Healthy Eating. *Int J Behav Nutr Phys Act, 5*, 5. doi: 10.1186/1479-5868-5-5.

CHAPTER 5: AN EXPLORATORY STUDY TO EXAMINE THE RELATIONSHIP BETWEEN FAMILY FUNCTIONING AND THE HOME FOOD AND ACTIVITY ENVIRONMENT

SUMMARY

Purpose

Family functioning is associated with parent and child behaviors and their weight status. There is limited understanding of the mechanisms at work between family functioning variables and outcomes related to childhood obesity. This exploratory study aimed to identify relationships among family functioning and the home food and activity environment.

Methods

Rural families of children attending preschool participated in home visits (n=28). Participants completed measures of family functioning (Chaos, Organization, and Control) and the Home Inventory Describing Eating and Activity (Home IDEA), a self-report questionnaire for the physical home environment for food and activity items. Parent and child height and weight were collected during the home visit.

Results

Parent weight status was associated with Control (r_s =0.33; p=0.03) and Chaos (r_s =-0.29; p=0.05). Parent age (r_s =-0.29; p=0.1) and child Ethnicity (r_s=-0.42; p=0.02) were related to Control. Organization and Chaos were significantly and positively related (r_s = 0.42; p=0.02). Chaos was positively and significantly related to meat availability (r_s=0.36, p=0.06) and no other relationships were identified among family functioning and the home food and activity environment.

Conclusion

This exploratory study affirmed the important relationship parent weight status shares with family functioning. While no relationships were identified for family functioning and the home food and activity environment, this area is crucial to explore further with a larger sample to understand the impact on family functioning as it relates to key influencers related to childhood obesity.

INTRODUCTION

Family functioning impacts the health of the home environment, as well as child behavior and weight status (Li Wen et al., 2011; Halliday et al., 2013; Kitzman et al., 2008; Hanscombe et al., 2011). Poor family functioning is associated with an increased risk of obesity and overweight (Halliday et al., 2013; Kitzman et al., 2008), fewer health promoting parent diet and activity behaviors (e.g. consumption of fast food and excessive screen time use) (Li Wen et al., 2011), and poorer coping skills (Jackson, 2005; Rubenstein & Feldman, 1993). Further, there is an increased risk of obesity for families with limited resources, as they are more likely to have less family support and organization and more stressors (Lohman et al., 2009; Parnicky et al., 1985; Patel, 2000). The level of confusion, chaos, and organization within the home has a direct impact on the development of children's cognitive ability, self-esteem, verbal development, performance in school and behavioral outcomes (Wachs, 1993; Petrill et al., 2004; Hanscombe et al., 2011; Bell et al., 2001). Also, chaos in the home impacts parent behaviors as seen through ineffective parent discipline, limited ability to comprehend and respond to their child's cues, and less constructive parent child interactions (Dumas et al., 2005).

A recent review of family functioning and childhood and adolescent obesity called for a higher level of evidence and greater understanding into the mechanisms behind family functioning and childhood obesity, better family functioning measures, and inclusion of family functioning in childhood obesity research and interventions (Halliday et al., 2013). Further, there is limited use of family theories in the study of pediatric obesity (Skelton et al., 2012). Skelton et al. (2012) recommend three important elements that need to be included in childhood obesity prevention and treatment to ensure effectiveness:1) focus on family functioning as a unit, 2) the family's desire for balance, and 3) addressing the external environments that impact the family, such as resources and demands.

This project aims to build upon our current research related to the home environment (Boles et al., 2013; Boles et al., 2014; Chapter 3 & 4) by exploring family functioning measures as they relate to the home food and activity availability environment and demographic characteristics. The purpose of this project is to gain additional insight into the usefulness of home food and activity availability as it relates to family functioning. This exploratory study is based on observations of working with the families in the rural communities over the past few years which revealed a need to better understand external determinants that impact the food and activity environment of rural families with young children. Home visits with these families revealed a level of chaos, stress, and family disorganization that we believe is impacting the home food and activity environment. Additional exploration and measurement of family functioning will provide insight into how these determinants might relate to the home food and activity environment. Thus, this project aims to better understand the relationship among three indicators

of family functioning - Chaos, Organization, and Control - the home food and activity environment, and demographic characteristics.

METHODS

Participants & Procedures

Families were recruited from 6 rural Colorado preschool locations. Flyers were sent home with children from the preschool and interested parents returned a form to the child's teacher (n=37) (Note: families are from the same sample as Phase II in Chapter 4). Twenty-eight of the 37 participated in the study. Eligibility for this project included English speaking families with a preschool aged child. Interested families were contacted via phone to explain the home research process, verify mailing address, and to schedule a home visit. Once the home visit was scheduled a packet containing a consent form and questionnaires (Family Chaos, Family Environment, and Demographic Questionnaire) was mailed to the participant. Parents were asked to complete all study questionnaires prior to the home visit. Other measures (Home IDEA-2 and weight status; described below) were conducted at the time of the home visit. Participants received $20 for their participation.

Measures

Family chaos. The degree of chaos was measured using the Confusion, Hubbub, and Order Scale (CHAOS; Matheny, 1995). The scale consists of 15 items rated on a 6 point likert scale (1=very much agree to 6= very much disagree) about the level of chaos in the home. Two sample questions include: "We almost always seem to be rushed" (regular score example) and "There is very little commotion in our home" (reverse score example). A total Chaos score was generated

by summing the items (following reverse scoring so that low values=high chaos). These items have acceptable internal consistency, as measured by Cronbach's alpha (Matheny, 1995).

Family environment. The Family Environment Scale (FES; Moos & Moos, 2009) is one of the most widely used instruments to assess family context in clinical and community research. It has undergone psychometric testing with diverse samples and has demonstrated good reliability (Moos & Moos, 2009). For this study, 2 of the 10 subscales were used to assess the family environment: organization (9 questions) and control (9 questions). Organization measures the level of importance organization and structure play in family life. A higher Organization score indicates a greater level of family organization. Control assesses to what extent rules and procedures are used to run family life. A higher score on Control indicates a more hierarchical, rule bound family that is high on the demandingness and low on responsiveness. A sample item for family Organization is "We are generally very neat and orderly" and a sample item for Control is "There are set ways of doing things at home". Participants are asked to mark a True or False for all statements. A total Organization and Control score are generated by summing the items under each subscale (following reverse scoring).

Home environment. The Home IDEA-2 assessed the availability of food and activity devices in the home as a self-report questionnaire. The Home IDEA-2 underwent appropriate psychometric testing with a majority of the items meeting reliability (kappa $\geq$ 0.60) (Boles et al., 2014; Boles et al., 2013) (See Chapter 4). It evaluated 110 food and drink items, 17 physical activity devices and measured the child's bedroom for 9 electronic devices (e.g. television, tablet). Only items that met reliability (kappa statistic $\leq$ 0.6) and fell under the appropriate food group categories

(fruit, vegetable, snacks, sugar sweetened beverage (SSB), whole grain, regular grain, legume, meat, child friendly, condiments, and fats) were included in the analysis (63 food and beverage items, 16 physical activity devices, and 8 electronic).

Weight status. Parent and child weight and height were measured, by the researcher, according the method of Harrison and colleagues (Harrison, 1988) on a digital scale (Lifesource ProFit UC321; Milpitas, CA) to the nearest 0.05 kg and by portable stadiometer to the nearest 0.1 cm (Seca Corp, Hamburg, Germany) by trained research staff. Children Body Mass Index (BMI) and sex- and age-adjusted BMIz scores were calculated in the manner documented in the 2000 CDC Growth Charts for the United States (Kuczmarski et al., 2002). Children's weight status was classified according to The National Center for Health Statistics (NCHS) CDC BMI categories (underweight ($< 5^{th}$ percentile, normal (5^{th}- $< 85^{th}$), overweight (85^{th}- $< 95^{th}$), and obese ($\geq 95^{th}$) for age and sex (Kuczmarski et al., 2002). Parent BMI was calculated from self-reported height and weight with the Center for Disease Control adult BMI equation, weight (kg) / [height (m)]^2 (CDC, 2011).

Demographic characteristics. The demographic questionnaire contained items that collected information regarding race, ethnicity (Hispanic=1, Non-Hispanic=2), parent age, income, and education.

Statistical Analysis

Food groups (fruit, vegetable, snacks, sugar sweetened beverage (SSB) whole grain, regular grain, legume, meat, convenience foods, diary, condiments, fats, electronic and physical activity

devices) were created for the Home IDEA-2 by grouping reliable (kappa statistic $\leq$ 0.6) food and beverage items (e.g. whole wheat bread, brown rice, whole wheat pasta) to create a group (e.g. whole grains). For family functioning variables - Chaos, Organization, and Control - subscales were created by summing the scored items for each scale. Organization and Control variables were transformed from their raw score to a standard score using the Raw Score to Standard Score Conversion Table (Moos & Moos, 2009). Family functioning subscales were then assessed for internal consistency using Cronbach's alpha. Data were examined for normality of distributions, skewness, kurtosis, and outliers. Outliers were assessed using box plots and the normalized z score; a z score value above 3.29 was considered an outlier (Tabachnick & Fidell, 2007). Descriptive statistics (means, SD, and frequencies) were calculated for home food and activity, family functioning, demographic and weight status variables.

Because home food availability data were not normally distributed, Spearman correlations were used to analyze relationships among home food and activity groups, family functioning variables, demographic and weight status variables. Due to the exploratory nature of this study, a significance level was set at a $p < 0.10$. All statistical analyses were conducted using Statistical Package for the Social Sciences (version 21.0, IBM SPSS Statistics, Inc., Chicago, IL).

RESULTS

Participant Characteristics

Demographic and weight status information is presented in Table 5-1. Complete data were collected from 28 parent/child participants (37 recruited; 28 participated). Most participants were mothers (21% Hispanic) with limited resources (58% <185% poverty; HHS, 2014). About a third

of the families participated in The Special Supplemental Nutrition Program for Women Infants and Children (commonly referred to as WIC) (33%) and had at least a high school education (32%).

The Family Functioning

Results from Cronbach's alpha were good for the Chaos scale (α=0.82), acceptable for Control (α= 0.61) and poor for Organization (α =0.48). Distributions for Chaos, Organization, and Control were normal, data were not significantly skewed, and there were no outliers. Descriptive statistics for family functioning and the home food and activity environment can be found in Table 5-2.

Chaos. In this sample, the reported average Chaos score was 4.54 $\pm$ 0.57. The range of possible values for Chaos scores is 1-6, with a high score representing low chaos in the home.

Organization. The range of possible values for Organization is 0-9 for raw scores, and 21-69 for standard scores; a high Organization score represents high organization. The raw mean Organization score for this sample was 6.29 $\pm$ 1.82. The mean standard score for Organization was 54.32 $\pm$ 9.60. Comparison of means and standard deviations between Organization, Control, and other groups (Normal and Distressed Adults, and African American and Latino Populations) can be found in Table 5-3 (Moos & Moos, 2009).

Control. The range of possible values for Control is 0-9 for raw scores and 27-76 for standard scores, a high Control score represents more control. The raw mean score for this sample was

4.61 ± 1.89. The standard mean score for this sample was 51.82 ± 10.20, which falls in the middle of the range of possible values.

The Home Food and Activity Environment

Distributions for sugar sweetened beverage (SSB), legume, meat, condiments, fats, and electronic and physical activity devices were not normal. Overall, there was a high percent availability (>50.0) of less healthful food items (condiments, convenience foods, and fats) and lower percent availability of more healthful food items (whole grains, dairy, and fruits, and vegetables). More detailed results for this data are presented elsewhere (Chapter 4, Tables 4-3 through 4-8; Note: same sample size n=28).

Relationships among Family Functioning, Home Food and Activity, Demographic, and Weight Status Variables

Family functioning variables Organization, and Control were not related to any home food or activity variables while Chaos was positively and significantly related to meat availability (r_s=0.36, p=0.06). Chaos was inversely related to parent BMI (r_s =-0.29; p=0.05) (note: a lower Chaos score is representative of high chaos). Control was positively related to parent BMI (r_s =0.33; p=0.03) and inversely related to parent age (r_s =-0.29; p=0.1). There was a significant difference between Control and child ethnicity, a higher control score was noted for Hispanic children (p=0.02). Lastly, Organization and Chaos were positively and significantly related (r_s = 0.42; p=0.02), which can be interpreted by a high level of organization and a low level of chaos (See Tables 5-4 and-5-6).

DISCUSSION

The purpose of this study was to explore relationships between select family functioning variables (Chaos, Organization, and Control) and the home food and activity environment through the availability of food and activity devices. While home meat availability was the only relationship identified among all 3 family functioning variables in this small exploratory study, there were significant relationships among family functioning, parent weight status, and child ethnicity, which is consistent with the current literature related to parent's influence on the home environment and child (Halliday et al., 2013; Li Wen et al., 2011; Kitzmann et al., 2008) and affirms the important relationship between family functioning and parent characteristics.

A majority of research for family functioning, as it relates to nutrition and activity, examines relationships between family functioning and behaviors such as dietary intake (Li Wen et al., 2011; Berge et al., 2013), activity (Berge et al., 2013), and family meal time (Rhee et al., 2008). Higher family functioning (structural, organizational, and interaction patters of family) is associated with less sedentary behavior and more frequent family meals and breakfast consumption in adolescent boys and girls (Berge et al., 2013). Lower family functioning is associated with more obesity favoring behaviors in mothers with young children (e.g. consumption of SSB, fast food, and excessive small screen time use) (Li Wen et al., 2011). This study explored how the availability of home food items and activity devices related to family functioning, as this is an area that has not been investigated. No significant relationships were identified among availability of food and activity devices. The insignificant findings could represent the important role family functioning shares with behaviors as opposed to the physical environment. However, behaviors like healthy eating policies and rules at home, such as

restricting sweetened beverages, have been shown to positively influence a child's diet (Spurrier et al., 2008; Gatshall et al.,2008). Gatshall et al (2008) reported that the healthy eating and physical activity policies were related to the availability of fruits, vegetables, SSB, and physical activity devices. This relationship demonstrates that parent rules and policies set the home environment which has a positive influence on child dietary intake and activity. Further research is needed to better understand how family functioning relates to the home food and activity environment given the limited understanding and research in this area.

Parent weight status and behaviors such as diet, feeding practices, parenting styles, and physical activity, influence the home environment and child behaviors and weight status (Johnson et al., 2011; Davison & Birch, 2001; Rhee et al., 2008; Spurrier et al., 2008; Gatshall et al., 2008; Wyse et al., 2011; Finn et al., 2002). Research has shown that a higher level of control is associated with obese mothers and parents who exert more control during mealtime are more likely to have a child that is overweight (Zeller et al., 2007; Mohens et al., 2007). However, this relationship is hypothesized that more controlling behaviors are not a cause for increased weight status but are a response to the child's weight and therefore could be more reflective of differences in parenting styles (Rhee et al., 2008). Further, ethnic minorities are more likely to report higher levels of achievement orientation, moral-religious values, organization, and control (Moos & Moos, 2009; Appendix C). We identified a similar relationship with Control, parent BMI and child Ethnicity. A higher Control score was positively related to parent BMI which suggests that overweight parents are more likely to engage in controlling behaviors. A higher Control score was also associated with ethnicity, however, the relationship was identified only between child ethnicity, not parent ethnicity. This could be explained due to mixed families with both Hispanic and Non-

Hispanic parents. Hispanic children are more likely to be overweight (Ogden et al., 2012) and in response, the parent completing the form reported a higher level of Control, in the home, which aligns with the hypothesis of controlling behaviors in response to overweight children (Rhee et al., 2008). These relationships are important to note as families that report a higher level of control and conflict have less coping skills (Jackson, 2005; Lohman & Jarvis, 2000; Rubenstein & Feldman, 1993) which could make dealing with stressors, demands, and changes more difficult for these families.

We also identified a significant relationship between Chaos and parent BMI and meat availability. The relationship identified between Chaos and home meat availability provides evidence that measures of family functioning relate to home food availability but given the small sample size of this study, further investigation is necessary to better understand home food and activity availability and family functioning. Chaos in the home was also related to parent BMI with more confusion and disorganization in the home (Chaos), the higher the parent BMI. This relationship is important to note as the level of chaos in the home influences parent and child behaviors with more chaos resulting in poor behavioral outcomes (Dumas et al., 2005; Coldwell et al., 2006; Petrill et al., 2004). Additionally, Zeller et al (2007) found that maternal distress level was associated with a higher child BMI, independent of maternal BMI, which aligns with the findings in this study with the level of Chaos relating to parent BMI. Family function factors, like the level of chaos and stress, are important components to address in the development and implementation of home environment interventions as they relate to family outcomes. By addressing these factors, through coping strategies, there could be positive changes made in the

health of the home environment which would be beneficial not only for child health but the health of the entire family.

There are several limitations to this exploratory study. The most notable is the small sample size which may have impacted the lack of relationships identified between family functioning and the home food and activity environment. It is also important to note that these families had an overall good level of family functioning which could also explain the limited findings between the home food and activity environment and family functioning. These results may not be generalizable to other populations given the sample population is rural families with young children. Additionally, the Cronbach's alpha value was low for Control and while acceptable for Organization, attention should be noted. This result could reflect that the measures for Organization and Control might not be the most appropriate for this population.

Based on observations in the home, the significant relationships identified in this study with family functioning and parent weight status, and the lack of understanding of family functioning in the home food and activity environment, it is important to continue to explore the mechanisms of family functioning and how it impacts the home environment. Future investigations should include both qualitative and quantitative methods, as well as testing with a larger sample size to gain better insight into the mechanisms behind family functioning and the home food and activity environment. This could include more measures of family functioning variables like, stress, conflict, or social support and parent behaviors such as, parenting style and feeding practices, along with Chaos, Organization, and Control. Using qualitative methods such as focus

groups would provide a greater understanding into why there is disorganization, chaos, stress, and conflict for families.

CONCLUSION

This study explored relationships among family functioning, the home food and activity environment, demographics and weight status. Despite the limited results with the home food and activity environment, this continues to be an important and emerging area to explore and understand, as family functioning directly impacts family health. With increased insight into the role family functioning plays in the home food and activity environment, there can be more specific tailoring of home environment interventions which may improve effectiveness and sustainability of behavior change for childhood obesity prevention efforts.

Table 5-1: Demographic Characteristics for Study Parent and Child Participants (n=28)
[a] Less than $41,000 is a proxy for <185% of poverty (HHS, 2014)

Anthropometric (M ± SD)	**Parent**	**Child**
BMI/BMIz	28.7 ± 7.3	0.31 ± 1.6
Demographic variable n (%)		
Gender		
Female	27 (96.4)	9 (32.1)
Male	1 (3.6)	19 (67.9)
Age		4.2 yrs
18-29	7 (25.9)	
30-49	19 (70.4)	
50-64	1 (3.7)	
Ethnicity		
Non-Hispanic	22 (78.6)	22 (78.6)
Hispanic	6 (21.4)	6 (21.4)
Education		
Some high school	2 (7.1)	
High school graduate	15(53.6)	
College graduate	13 (39.3)	
Income		
Less than or equal to $41,000[a]	14 (53.8)	
41,001-48k	2 (7.6)	
Greater than $62,000	10 (38.4)	

Table 5-2: Home Environment Means, Standard Deviations, Confidence Intervals, and Ranges for Study Parent Participants

Note. An Organization score of less than 50.0 is classified as disorganized (Billings & Moos, 1982)

Note. There is not a functional categorization for Control. A higher control score indicates more control in the home.

Note. Possible range for Chaos score is 1-6. A higher Chaos score indicates less chaos in the home.

[a] Standard score values, Confidence Intervals and Ranges are based on these values.

Item (total # of items)	Mean ± SD	CI	Range
Fruit (n=7)	3.1 ± 1.8	2.4, 3.7	(0-6)
Vegetable (n=10)	3.5 ± 1.8	2.8, 4.2	(1-7)
Snacks (n=6)	5.9 ± 1.7	5.2, 6.6	(1-6)
SSB (n=3)	1.7 ± 1.1	1.2, 2.1	(0-3)
Whole grain (n=4)	1.6 ± 1.2	1.1, 2.0	(0-4)
Regular grain (n=3)	1.3 ± 0.8	1.0, 1.6	(0-3)
Legume (n=3)	1.6 ± 0.7	1.4, 1.9	(0-3)
Meat (n=4)	2.7 ± 1.0	2.3, 3.0	(0-4)
Convenience foods (n=5)	2.8 ± 1.5	2.2, 3.5	(0-5)
Dairy (n=8)	2.1 ± 1.1	1.6, 2.5	(0-4)
Condiments (n=2)	1.2 ± 0.4	1.0, 1.3	(1-2)
Electronic devices (n=8)	0.8 ± 1.0	0.4, 1.2	(0-3)
Physical activity devices (n=16)	8.2 ± 4.4	6.5, 9.9	(0-14)
Chaos	4.5 ± 0.57	4.3, 4.8	(3.2-5.7)
Organization	54.3 ± 9.6[a]	54.5, 58.0	(37-69)
Control	51.8 ± 10.2[a]	47.9, 55.8	(32-76)

Table 5-3 Comparison of Means and Standard Deviations among Study Sample and Normal and Distressed Adults, and African American and Latino Populations

Note. Comparison groups for normal adults, distressed adults, African Americans & Latinos from Moos & Moos, 2009 Appendix C

Note: A high Organization score represents more organization in the home.

Note: A high Control score represents more control in the home.

Comparison Group	Possible Values	This Study (n=28)	Normal Adults (n= 17, 730)	Distressed Adults (n=5,435)	African Americans & Latinos (n=454)
Organization	0-9	6.29 $\pm$ 1.82	5.72 $\pm$ 2.12	5.32 $\pm$ 2.25	6.02 $\pm$ 2.28
Control	0-9	4.61 $\pm$ 1.89	4.72 $\pm$ 2.04	5.10 $\pm$ 2.10	4.99 $\pm$ 2.07

Table 5-4: Correlations among Family Functioning and the Home Food Environment

**p < 0.1*

Note. Veg. = vegetable; SSB= sugar sweetened beverage; WG= whole grain; RG= regular grain; Leg.= legume; CF= convenience food; Cond.= condiments; Org.= Organization; Con.= Control

[a] A higher Chaos score= lower chaos

Variable	Fruit	Veg.	Snacks	SSB	WG	RG	Leg.	Meat	CF	Diary	Cond.	Fats
Chaos[a]	0.01	0.30	-0.04	-0.01	0.11	-0.05	0.04	0.36*	-0.23	0.12	0.03	0.10
Org.	-0.01	0.03	-0.02	-0.01	-0.01	-0.01	0.15	0.13	-0.002	0.01	0.10	-0.18
Control	0.03	0.04	0.02	0.11	-0.08	0.01	0.24	-0.10	0.15	0.12	0.26	-0.30

Table 5-5: Correlations among Family Functioning and the Home Activity Environment
*p<0.05
Note. PA= physical activity
[a] A higher Chaos score= lower chaos

Variable	Electronic Devices	PA Devices	Chaos	Organization	Control
Chaos [a]	0.20	0.23		**0.42***	-0.06
Organization	-0.18	0.10	**0.42***		0.17
Control	-0.04	-0.20	-0.06	0.17	

Table 5-6: Correlations among Family Functioning, Demographic, and Weight Status for Study Participants

*p<0.1
**p<0.05
***p<0.01
Note. Org.=Organization
Note. A higher Chaos score= lower chaos
Note. Parent Edu= Parent Education Level
[a] CDC BMI categories (underweight (< 5th percentile, normal (5th- < 85th), overweight (85th- < 95th), and obese (≥ 95th) for age and sex
[b] Hispanic=1, Non-Hispanic=2

Variable	Parent BMI	Child BMI [a]	Child Ethnicity [b]	Parent Ethnicity [b]	Parent Age	Parent Edu.	Income
Chaos	**-0.29***	0.18	0.17	0.11	-0.08	0.03	-0.06
Org.	-0.14	-0.11	0.07	0.01	0.13	0.18	0.03
Control	**0.41*****	-0.14	**-0.42****	-0.19	**-0.29***	0.01	-0.21

REFERENCES

Center for Disease Control and Prevention. (2011). Healthy Weight- It's Not a Diet, it's a Lifestyle. *About BMI for Adults.* Retrieved June 2014, 2014, from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html?s_cid=tw_ob064

Bell, N. J., Rychener, S. R., & Munsch, J. (2001). Multiple Views of the Family and Adolescent Social Competencies. *Journal of Research on Adolescence, 11*(4), 375-400.

Berge, J. M., Wall, M., Larson, N., Loth, K. A., & Neumark-Sztainer, D. (2013). Family Functioning: Associations with Weight Status, Eating Behaviors, and Physical Activity in Adolescents. *J Adolesc Health, 52*(3), 351-357. doi: 10.1016/j.jadohealth.2012.07.006.

Billings, A. G., & Moos, R. H. (1982). Social Support and Functioning among Community and Clinical Groups: A Panel Model. *J Behav Med, 5*(3), 295-311.

Boles, R. E., Burdell, A. C., Johnson, S. L., Gavin, W. J., Davies, P. L., & Bellows, L. L. (2014). Home Food and Activity Assessment: Development and Validation of an Instrument for Diverse Families of Young Children. *Appetite*(0). doi: http://dx.doi.org/10.1016/j.appet.2014.04.026.

Boles, R. E., Scharf, C., Filigno, S. S., Saelens, B. E., & Stark, L. J. (2013). Differences in Home Food and Activity Environments between Obese and Healthy Weight Families of Preschool Children. *Journal of Nutrition Education and Behavior, 45*(3), 222-231. doi: http://dx.doi.org/10.1016/j.jneb.2012.09.012.

Coldwell, J., Pike, A., & Dunn, J. (2006). Household Chaos--Links with Parenting and Child Behaviour. *J Child Psychol Psychiatry, 47*(11), 1116-1122. doi: 10.1111/j.1469-7610.2006.01655.x.

Davison, K. K., & Birch, L. L. (2001). Childhood overweight: A Contextual Model and Recommendations for Future Research. *Obes Rev, 2*(3), 159-171.

Dumas, J. E., Nissley, J., Nordstrom, A., Smith, E. P., Prinz, R. J., & Levine, D. W. (2005). Home Chaos: Sociodemographic, Parenting, Interactional, and Child Correlates. *J Clin Child Adolesc Psychol, 34*(1), 93-104. doi: 10.1207/s15374424jccp3401_9.

Finn, K., Johannsen, N., & Specker, B. (2002). Factors Associated with Physical Activity in Preschool Children. *J Pediatr, 140*(1), 81-85.

Gattshall, M. L., Shoup, J. A., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of a Survey Instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *Int J Behav Nutr Phys Act, 5*, 3. doi: 10.1186/1479-5868-5-3.

Halliday, J. A., Palma, C. L., Mellor, D., Green, J., & Renzaho, A. M. (2013). The Relationship between Family Functioning and Child and Adolescent Overweight and Obesity: A Systematic Review. *Int J Obes (Lond)*. doi: 10.1038/ijo.2013.213.

Hanscombe, K. B., Haworth, C. M., Davis, O. S., Jaffee, S. R., & Plomin, R. (2011). Chaotic Homes and School Achievement: A Twin Study. *J Child Psychol Psychiatry, 52*(11), 1212-1220. doi: 10.1111/j.1469-7610.2011.02421.x.

Harrison, G., Buskirk, E., Carter, J. (1988). *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics Books.

Jackson, Y. (2005). Testing the Compensatory and Immunity Models of Children's Adaptive Behaviors: The Role of Appraisal. *American Journal of Orthopsychiatry, 75*(3), 369-380.

Johnson, L., van Jaarsveld, C. H., & Wardle, J. (2011). Individual and Family Environment Correlates Differ for Consumption of Core and Non-core Foods in Children. *Br J Nutr, 105*(6), 950-959. doi: 10.1017/s0007114510004484.

Kitzmann, K. M., Dalton, W. T., & Buscemi, J. (2008). Beyond Parenting Practices: Family Context and the Treatment of Pediatric Obesity. *Family Relations, 57*(1), 13-23. doi: 10.1111/j.1741-3729.2007.00479.x.

Kuczmarski, R. J., Ogden, C. L., Guo, S. S., Grummer-Strawn, L. M., Flegal, K. M., Mei, Z., Johnson, C. L. (2002). 2000 CDC Growth Charts for the United States: Methods and Development. *Vital and Health Statistics. Series 11, Data from the National Health Survey*(246), 1-190.

Li Wen, M., Simpson, J. M., Baur, L. A., Rissel, C., & Flood, V. M. (2011). Family Functioning and Obesity Risk Behaviors: Implications for Early Obesity Intervention. *Obesity, 19*(6), 1252-1258. doi: 10.1038/oby.2010.285.

Lohman, B. J., & Jarvis, P. A. (2000). Adolescent Stressors, Coping Strategies, and Psychological Health Studied in the Family Context. *Journal of Youth and Adolescene, 29*(1), 15-43.

Lohman, B. J., Stewart, S., Gundersen, C., Garasky, S., & Eisenmann, J. C. (2009). Adolescent Overweight and Obesity: Links to Food Insecurity and Individual, Maternal, and Family Stressors. *J Adolesc Health, 45*(3), 230-237. doi: 10.1016/j.jadohealth.2009.01.003.

Matheny Jr, A. P., Wachs, T. D., Ludwig, J. L., & Phillips, K. (1995). Bringing Order Out of Chaos: Psychometric Characteristics of the Confusion, Hubbub, and Order Scale. *Journal of Applied Developmental Psychology, 16*(3), 429-444. doi: http://dx.doi.org/10.1016/0193-3973(95)90028-4.

McEachern, A. G. (2002). A Comparison of Family Environment Characteristics among White (Non-Hispanic), Hispanic, and African Caribbean Groups. *Journal of Multicultural Counseling and Development, 30*(1), 40.

Moens, E., Braet, C., & Soetens, B. (2007). Observation of Family Functioning at Mealtime: a Comparison between Families of Children with and without Overweight. *J Pediatr Psychol, 32*(1), 52-63. doi: 10.1093/jpepsy/jsl011.

Moos R., &, Moos, B. (2009). Family Environment Scale Manual (4th ed.). 855 Oak Grove Avenue, Suite 215, Menlo Park, CA 94025 U.S.A: Consulting Phsychologis Press.

Moos R., &, Moos, B. (2009). Family Environment Scale Manual (4th ed.). *Appendix C-7*. 855 Oak Grove Avenue, Suite 215, Menlo Park, CA 94025 U.S.A: Consulting Phsychologis Press.

Parnicky, J., Williams, S., & Silva, P. (1985). Family Environment Scale: A Dunedin (New Zealand) Pilot Study. *Australian Psychologist*(20), 195-204.

Patel, M. K. (2000). Perceived Family Environment: A Study in Relation to Economic Status of Family. *Journal of the Indian Academy of Applied Psychology, 26*(1-2), 109-114.

Petrill, S. A., Pike, A., Price, T., & Plomin, R. (2004). Chaos in the Home and Socioeconomic Status are Associated with Cognitive Development in Early Childhood: Environmental Mediators Identified in a Genetic Design. *Intelligence, 32*(5), 445-460. doi: http://dx.doi.org/10.1016/j.intell.2004.06.010.

Rhee, K. (2008). Childhood Overweight and the Relationship between Parent Behaviors, Parenting Style, and Family Functioning. *The ANNALS of the American Academy of Political and Social Science, 615*(1), 11-37. doi: 10.1177/0002716207308400.

Rubenstein, J. L., & Feldman, S. S. (1993). Conflict-resolution Behavior in Adolescent Boys: Antecedent and Adaptional Correlates. *Journal of Research on Adolescence*(3), 41-66.

Skelton, J. A., Buehler, C., Irby, M. B., & Grzywacz, J. G. (2012). Where are Family Theories in Family-based Obesity Treatment: Conceptualizing the Study of Families in Pediatric Weight Management. *Int J Obes, 36*(7), 891-900.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Tabachnick, B. G., & Fidell, L. S. (2007). Using Multivariate Statistics (6th ed.). Boston: Pearson/Allyn & Bacon.

United States Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. (2014). *2014 Poverty Guidelines.* Retrieved September 3, 2014 http://aspe.hhs.gov/poverty/14poverty.cfm.

Wachs, T. D. (1993). The Nature-Nuture Gap: What We have here is a Failure to Collaborate. In R. Plomin, McClearn, Gerald E. (Ed.), *The Nature-Nuture Gap: What We have here is a Failure to Collaborate* (pp. 375-391). Washington, DC: American Psychologyical Assocatioin.

Wyse, R., Campbell, E., Nathan, N., & Wolfenden, L. (2011). Associations between Characteristics of the Home Food Environment and Fruit and Vegetable Intake in Preschool Children: A Cross-sectional Study. *BMC Public Health, 11*, 938. doi: 10.1186/1471-2458-11-938.

Zeller, M. H., Reiter-Purtill, J., Modi, A. C., Gutzwiller, J., Vannatta, K., & Davies, W. H. (2007). Controlled Study of Critical Parent and Family Factors in the Obesigenic Environment. *Obesity (Silver Spring), 15*(1), 126-136. doi: 10.1038/oby.2007.517.

CHAPTER 6

DISCUSSION

Overview

The home is a complex environment with multiple factors that influence both parent and child behaviors and weight status (Davison & Birch, 2001). Parent behaviors largely influence the home environment through role modeling (Spurrier et al., 2008) making food and activity devices available and accessible (Cullen et al., 2003; Gattshall et al.,2008), and creating a social (family) climate that is conducive to optimal child growth and development (Halliday et al., 2013). External influences on the parent, such as, income and stress also impact the home food and activity environment, as well as the family unit (Rhee et al., 2008; Zeller et al., 2007). These factors not only influence parent and child behaviors, they also impact measurement of the home environment through the dynamic nature of the home food environment and the external factors that place constant demands on the family and home environment. This project aimed to identify some of those factors to further understand the complexity of the home environment. These efforts may help to better inform messages, strategies, and addressing interventions aimed at child dietary intake, physical activity, and ultimately childhood obesity.

Dietary Recommendations of Preschool-aged Children

Proper nutrition is essential for healthy growth in children and is associated with a decrease in adverse health outcomes, such as obesity (Lee et al., 2007; Skinner et al., 2012; Van Duyn & Pivonka, 2000). However, children do not meet the dietary recommendations for key food groups, like fruits and vegetables (Guenther et al., 2006). Similar to the national findings, this study found that, on average, children do not meet the dietary recommendations for the majority

of key food groups. Child intake for protein (meat and legume), dairy and vegetables (including potatoes), fell below the dietary recommendations (USDA, 2010); while fruit and average daily kcals were met. While daily kcals are being met but recommendations for major food groups are not, might suggest that kcals are coming from energy dense foods such as, sugar sweetened beverages (SSB). Further, families with limited resources (Ding et al., 2012), more stress (Li Wen et al., 2011), Hispanic populations (Haerens et al., 2008; Kant & Graubard, 2011) and those living in rural areas (Tai-Seale, 2003) are less likely to have healthful diets. This study supports these findings as it was identified that income and ethnicity were related to kcals ingested from sugar sweetened beverages (SSB) and our rural sample had an overall poor diet quality. The disparity that is seen in diet quality among different ethnic groups, those with limited resources, and rural populations highlight the need to further understand the determinants and address these populations through improved food policies and interventions.

Relationship between Home Food Availability and Child Dietary Intake

From the social ecological perspective, factors that can have an impact on child weight status include child dietary intake, the home food environment, and family functioning (Davison & Birch 2001; Halliday et al., 2013; Spurrier et al., 2008; Cullen et al., 2003). Consistent with the current literature in home food availability and child dietary intake, this study affirmed the positive relationship among home fruit and vegetable availability and child dietary intake of fruits and vegetables (Cullen et al., 2003; Hanson et al., 2005 Nanney et al., 2007; Neumark-Sztainer et al., 2003). Despite the availability of vegetables, children still are still not meeting the dietary recommendations for vegetables. This highlights an area to better understand why availability of key food groups at home are not being consumed and also an area to include in

qualitative studies to identify strategies that resonate with parents to increase intake of vegetables. Further, understanding of the home environment was expanded through the identified relationships among whole grain, sugar sweetened beverage (SSB) and child dietary intake. These identified relationships also highlight areas in the home that can be targeted to improve diet quality for young children.

It is important to note the non-significant relationships between food availability and child dietary intake. There were no significant relationships found among meat, dairy, legumes, or potato availability and child intake of those items. This may indicate that there are other stronger influences on child dietary intake than home food availability. For example, there was a low percent availability of dairy items reported in the home yet child dietary intake was close to the dietary recommendations (0.3 cup deficit). This suggests that child dietary intake of dairy was consumed presumably outside the home, perhaps at school or in a child care situation. The impact of other environments could help explain the insignificant relationships among home food availability and child dietary intake. Another explanation could be parents' concerns and attitudes towards their child's diet and the perceived difficulty in achieving a healthy diet. Slater et al (2010) found that diet and activity level of their child was of little concern when compared to other health indicators and barriers such as lack of the availability of healthy food and food advertisements made achieving a healthy diet difficult (Slater et al., 2010). The different environments and parent concerns, attitudes, and perceived barriers highlight areas in the home that could be targeted to better understand to make improvements on child diet.

Measurement Limitations of the Home Food Environment and Child Dietary Intake

Measurement of the home environment and child dietary intake pose challenges for researchers. Factors contributing to the difficulty in measurement include cost, time, and researcher and participant burden; difficulty in reliably assessing a child's diet and the home environment; and drawing comparisons between the two (Coates et al., 1978; French et al., 2008; Livingstone et al., 2004; Magarey et al., 2011; Pinard et al., 2012). The use of food frequency questionnaires (FFQs) in intervention studies to assess the diet and/or diet change is often questioned but is the most frequently used method to assess dietary intake of young children (Bell et al., 2013; Livingstone et al., 2004). Similarly, short food checklists are the most often used to assess the home food environment (Cullen et al., 2003; Crockett et al, 1992; Gattshall et al., 2008; Hearn et al., 1998; Spurrier et al., 2008; Neumark-Sztainer, 2003). The advantages of using both the FFQ and short food checklists are seen in lower participant burden and cost while providing a summation of both child diet and the home food environment (Bell et al., 2013).

Despite the many advantages of using a FFQ and short food checklists, there are also disadvantages. For FFQs, children below the age of 10 do not have the cognitive capabilities to provide information on usual intake, serving size or frequency of behaviors (Livingstone et al., 2004). Therefore, parents or caregivers complete dietary assessments on behalf of their child. This brings additional disadvantages as seen in memory recall and the lack of skills to quantify amount of foods eaten (Magarey et al., 2011). Further, parental proxy answers also may not be accurate as they cannot report on school-based dietary intake or before or after school activities. Likewise, despite the design of the Home IDEA as an inventory, parents often rely on memory to complete the assessment bringing the disadvantage of memory recall. Another source of error in

instrument completion could be the level of stress, demands, and distractions that are placed on parents which could influence their ability to complete the assessments. These sources of error could all impact the outcomes found in this study. However, given the difficult nature of community research, it does provide a summation of the home food environment and child diet intake illustrating trends and areas to improve in the home food environment and child dietary intake.

Finally, comparison of the Home IDEA and the BKFS could carry additional limitations. Groups were created from the Home IDEA to best match food groups from the FFQ to allow for comparison. Creating groups with this method could limit the identification of relationships between certain foods/food groups for child diet and home food availability. An example of this can be seen upon further exploration of potatoes. It was identified that home potato availability was only related to dietary intake of French fries/tater tots and not all potatoes which includes both regular and sweet potatoes. This demonstrates how difficult it is to compare two different measures given that groups were created from home food availability to match the dietary groups on the FFQ. Despite these limitations, this method provided additional insight into the home food environment of families with young children through the expansion of food groups, which is an area that is underdeveloped in the current literature.

Questionnaire Development Challenges

Questionnaire development and design are both time and resource intensive; involve attention to detail; consultation with experts, the literature, and target audience; and requires appropriate psychometric testing (CDC, 2009; Dillman, 2006; Pinnard et al., 2012; Townsend et al., 2008).

The amount of time and resources spent on the development and modification of the Home IDEA, starting with the modification from the Home Health Assessment (Boles et al., 2013) to the final iteration, the Home IDEA-2, provides an example of the complex nature of questionnaire development. Modification of the Home IDEA included many levels of refinement and testing that were guided by both qualitative and quantitative methods. Through the rigorous steps taken, there were improvements made to psychometric functioning of the assessment, but there were still areas that proved to be problematic.

Areas identified by parent participants and results from the reliability testing of the Home IDEA-2 indicate there are still areas that are not understood or well received by the parent participant. The challenges and problematic areas for completion of the Home IDEA-2 include parents relying on their memory to inventory their home food and activity items; comprehension of the nutrition label; interpretation of item meaning; and stressors and distractions at time of administration (e.g. children, cooking dinner, organized activities etc.). Comprehension of the nutrition label, ingredient list, and item examples could be reflective of the lack of education this audience has which could impact their ability to complete the task. This is consistent with research for audiences with limited resources (Rothman et al., 2006; Townsend, 2008) and their difficulties in completing questionnaire material. Despite the effort to facilitate physical identification of food and activity times on the questionnaire through the modifications of instructions, inclusion of pictures, and questions related to a count of food items, parents still relied on their memory to complete the assessment, thus limiting the reliability of the tool. This is an area to take into consideration for future investigations and is reflective of biases and limitations with self-report questionnaires. Despite these problematic areas, improvements were

made to enhance the psychometric properties. Hence, this project contributed to an identified need within the literature for a comprehensive, psychometrically tested home environment assessment for families with limited resources with young children (Pinnard et al., 2012).

Future Directions and Considerations for Research

This study was able to demonstrate the importance of home food availability on child dietary intake, yet, there are other key elements that influence a child's diet. To provide further insight into the home environment, future research should include the social, activity, school, and community environments, as well as, longitudinal analysis. Each of these areas would allow for additional insight into other factors that may influence child diet and activity, thus allowing for a more comprehensive understanding of the home food and activity environment as it relates to child behavior.

Social home environment. Parent behaviors such as modeling of healthful eating, feeding practices, and family meals all influence child dietary intake (Cooke et al., 2004; Johnson et al., 2011; Spurrier et al., 2008; Ward et al., 2011). Parent dietary intake of healthful foods is associated with child intake of those foods (Chi-Ming et al., 2007; Johnson et al., 2011). For example, allowing the child to choose fruits and vegetables or growing produce, positively influences a child's diet (Gross et al., 2010; Nanney et al., 2007) while the use of food as a reward or less frequent family meals, can negatively impact a child's diet (Spurrier et al., 2008). Additionally, parent feeding practices such as restriction and pressure have been shown to predict consumption of fruit and vegetables in young children (Wardle et al., 2005; Campbell et al., 2007) and an indulgent feeding practice is associated with a higher child BMI (Hennessy et

al., 2010). Given the important relationship parent behaviors share with child diet, exploration into how those behaviors relate to home food availability could identify problematic behaviors that relate to food availability which, in turn, can then be incorporated into messages and strategies to improve home food availability and potentially child diet quality.

Home activity environment. The scope of this project focused on the home food environment and child dietary intake, however, the Home IDEA contains physical activity and electronic devices in the child's bedroom. Child activity level is associated with availability and amount of activity devices like jungle gyms and televisions (Hales et al., 2013; Spurrier et al., 2008; Rosenberg et al., 2010) and impacts child risk for obesity (Dennison et al., 2002; Jacka et al., 2011; Jimenez-Pavon et al., 2010). Further exploration between child physical activity levels, parent activity, as well as behavioral perceptions of parent and child activity level as they relate to home activity availability should be examined. These additional considerations for the home activity environment will supplement the findings of this study to provide further insight into the home environment.

Longitudinal analysis. Given the cross-sectional nature of this project, understanding and identifying longitudinal relationships in the home food and activity environment would provide greater insight on the impact the home has on child health. Changes in the home food availability environment have been analyzed based on outcomes of particular interventions and programs, which demonstrated positive changes in home food availability following an intervention (Boles et al., 2010; Cullen et al., 2009; Kegler et al., 2012). However, these evaluations are of short duration, pre and post intervention and are subject to limited food lists (e.g. fruits, vegetables,

low/high fat and sugar foods). Given the dynamic nature of the home food environment and limited understanding of the longitudinal impacts it has on child health, evaluation of food availability longitudinally would provide insight into how the environment changes or remains stable over time. Also, it could allow for the identification of home food availability in early childhood that predicts nutrient intake in later childhood years. Similarly, this relationship could also be explored with the availability of electronic and physical activity devices. It was identified that there was a high availability of physical activity devices in the homes but does a greater availability of physical activity devices in early childhood impact child activity level in later childhood years? Understanding these relationships would help identify key areas to address in early childhood that could positively influence diet and activity.

Other environments. Child diet is influenced by many different sources and environments such as preference (Gibson & Wardle, 2003), food advertisements (Campbell et al., 2007), school food opportunities (school environment), and access to fast food outlets (built environment) (Davison & Birch, 2001). This project only addressed the home food environment; future research could investigate how the school nutrition environment impacts the home food environment. Policies such as, no junk food advertisements to children, limited opportunities for vending machines, or new healthy food options on the lunch line could influence the home food environment. Advertisements (Campbell et al., 2007; Walton et al.2009) and exposure to food and food opportunities (Reinaerts et al., 2007) been shown to increase child preference for those items. So if schools have better food policies, it could impact what the child asks for and therefore, improve the home food environment.

Lastly, the community environment through policies and programs (e.g. The Special Supplemental Program for Women, Infants, and Children- commonly referred to as WIC, Supplemental Nutrition Assistance Program- commonly referred to as SNAP), as well as the built environment (e.g. access to grocery stores or fast food outlets) impact child weight status (Galvez et al., 2009; Salois, 2012). The density of convenient style stores is positively related to child obesity (Salois, 2012; Galvez et al., 2009) and WIC participants are required to attended educational workshops which could influence availability of foods in the home. This project did not investigate the impact access to food or use of food assistance programs has on the home food environment. Understanding the impact programs and access to food has on the home food environment will help identify problematic aspects of those environments which can be targeted to improve the home food environment, as well as inform recommendations for improvements to programs. Understanding the home food environment through the social ecological approach will strengthen efforts to identify various factors from different environments that influence child dietary intake.

Generalizability of the Home IDEA. Testing of the Home IDEA was done with a mix of Hispanic (1/3rd) and White families. A majority of these families had limited resources and they all were from rural Colorado communities. A larger sample size and testing with other races/ethnicities, families with older children, or families living in other rural or urban areas would further strengthen the generalizability of the tool. Also, cultural considerations should be addressed and necessary modifications made to be sensitive of different cultures and ethnicities.

Geographical considerations. This project has demonstrated the importance of qualitative and quantitative methodologies to better understand the home environment of low income, rural families with young children. Observations through home visits with families and time spent in the communities revealed larger issues which should be addressed to benefit intervention development and implementation. An observation that was made and supported quantitatively is the impact of location on health. Each rural location is different despite a uniform classification of being "rural". The common thread at each location is their isolation from large cities but the differences are visual and are also voiced through the communities and parents. The foundations for the differences are seen the in the priorities and values of each location, as well as, demographic characteristics, such as education, income, and ethnicity. These factors should be taken into consideration and further explored to ensure that messages and strategies are appropriate for each location.

Future Directions and Considerations for Interventions

The Home IDEA provides a snapshot of the home food and activity environment which can aid in the development of messages, programs, and interventions targeted at the home environment. Yet, as demonstrated through this project, there are other influences, such as demographic factors, location, and family functioning that impact the home physical and social environment. These areas should be addressed and included in intervention development, implementation, and evaluation. Additionally, further exploration into the home environment of families with young children would enhance the effectiveness of intervention efforts.

Home environment interventions. Home environment interventions for childhood obesity prevention and treatment are limited through use of complete behavioral change theory, family theory, and process evaluation (Knowlden & Sharma, 2012; Skelton et al., 2012). Current strategies targeting the home environment include home visitations, educational sessions, telephone counseling, tailored newsletters, goal setting, and multi-component class sessions (Cullen et al., 2009; Golan et al., 2006; Harvey-Berino & Rourke, 2003; Stark, 2010; Tabak et al., 2012). Targets for home environment interventions include: child or parent only, parent and child, and teachers (Stark et al., 2011; Golan et al., 2004; 2006) with the most effective target being the parent (Golan et al., 2006). Further, family involvement and incorporation of family functioning should be included as the family heavily influences one another (Skelton et al., 2012). Tailoring, family considerations, and parent involvement each provide a bridge between academic organizations and the target audience, allowing for a more relevant, culturally-responsive, and sustainable intervention (Freudenberg, 1995; Jurkowski et al., 2013).

Additional target audience input. Further qualitative research in the home food, activity, and family environment would better inform the development of messages, programs, and interventions. Observations made during home visits identified other areas of concern that impact the home environment, which include family dynamics, food insecurity, and basic life skills. While family functioning was explored in this project, in relation to home food and activity availability, further insight into the mechanisms of how family functioning relates to the home environment needs to be understood. Thus, there needs to be additional efforts to better understand and capture family functioning and the relationship it shares with young children's diet and activity. The benefit of supplementary qualitative work with this audience will help to

identity additional factors in the home environment that inhibit or promote healthy eating and activity. As this project demonstrated, continual inclusion of target audience insight will strengthen all components of questionnaire design, programs, and interventions targeted at the home environment.

Addressing family needs. Family considerations, through understanding how external factors influence the family structure and functioning, as well as, incorporation of family theory needs to be included in intervention development along with additional exploration (Skelton et al., 2012; Halliday et al., 2013). Identifying what the larger issues are and understanding what each family's reality is will strengthen efforts to make healthful changes in the home environment. For some families the problem may be that their child is a picky eater, for others it is how to work, pay bills, and provide the next meal. Regardless of the challenges, parents do the best they can with what they have. Whether it is general knowledge, skill, or desire, there are certainly deeper issues that should be addressed before behavior change can be achieved. Bronfenbrenner explains that what matters for behavior and development is the perceived environment rather than the objective reality (Bronfenbrenner, 1979). Additional qualitative work with parents to gain a better understanding in their perceived reality, in addition to the objectively measured environment, will provide further insight into the complex family and home environment. Through this, the needs of families will be better met by meeting families at their "reality" and moving them forward in a way that works for them. This may vary from community to community but what each family has in common is the desire to live and give the best they can to their children. They just need the appropriate knowledge, resources, and skills to accomplish

this. Researchers and communities should work together to address this need in an effort to fill the gap through the development of effective behavior change interventions.

Conclusion

This study demonstrated that home food availability shares an important relationship with child dietary intake and also expanded insight into those relationships. It demonstrated that through rigorous tool development utilizing both quantitative and qualitative methodologies, improvements to psychometric properties of a home food and activity assessment can be achieved. This project also examined family dynamics and highlighted relationships between Chaos, Control and parent weight stats, but did not identify any significant relationships among home food and activity availability. Collectively, this project fulfilled an identified need in the literature for a comprehensive food and activity home assessment with appropriate psychometrics for families with young children.

REFERENCES

Bell, L. K., Golley, R. K., & Magarey, A. M. (2013). Short Tools to Assess Young Children's Dietary Intake: A Systematic Review Focusing on Application to Dietary Index Research. *J Obes, 2013*, 709626. doi: 10.1155/2013/709626.

Boles, R. E., Scharf, C., Filigno, S. S., Saelens, B. E., & Stark, L. J. (2013). Differences in Home Food and Activity Environments between Obese and Healthy Weight Families of Preschool Children. *Journal of Nutrition Education and Behavior, 45*(3), 222-231. doi: http://dx.doi.org/10.1016/j.jneb.2012.09.012.

Boles, R. E., Scharf, C., & Stark, L. J. (2010). Developing a Treatment Program for Obesity in Preschool-Age Children: Preliminary Data. *Children's Health Care, 39*(1), 34-58. doi: 10.1080/02739610903455137.

Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, Massachusetts, and London, England: Harvard University Press.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations Between the Home Food Environment and Obesity-promoting Eating Behaviors in Adolescence. *Obesity, 15*(3), 719-730. doi: 10.1038/oby.2007.553.

Center for Disease Control and Prevention. (2009). *Simply Put: A Guide for Creating Easy-to-Understand Materials*. Atlanta, GA.

Chi-Ming, H., Wei, L., Hsiao-Chi, Y., & Wen-Harn, P. (2007). The Relationship between Snack Intake and its Availability of 4th-6th graders in Taiwan. *Asia Pacific Journal of Clinical Nutrition, 16*, 547-552.

Coates, T. J., Jeffrey, R. W., & Wing, R. R. (1978). The Relationship between Persons' Relative Body Weights and the Quality and Quantity of Food Stored in their Homes. *Addict Behav, 3*(3-4), 179-184.

Cooke, L. J., Wardle, J., Gibson, E. L., Sapochnik, M., Sheiham, A., & Lawson, M. (2004). Demographic, Familial and Trait Predictors of Fruit and Vegetable Consumption by Pre-school Children. *Public Health Nutr, 7*(2), 295-302. doi: 10.1079/phn2003527.

Cullen, K.W., Baranowski, T., Owens E, Marsh T, Rittenberry L, De Moor C. (2003). Availability, Accessibility, and Preferences for Fruit, 100% Fruit Juice, and Vegetables influence children's dietary behavior. *Health Education and Behavior, 30*(5), 615-626. doi: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14582601.

Cullen, K. W., Smalling, A. L., Thompson, D., Watson, K. B., Reed, D., & Konzelmann, K. (2009). Creating Healthful Home Food Environments: Results of a Study with

Participants in the Expanded Food and Nutrition Education Program. *Journal of Nutrition Education & Behavior, 41*(6), 380-388. doi: 10.1016/j.jneb.2008.12.007.

Davison, K. K., & Birch, L. L. (2001). Childhood overweight: A Contextual Model and Recommendations for Future Research. *Obes Rev, 2*(3), 159-171.

Dennison, B. A., Erb, T. A., & Jenkins, P. L. (2002). Television Viewing and Television in Bedroom Associated with Overweight Risk among Low-income Preschool Children. *Pediatrics, 109*(6), 1028-1035.

Dillman, D. A., Smyth, J. D., Christian, L. M. (2006). *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method* (3 ed.). Chapter 4-6. Hoboken, NJ: Wiley, John & Sons, Incorporated.

Ding, D., Sallis, J. F., Norman, G. J., Saelens, B. E., Harris, S. K., Kerr, J., Glanz, K. (2012). Community Food Environment, Home Food Environment, and Fruit and Vegetable Intake of Children and Adolescents. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2010.07.003.

Hennessy, E., Huges, S. O., Goldberg, J. P., Hyatt, R. R., Economos, E. C. (2010). Parent Behavior and Child Weight Status among a Diverse Group of Underserved Rural Families. *Appetite, 54*, 369-377.

French, S. A., Shimotsu, S. T., Wall, M., & Gerlach, A. F. (2008). Capturing the Spectrum of Household Food and Beverage Purchasing Behavior: A Review. *Journal of the American Dietetic Association, 108*(12), 2051-2058. doi: http://dx.doi.org/10.1016/j.jada.2008.09.001.

Freudenberg, N., Eng, E., Flay, B., Parcel, G., Rogers, T., & Wallerstein, N. (1995). Strengthening Individual and Community Capacity to Prevent Disease and Promote Health: In Search of Relevant Theories and Principles. *Health Education Quarterly, 22*, 290-306.

Galvez, M. P., Hong, L., Choi, E., Liao, L., Godbold, J., & Brenner, B. (2009). Childhood Obesity and Neighborhood Food-store Availability in an Inner-city Community. *Acad Pediatr, 9*(5), 339-343. doi: 10.1016/j.acap.2009.05.003.

Gattshall, M. L., Shoup, J., Marshall, J. A., Crane, L. A., & Estabrooks, P. A. (2008). Validation of aS instrument to Assess Home Environments for Physical Activity and Healthy Eating in Overweight Children. *International Journal of Behavioral Nutrition and Physical Activity, 5*(3).

Gibson, E., & Wardle, J. (2003). Energy Density Predicts Preferences for Fruit and Vegtables in 4-Year-old Children. *Appetite, 41*(1), 97-98.

Golan, M., & Crow, S. (2004). Targeting Parents Exclusively in the Treatment of Childhood Obesity: Long-term Results. *Obes Res*(12), 357–361.

Golan, M., Kaufman, V., Shahar, D. R. (2006). Childhood Obesity Treatment: Targeting Parents Exclusively vs. Parents and Children. *British Journal of Nutrition, 95*(5), 1008-1015.

Gross, S. M., Pollock, E. D., & Braun, B. (2010). Family Influence: Key to Fruit and Vegetable Consumption among Fourth- and Fifth-grade Students. *Journal of Nutrition Education & Behavior, 42*(4), 235-241. doi: 10.1016/j.jneb.2009.05.007.

Guenther, P. M., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2006). Most Americans Eat much Less than Recommended Amounts of Fruits and Vegetables. *J Am Diet Assoc, 106*(9), 1371-1379. doi: 10.1016/j.jada.2006.06.002.

Haerens, L., Craeynest, M., Deforche, B., Maes, L., Cardon, G., & De Bourdeaudhuij, I. (2008). The Contribution of Psychosocial and Home Environmental Factors in Explaining Eating Behaviours in Adolescents. *Eur J Clin Nutr, 62*(1), 51-59. doi: 10.1038/sj.ejcn.1602681.

Hales, D., Vaughn, A. E., Mazzucca, S., Bryant, M. J., Tabak, R. G., McWilliams, C., Ward, D. S. (2013). Development of HomeSTEAD's Physical Activity and Screen Time Physical Environment Inventory. *Int J Behav Nutr Phys Act, 10*, 132. doi: 10.1186/1479-5868-10-132.

Halliday, J. A., Palma, C. L., Mellor, D., Green, J., & Renzaho, A. M. (2013). The Relationship between Family Functioning and Child and Adolescent Overweight and Obesity: A Systematic Review. *Int J Obes (Lond)*. doi: 10.1038/ijo.2013.213.

Hanson, N. I., Neumark-Sztainer, D., Eisenberg, M. E., Story, M., & Wall, M. (2005). Associations between Parental Report of the Home Food Environment and Adolescent Intakes of Fruits, Vegetables and Dairy Foods. *Public Health Nutr, 8*(1), 77-85.

Harvey-Berino J, & Rourke, J. (2003). Obesity Prevention in Preschool Native-American Children: A Pilot Study Using Home Visiting. *Obes Res, 11*(5), 606–611.

Hearn, M. D., Baranowski, T., Baranowski J, Doyle C, Smith M, Lin LS, Resnicow K. (1998). Environmental Influences on Dietary Behavior among Children：Availability and Accessibility of Fruit and Vegetables Enable Consumption. *J Health Education, 29*(1), 26-32.

Jacka, F. N., Pasco, J. A., Williams, L. J., Leslie, E. R., Dodd, S., Nicholson, G. C., Berk, M. (2011). Lower Levels of Physical Activity in Childhood Associated with Adult Depression. *Journal of Science and Medicine in Sport, 14*(3), 222-226. doi: http://dx.doi.org/10.1016/j.jsams.2010.10.458.

Jimenez-Pavon, D., Kelly, J., & Reilly, J. J. (2010). Associations between Objectively Measured Habitual Physical Activity and Adiposity in Children and Adolescents: Systematic

Review. *International Journal of Pediatric Obesity, 5*(1), 3-18. doi: 10.3109/17477160903067601.

Johnson, L., van Jaarsveld, C. H., & Wardle, J. (2011). Individual and Family Environment Correlates Differ for Consumption of Core and Non-core Foods in Children. *Br J Nutr, 105*(6), 950-959. doi: 10.1017/s0007114510004484.

Jurkowski, J., Green Mills, L., Lawson, H., Bovenzi, M., Quartimon, R., & Davison, K. (2013). Engaging Low-Income Parents in Childhood Obesity Prevention from Start to Finish: A Case Study. *Journal of Community Health, 38*(1), 1-11. doi: 10.1007/s10900-012-9573-9.

Kant, A. K., & Graubard, B. I. (2011). 20-Year Trends in Dietary and Meal Behaviors were Similar in U.S. Children and Adolescents of Different Race/Ethnicity. *J Nutr, 141*(10), 1880-1888. doi: 10.3945/jn.111.144915.

Kegler, M. C., Alcantara, I., Veluswamy, J. K., Haardorfer, R., Hotz, J. A., & Glanz, K. (2012). Results from an Intervention to Improve Rural Home Food and Physical Activity Environments. *Prog Community Health Partnersh, 6*(3), 265-277. doi: 10.1353/cpr.2012.0042.

Knowlden, A. P., & Sharma, M. (2012). Systematic Review of Family and Home-based Interventions Targeting Pediatric Overweight and Obesity. *Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 13*(6), 499-508. doi: 10.1111/j.1467-789X.2011.00976.x.

Lee, W. W. R. (2007). An Overview of Pediatric Obesity. *Pediatric Diabetes, 8*, 76-87. doi: 10.1111/j.1399-5448.2007.00337.x.

Li Wen, M., Simpson, J. M., Baur, L. A., Rissel, C., & Flood, V. M. (2011). Family Functioning and Obesity Risk Behaviors: Implications for Early Obesity Intervention. *Obesity, 19*(6), 1252-1258. doi: 10.1038/oby.2010.285.

Livingstone, M. B. E. (2004). Issues in Dietary Intake Assessment of Children and Adolescents. *British Journal of Nutrition, 92*(S2), S213.

Stark, L. J., Boles R.E., Kuhl E., Ratcliff, M., Scharf, C., Bolling, C., & Rausch, J.. (2010). A Pilot Randomized Controlled Trial of a Clinic and Home-based Behavioral Intervention to Decrease Obesity in Preschoolers. *Obesity, 19*, 134–141.

Magarey, A., Watson, J., Golley, R. K., Burrows, T., Sutherland, R., McNaughton, S. A., Collins, C. (2011). Assessing Dietary Intake in Children and Adolescents: Considerations and Recommendations for Obesity Research. *Int J Pediatr Obes, 6*(1), 2-11. doi: 10.3109/17477161003728469.

Nanney, M. S., Johnson, S., Elliott, M., & Haire-Joshu, D. (2007). Frequency of Eating Homegrown Produce Is Associated with Higher Intake among Parents and Their

Preschool-Aged Children in Rural Missouri. *Journal of the American Dietetic Association, 107*(4), 577-584. doi: 10.1016/j.jada.2007.01.009.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of Fruit and Vegetable Intake among Adolescents: Findings from Project EAT. *Preventive Medicine, 37*(3), 198-208. doi: http://dx.doi.org/10.1016/S0091-7435(03)00114-2.

Pinard, C. A., Yaroch, A. L., Hart, M. H., Serrano, E. L., McFerren, M. M., & Estabrooks, P. A. (2012). Measures of the Home Environment Related to Childhood Obesity: A Systematic Review. *Public Health Nutr, 15*(1), 97-109. doi: 10.1017/s1368980011002059.

Reinaerts, E., de Nooijer, J., Candel, M., & de Vries, N. (2007). Explaining School Children's Fruit and Vegetable Consumption: The Contributions of Availability, Accessibility, Exposure, Parental Consumption and Habit in Addition to Psychosocial Factors. *Appetite, 48*(2), 248-258. doi: 10.1016/j.appet.2006.09.007.

Rhee, K. (2008). Childhood Overweight and the Relationship between Parent Behaviors, Parenting Style, and Family Functioning. *The ANNALS of the American Academy of Political and Social Science, 615*(1), 11-37. doi: 10.1177/0002716207308400.

Rosenberg, D. E., Sallis, J. F., Kerr, J., Maher, J., Norman, G. J., Durant, N., Saelens, B. E. (2010). Brief Scales to Assess Physical Activity and Sedentary Equipment in the Home. *Int J Behav Nutr Phys Act, 7*, 10. doi: 10.1186/1479-5868-7-10.

Rothman, R. L., Housam, R., Weiss, H., Davis, D., Gregory, R., Gebretsadik, T., Elasy, T. A. (2006). Patient Understanding of Food Labels: The Role of Literacy and Numeracy. *American Journal of Preventive Medicine, 31*(5), 391-398. doi: http://dx.doi.org/10.1016/j.amepre.2006.07.025.

Salois, M. J. (2012). The Built Environment and Obesity among Low-income Preschool Children. *Health & Place, 18*(3), 520-527. doi: http://dx.doi.org/10.1016/j.healthplace.2012.02.002.

Skelton, J. A., Buehler, C., Irby, M. B., & Grzywacz, J. G. (2012). Where are Family Theories in Family-based Obesity Treatment: Conceptualizing the Study of Families in Pediatric Weight Management. *Int J Obes, 36*(7), 891-900.

Skinner, A. C., Steiner, M. J., & Perrin, E. M. (2012). Self-reported Energy Intake by Age in Overweight and Healthy-weight Children in NHANES, 2001-2008. *Pediatrics, 130*(4), e936-942. doi: 10.1542/peds.2012-0605.

Slater, A., Bowen, J., Corsini, N., Gardner, C., Golley, R., Noakes, M. (2010). Understanding Parent Concerns About Children's Diet, Activity and Weight Status: An Important Step Towards Effective Obesity Prevention Interventions. *Public Health Nutrition, 8*: 1221-1228.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the Home Environment and Physical Activity and Dietary Patterns of Preschool Children: A Cross-sectional Study. *Int J Behav Nutr Phys Act, 5*, 31. doi: 10.1186/1479-5868-5-31.

Tabak, R. G., Tate, D. F., Stevens, J., Siega-Riz, A. M., & Ward, D. S. (2012). Family Ties to Health Program: A Randomized Intervention to Improve Vegetable Intake in Children. *Journal of Nutrition Education and Behavior*(0). doi: 10.1016/j.jneb.2011.06.009.

Tai-Seale, T. C. (2003). Nutrition and Overweight Concerns in Rural Areas: A Literature Review. (Vol. 2, pp. 2). College Station, TX In Rural Healthy People 2010: A Companion Document to Healthy People 2010: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center.

Townsend, M. S., Sylva, K., Martin, A., Metz, D., & Wooten-Swanson, P. (2008). Improving Readability of an Evaluation Tool for Low-income Clients Using Visual Information Processing Theories. *Journal of Nutrition Education and Behavior, 40*(3), 181-186. doi: http://dx.doi.org/10.1016/j.jneb.2007.06.011.

USDA and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC: U.S. Government Printing Office; 2010.

Van Duyn, M. A., & Pivonka, E. (2000). Overview of the Health Benefits of Fruit and Vegetable Consumption for the Dietetics Professional: Selected Literature. *J Am Diet Assoc, 100*(12), 1511-1521. doi: 10.1016/s0002-8223(00)00420-x.

Walton, M., Pearce, J., & Day, P. (2009). Examining the Interaction between Food Outlets and Outdoor Food Advertisements with Primary School Food Environments. *Health & Place, 15*(3), 811-818. doi: 10.1016/j.healthplace.2009.02.003.

Ward, D. S., Vaughn, A. E., Bangdiwala, K. I., Campbell, M., Jones, D. J., Panter, A. T., & Stevens, J. (2011). Integrating a Family-focused Approach into Child Obesity Prevention: Rationale and Design for the My Parenting SOS study randomized control trial. *BMC Public Health, 11*, 431. doi: 10.1186/1471-2458-11-431.

Zeller, M. H., Reiter-Purtill, J., Modi, A. C., Gutzwiller, J., Vannatta, K., & Davies, W. H. (2007). Controlled Study of Critical Parent and Family Factors in the Obesigenic Environment. *Obesity (Silver Spring), 15*(1), 126-136. doi: 10.1038/oby.2007.517.

APPENDICIES

APPENDIX A: HUMAN RESEARCH COMMITTEE LETTER OF APPROVAL

Colorado State University
Knowledge to Go Places

Research Integrity & Compliance Review Office
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011
Fort Collins, CO
TEL: (970) 491-1553
FAX: (970) 491-2293

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	June 28, 2010
TO:	Bellows, Laura, 1571 Food Sci and Human Nutrition Melby, Christopher, 1571 Food Sci and Human Nutrition, Davies, Patricia, 1573 Occupational Therapy
FROM:	Barker, Janell, CSU IRB 1
PROTOCOL TITLE:	A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is Sustained in Early Elementary School
FUNDING SOURCE:	US Department of Agriculture : 90899
PROTOCOL NUMBER:	10-1891H
APPROVAL PERIOD:	Approval Date: June 28, 2010 Expiration Date: June 24, 2011

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is Sustained in Early Elementary School. The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

Janell Barker, Senior IRB Coordinator - (970) 491-1655 Janell.Barker@Research.Colostate.edu
Evelyn Swiss, IRB Coordinator - (970) 491-1381 Evelyn.Swiss@Research.Colostate.edu

Janell Barker

Barker, Janell

Includes:

Approval is for a maximum of 300 children; 300 parents and 50 teachers using the approved consent form for the parents, teachers and verbal assent for the children. Parental consent must be obtained for participants who are under the age of 18. CONDITIONS OF THE APPROVAL ARE: Translated consent and instruments are to be submitted once available and prior to use. The letters of cooperation from each school district are to be submitted once obtained and prior to recruitment. Submit these documents as amendments.

Colorado State University
Knowledge to Go Places

Research Integrity & Compliance Review Office
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011
Fort Collins, CO
TEL: (970) 491-1553
FAX: (970) 491-2293

Approval Period:	June 28, 2010 through June 24, 2011
Review Type:	EXPEDITED
IRB Number:	0000020[illegible]
Funding:	US Department of Agriculture : 90899

Colorado State University
Knowledge to Go Places

Research Integrity & Compliance Review Office
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011 Fort Collins, CO
TEL: (970) 491-1553
FAX: (970) 491-2293

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	August 14, 2013
TO:	Bellows, Laura, 1571 Food Sci and Human Nutrition Pagliassotti, Michael, 1571 Food Sci and Human Nutrition, Davies, Patti, 1573 Occupational Therapy
FROM:	Barker, Janell, Coordinator, CSU IRB 1
PROTOCOL TITLE:	A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is Sustained in Early Elementary School
FUNDING SOURCE:	Funding - Grants/Contracts
PROTOCOL NUMBER:	10-1891H
APPROVAL PERIOD:	Approval Date: August 14, 2013 Expiration Date: June 22, 2014

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is Sustained in Early Elementary School. The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

Janell Barker, Senior IRB Coordinator - (970) 491-1655 Janell.Barker@Colostate.edu
Evelyn Swiss, IRB Coordinator - (970) 491-1381 Evelyn.Swiss@Colostate.edu

Barker, Janell

Janell Barker

Barker, Janell

Amendment approval is to expand the home interviews with the parents using the revised consent form, adding two measures and using the revised recruitment. Additional recruitment sites will be added upon approval and submission of the letter into eProtocol as an Amendment.

Approval Period:	August 14, 2013 through June 22, 2014
Review Type:	EXPEDITED
IRB Number:	00000202
Funding:	US Department of Agriculture

Colorado State University

would like to invite you and your child to participate in a research study!

The study will examine:

- **Children's physical activity levels and eating habits**
- **Parent's/Caregiver's physical activity levels and eating habits**

This is a 3 year study.
Receive $40 per year for your participation.

Look inside for more information on the study and consent forms.

August 2010

Dear Parents/Caregivers:

Childhood obesity is a growing problem in the United States. Researchers at Colorado State University are working on a project which aims to establish healthful eating and physical activity habits during the preschool years. As part of the research study, CSU staff is interested in measuring children's eating habits, physical activity levels, motor skills, confidence, and height and weight. With your consent, your child will be asked to participate in several study activities, including:

1. Measuring daily physical activity levels – wearing a step counter for 6 days;
2. Motor Skills Test – testing your child's ability to balance, skip, run, jump, throw, catch, etc.;
3. Taste Testing – tasting several different foods and describing if they liked them or not;
4. Self Confidence – learning more about their confidence in physical activity, peer interactions, and other daily activities.

The details of these activities are outlined on the next page in the consent form.

In addition to your child's nutrition and physical activity habits, we are also interested in your activity levels as parent(s)/caregiver(s). We are asking an adult family member to wear a pedometer for six days to measure daily physical activity levels. We are also asking each parent/caregiver to complete a survey about their child's eating habits. We will be sending home research packets 2 times per year for 3 years. You will receive $20 each time for completing the survey and wearing the pedometer (up to $120 over 3 years).

Attached to this letter are consent forms for you to fill out if you are interested in taking part in the study:

1. Child's consent form – Please fill out if you would like your child to participate in the study.
2. Parent's physical activity assessment consent form – Please fill out if you would like to participate. Please note that you do not have to participate in the physical activity part of the study for your child to participate.
3. Photo release form – We would like to take photographs of children participating in the different tests. These photos will not identify your child by name. They will be used for presentations, reports, and other research activities.

There are two copies of each attached consent form. One copy is to be completed and ***returned to your preschool*** and the other is to keep for your records.

If you have any questions about the study, please do not hesitate to contact Laura Bellows at 970-491-1305.

Sincerely,

Laura Bellows, PhD, MPH, RD
Principal Investigator

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Child physical activity assessment)

TITLE OF PROJECT: *A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is sustained in Elementary School*

NAME OF PRINCIPAL INVESTIGATOR: Laura Bellows, PhD, MPH, RD

CO-INVESTIGATORS: Patti Davies, PhD, OTR

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Laura Bellows, 970-491-1305

SPONSOR OF PROJECT: USDA Agriculture and Food Research Initiative (AFRI)

The purpose of this study is to identify physical activity, gross motor skills, taste preferences, and food consumption in young children and how they relate to each other. Further, we hope to explore how the parent activity levels and eating environments influence children's behaviors.

We would like your child, if he or she wants to, to be a part of nutrition and physical activity assessments. There are several parts to the study.

1) Physical Activity Levels – This will be measured by having your child wear a pedometer (an instrument that measures the number of steps your child takes each day) for six days to get find out how active your child is on a daily basis. You will be asked to record the number of steps, as indicated on the pedometer, each night before your child goes to bed.
2) Motor Skill Assessments - This part of the study will take place at your child's school. If your child would like to participate, s/he will be taken with a small group of children, by researchers, to an area where several assessments will be performed. First, your child's height and weight will be taken. Next, s/he will be asked to perform various gross motor skills, like balancing, skipping, and throwing a ball. The persons asking your child to perform these assessments will be trained to do so. The assessment will not take more than 20-30 minutes to do and should be enjoyable for your child.
3) Taste Testing – Your child will be asked to take part in a taste test. S/he will be asked to try several foods and then tell us whether they liked the food, if it was just ok, or if they didn't like it. We will also observe your child at lunchtime to see which foods your child selects and how much they eat. Your child will not be forced to eat any foods. It will be up to them whether or not they want to eat the foods offered.
4) Self Confidence – We will ask your child several questions about their confidence levels around physical activity, interacting with their friends and peers, and other daily tasks.

Your child's name will not be used in any way and your child will not be taped or video recorded. All assessment recording sheets will be kept in a locked cabinet at Colorado State University in the Department of Food Science and Human Nutrition.

There are no known risks of this study. Some children may feel nervous in the presence of new people. Our people will be trained to ease these feelings.

Potential benefits of participating in the study will be that children and parents become more aware of the activities and foods that children enjoy. We hope this study will help us learn how physical activity and food choices in preschool are carried through elementary school. We think that taking part in and enjoying nutrition and physical activity programs as a young child will lead to healthy lifestyles throughout life.

Although confidentiality cannot be guaranteed in group settings, all results will be used for research purposes only. All information provided by you will be fully confidential and used for research purposes only. Your information will be assigned a number instead of using your name.

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

If you agree to allow your child to take part in this study, it is your choice. You may stop your child's participation at any time without penalty or loss of benefits.

Your signature means that you have read and understand this consent form, you have willingly signed it, and you have received a copy of this form .If you have any questions about your child's rights as a volunteer in this research, contact Janell Barker, Administrator of Human Research at 970-491-1655.

_____
Child's name (printed)

_____ Gender: _____Male _____Female
Child's birthdate

_____ _____
Investigator or co-investigator's signature Date

PARENTAL SIGNATURE FOR MINOR

As parent or guardian you authorize _____ (print name) to become a participant for the described research. The nature and general purpose of the project have been satisfactorily explained to you by _____ and you are satisfied that proper precautions will be observed.

_____
Parent/Guardian name (printed)

_____ _____
Parent/Guardian signature Date

_____
_____
Phone Number Email

Address:

_____

_____

Additional Information

1. Does your child have any food allergies? Yes No
   a. If so, please list: _____
2. May we contact you for future research studies? Yes No

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(PARENT physical activity assessment)

TITLE OF PROJECT: *A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is sustained in Elementary School*

NAME OF PRINCIPAL INVESTIGATOR: Laura Bellows, PhD, MPH, RD

CO-INVESTIGATORS: Patti Davies, PhD, OTR

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Laura Bellows, 970-491-1305

SPONSOR OF PROJECT: USDA Agriculture and Food Research Initiative (AFRI)

The purpose of this study is to identify physical activity, gross motor skills, taste preferences, and food consumption in young children and how they relate to each other. Further, we hope to explore how the parent activity levels and eating environments influence children's behaviors.

We would like you to be a part of a study that measures your physical activity levels. This will be measured by having you wear a pedometer (an instrument that measures the number of steps taken each day) for six days to get find out how active you are on a daily basis. You will be asked to record the number of steps, as indicated on the pedometer, each night before you go to bed. For your participation, each family will receive $40 per year - $20 at the beginning of the study and $20 at the end of the study. The study is 3 years so you may be eligible for $40 each year for a total of $120. The number of participants in this study is limited. Study participants will be selected based on the order in which this form is returned, the age of your child, and your child's attendance at school on the first day of the study.

Your name will not be used in any way. All assessment recording sheets will be kept in a locked cabinet at Colorado State University in the Department of Food Science and Human Nutrition. Your identity/record of receiving compensation (NOT your data) may be made available for an audit by CSU officials for financial audits.

There are no known risks of this study.

A potential benefit of participating in the study will be that you become more aware of your physical activity levels. We think that taking part in and enjoying physical activity as a family may benefit the development of healthful habits in young children that will lead to healthy lifestyles throughout life.

Although confidentiality cannot be guaranteed in group settings, all results will be used for research purposes only. All information provided by you will be fully confidential and used for research purposes only. Your information will be assigned a number instead of using your name.

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

If you agree to take part in this study, it is your choice. You may stop your participation at any time without penalty or loss of benefits.

Your signature means that you have read and understand this consent form, you have willingly signed it, and you have received a copy of this form. If you have any questions about your child's rights as a volunteer in this research, contact Janell Barker, Administrator of Human Research at 970-491-1655.

_____ _____

Adult Participant's name (printed) Phone Number

_____
Adult Participant's signature

_____ _____
Investigator or co-investigator's signature Date

Department of Food Science and Human Nutrition
College of Applied Human Sciences
1571 Campus Delivery
Fort Collins, Colorado 80523-1571
Office: (970) 491-3663 FOOD
Office: (970) 491-3819; Fax: (970) 491-7252
website: www.fshn.cahs.colostate.edu/

PHOTOGRAPHY CONSENT FORM/MODEL RELEASE

I, *(print name)*_____, hereby grant permission to Colorado State University, its employees or representatives, to take and use:

(check all that apply:)
- ❸ photographs
- ❸ videotape
- ❸ digital images

of my child, *(print name)*_____, for use in promotional or educational materials. These materials might include printed or electronic publications, web sites or other electronic communications. I authorize the use of these images indefinitely without compensation to me. All negatives, positives, prints, digital reproductions and videotape shall be the property of Colorado State University.

_____
(Date)

_____
(Signature of adult guardian)

_____
(Address)

_____
(City, State, Zip)

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Teacher Participation)

TITLE OF PROJECT: *A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is sustained in Elementary School*

NAME OF PRINCIPAL INVESTIGATOR: Laura Bellows, PhD, MPH, RD

CO-INVESTIGATORS: Patti Davies, PhD, OTR

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Laura Bellows, 970-491-1305

SPONSOR OF PROJECT: USDA Agricultural and Food Research Initiative (AFRI)

The purpose of this study is to identify physical activity, gross motor skills, taste preferences, and food consumption in young children and how they relate to each other. Further, we hope to explore how the parent activity levels and eating environments influence children's behaviors.

We would like you to be a part of a study that measures the type and amount of nutrition and physical activity education in your classroom, your opinion about the Food Friends and Mighty Moves program. Mighty Moves will be conducted each school day for 15-20 each day. You will record the amount of time each day that children had the opportunity to engage in physical activity. Further, you will be asked to conduct the Food Friends nutrition program and record the amount of time you spend doing nutrition related activities. We will also observe your classroom to see how the children engage in the Mighty Moves activities and then interview you about the program. You will be compensated $50 for your participation in the study.

Your name will not be used in any way. All assessment recording sheets will be kept in a locked cabinet at Colorado State University in the Department of Food Science and Human Nutrition. Your identity/record of receiving compensation (NOT your data) may be made available for an audit by CSU officials for financial audits.

There are no known risks of this study.

Potential benefits of participating in the study will be that you will become aware of the important nutrition and physical activity behaviors that may impact weight status. We think that taking part in and enjoying physical activity and nutrition activities may benefit the development of healthful habits in young children that will lead to healthy lifestyles throughout life.

Although confidentiality cannot be guaranteed in group settings, all results will be used for research purposes only. All information provided by you will be fully confidential and used for research purposes only. Your information will be assigned a number instead of using your name.

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

If you agree to take part in this study, it is your choice. You may stop your participation at any time without penalty or loss of benefits.

Your signature means that you have read and understand this consent form, you have willingly signed it, and you have received a copy of this form .If you have any questions about your child's rights as a volunteer in this research, contact Janell Barker, Administrator of Human Research at 970-491-1655.

_____ _____
Participant's name (printed) Phone Number

_____
Participant's signature

_____ _____
Investigator or co-investigator's signature Date

APPENDIX C: RECRUITMENT PACKET- INTEREST FLYER & LETTER OF CONSENT: CHAPTER 4 & 5

Colorado State University

would like to invite you to participate in a research study!

We would like to interview you at your home to learn more about your family, and the foods and physical activity items in your home.

You will receive **$20** for your time.

Interviews will be scheduled to fit your schedule.

If interested in participating, please return the attached interest form to your child's teacher. We will contact you to schedule the interview and give you more information.

For further questions please contact:
Alexandra Burdell at 770-778-8934 (cell) or (970)-491-2641 (office)
Laura Bellows at 970-491-1305

I'm interested in participating in an interview on

The family and home food and activity environment of Preschoolers!

_____

(Print your Name)

_____

(Address

_____ _____

(Phone Number) **(Email)**

Please return in to your child's teacher. Thank you for your interest!
You can also contact Alexandra Burdell at 770-778-8934 or Laura Bellows at 970-491-1305

I'm interested in participating in an interview on

The family and home food and activity environment of Preschoolers!

_____

(Print your Name)

_____

(Address

_____ _____

(Phone Number) **(Email)**

Please return in to your child's teacher. Thank you for your interest!
You can also contact Alexandra Burdell at 770-778-8934 or Laura Bellows at 970-491-1305

Colorado State University's LEAP Study

Invites you to participate in our research project!

We are interested in your thoughts and ideas on family, pre-school nutrition, food, and physical activity in the home environment. We would greatly appreciate your time in filling out the enclosed surveys.

Please complete the enclosed surveys prior to the scheduled interview date:
DATE AND TIME

For your participation, you will be compensated **$20**.

Department of Food Science and Human Nutritio
College of Applied Human Science
1571 Campus Deliver
Fort Collins, Colorado 80523-157

DATE

Dear PARENT,

Researchers at Colorado State University are working on a project to assess children's eating and physical activity behaviors in early childhood. We are interested in understanding the home food, activity and family environment of preschoolers. There are two parts to this study – **1.)** Filling out surveys; and **2.)** A home visit. Below you will find a description of what is enclosed in this packet and what you can expect for the home visit.

Surveys:

Enclosed you will find: **1.)** Consent form **2.)** Information survey **3.)** Family survey

1. **Consent form**

This form explains what we would like your help on and that there are no risks to you. There are 2 copies of this form. One for you to **keep** and one for you to **sign** and return to us on your home visit. There is also a page about obtaining height and weight of your child at school. You do not need to sign this if your child will be present for the home visit.

2. **Information survey**

This survey asks a few background questions about you and your child, such as age, race, education, number of siblings and where you do your food shopping.

3. **Family survey**

This survey asks a few questions about your opinion on your home and family, such as, family rules and activities.

Home visit:

The home visit will take place in your home and you will fill out a home survey at the same time as me. This survey asks about food, electronic, and physical activity items. This will take about 60 minutes. There will be 2 researchers (myself and a team member) that come into your home. We will also take height and weight of you and your child. *Your child does not need to be present for the interview.* Your participation is completely voluntary and any information you give us will be very helpful. You will receive **$20** for your participation.

Please complete the surveys and sign the consent at the bottom of the page and have all the items with you for the scheduled home visit.

If you have any questions or concerns about the interview please contact Alexandra Burdell at (office) 970-491-2641, (cell) 770-778-8934 or alex.burdell@colostate.edu or Laura Bellows at (office) 970-491-1305 or laura.bellows@colostate.edu.

Thank you for your time and participation,
Alexandra Burdell (PhD student)

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Interviews)

TITLE OF PROJECT: *A Longitudinal Study to Assess if the Effectiveness of a Preschool Nutrition and Physical Activity Program is sustained in Elementary School*

NAME OF PRINCIPAL INVESTIGATOR: Laura Bellows, PhD, MPH, RD

CO-INVESTIGATORS: Patti Davies, PhD, OTR

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Laura Bellows, 970-491-1305

SPONSOR OF PROJECT: USDA Agriculture and Food Research Initiative (AFRI)

The purpose of this research is to understand how you think about your home eating/food and physical activity environment. Based on these interviews we will be better able to understand how individuals think about family, food and physical activity in the home.

You will be asked to participate in a 60 minute in home interview. Compensation of $20 for your time will be provided. A trained person will lead the interview and you will be asked to complete a home assessment. The trained person will complete the home assessment while you are completing yours. The trained interviewer will also take your height and weight as well as your child's. If your child is not at home at the time of the interview, we ask for your permission to take their height and weight at their school (see attached form).

Your name will not be used in any way. All transcripts will be kept in a locked cabinet or password-protected computer at Colorado State University in the Department of Food Science and Human Nutrition. Your identity/ record of receiving compensation (NOT your data) may be made available for an audit by CSU officials for financial audits.

There are no known risks of this study.

A potential benefit of participating in the study will be that you become more aware of your home eating and activity environment. We think that eating healthy and enjoying physical activity as a family may benefit the development of healthful habits in young children that will lead to healthy lifestyles throughout life.

Although confidentiality cannot be guaranteed in group settings, all results will be used for research purposes only. All information provided by you will be fully confidential and used for research purposes only. Your information will be assigned a number instead of using your name.

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

If you agree to take part in this study, it is your choice. You may stop your participation at any time without penalty or loss of benefits.

Your signature means that you have read and understand this consent form, you have willingly signed it, and you have received a copy of this form. If you have any questions about your child's rights as a volunteer in this research, contact Janell Barker, Administrator of Human Research at 970-491-1655.

_____ _____
Adult Participant's name (printed) Phone Number

_____
Adult Participant's signature

_____ _____

Investigator or co-investigator's signature Date

If my child is not home at the time of the interview, I give permission for researchers at Colorado State University to take my child's height and weight at school.

_____
Child's name

_____
School & Classroom Teacher

_____ _____
Parent/Guardian name (printed) Phone Number

_____
Parent/Guardian's signature

_____ _____
Investigator or co-investigator's signature Date

APPENDIX D: DEMOGRAPHIC SURVEY: CHAPTER 3

Information Sheet
Please tell us about your child and your family

1. **Child's Name** (Please Print): _____

2. **What is your child's birth date?** ____/____/____

3. **What is your child's gender?** ☐ Male ☐ Female

4. **What is your relationship to your child?**

☐ Mother ☐ Father ☐ Grandparent ☐ Legal Guardian ☐ Other _____

5. **How would you describe the ethnicity of_____?**

	Hispanic or Latino	**Not Hispanic or Latino**	**Not applicable**
Your Child	☐	☐	
Yourself	☐	☐	
Your Spouse/Partner or other adult living with you	☐	☐	☐

6. How would you describe the racial background of_____?

	American Indian/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Black/ African American	White	Other (Please specify)	Not applicable
Your Child	☐	☐	☐	☐	☐	☐ _____	
Yourself	☐	☐	☐	☐	☐	☐ _____	
Your Spouse/Partner or other adult living with you	☐	☐	☐	☐	☐	☐ _____	☐

7. What is _____age?

	18-29	30-49	50-64	65 and over	Not applicable
Your	☐	☐	☐	☐	
Your Spouse/Partner or other adult living with you	☐	☐	☐	☐	☐

8. What is the highest level of education completed by_____?

	Some high school	High school graduate	Some college	Trade/ Technical/ vocational training	College graduate	Some post-graduate work	Post-graduate degree	Not applicable
You	☐	☐	☐	☐	☐	☐	☐	
Your Spouse/Partner or other adult living with you	☐	☐	☐	☐	☐	☐	☐	☐

9. What is your work status?

☐ Not employed ☐ Part-time ☐ Full-time

10. Please check your approximate annual income <u>before-taxes</u>, from all sources: wages, salary, unemployment, and all other sources of public assistance:

☐ Less than $27,000
☐ $27,000 - $34,000
☐ $34,001 - $41,000
☐ $41,001 - $48,000
☐ $48,001 - $55,000
☐ $55,001 - $62,000
☐ $62,001 - $69,000
☐ More than $69,000

11. Please indicate the number of family members living in your household (<u>including yourself</u>), who are:

a. related to you, and
b. supported by the income of the parent or guardian of the household

Total number of related family members in your household = _____

12. For each adult in the household, please list his or her relationship to the child.
(ie: mother, father, aunt, etc.)

_____ _____ _____ _____

13. Number of children in the family, including the child in this study: (please check one)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ more than 7

14. The child in this study is _____. (check one)

☐ the oldest ☐ a middle child ☐ the youngest ☐ an only child

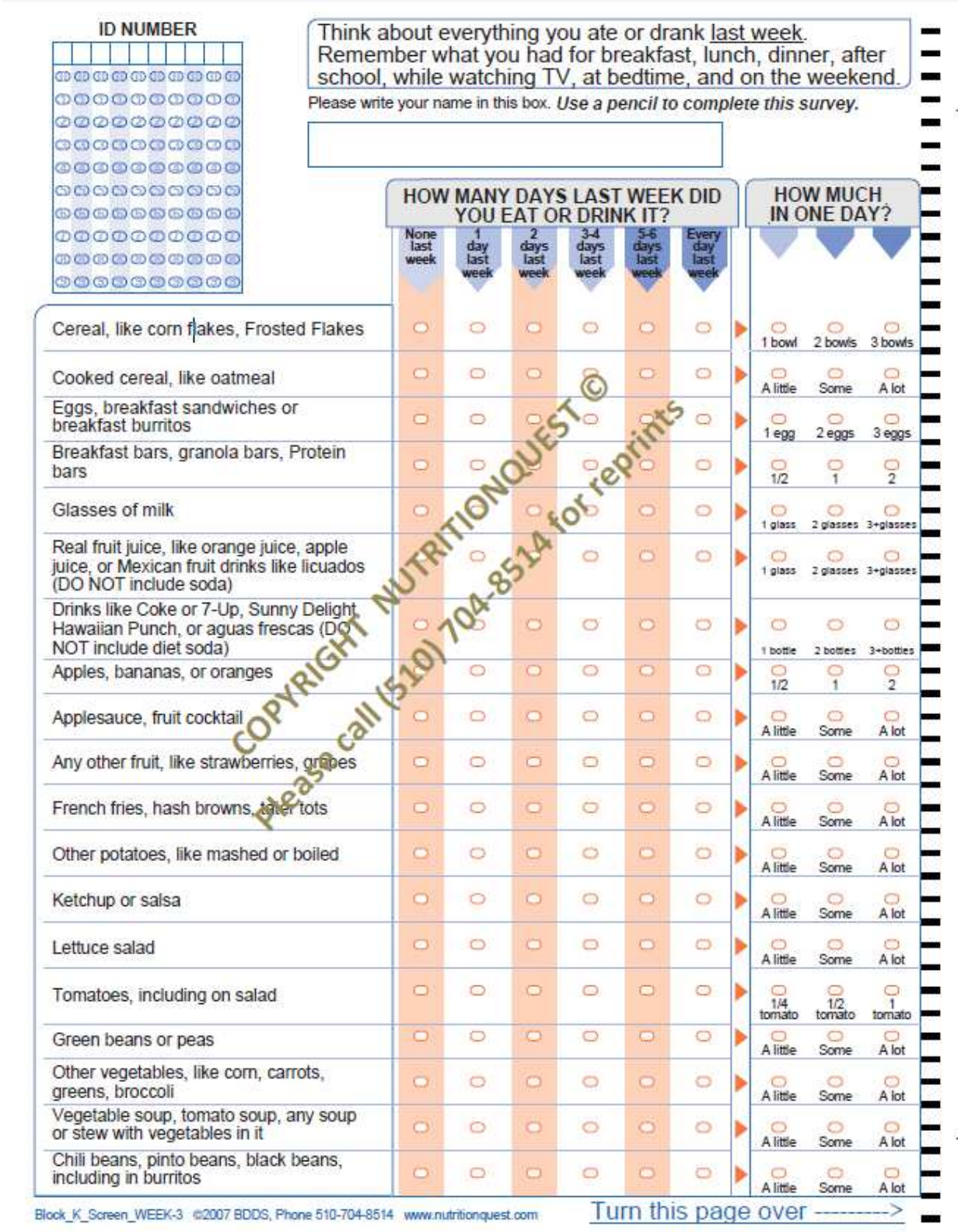
APPENDIX E: ADDITIONAL DEMOGRAPHIC QUESTIONS: CHAPTER 4 & 5

Where do you the majority of your grocery shopping?
□ Grocery Sore (Small local grocer)
□ Convenient Store
□ Supermarket (Safeway, King Sooper/City Market)
□ Food Bank
□ Other_____

How far is that from your home?
□ <5 miles
□ 5-10 miles
□ 11-20 miles
□ 21-30 miles
□ >30 miles

How often do you have to make that trip?
□ Several times a week
□ Once a week
□ Every 2 weeks
□ Once a month
□ Other_____

APPENDIX F: BLOCK KIDS FOOD SCREENER: CHAPTER 3



ID NUMBER

Think about everything you ate or drank last week. Remember what you had for breakfast, lunch, dinner, after school, while watching TV, at bedtime, and on the weekend.

Please write your name in this box. *Use a pencil to complete this survey.*

	HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?						HOW MUCH IN ONE DAY?		
	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week			
Cereal, like corn flakes, Frosted Flakes	○	○	○	○	○	○	1 bowl	2 bowls	3 bowls
Cooked cereal, like oatmeal	○	○	○	○	○	○	A little	Some	A lot
Eggs, breakfast sandwiches or breakfast burritos	○	○	○	○	○	○	1 egg	2 eggs	3 eggs
Breakfast bars, granola bars, Protein bars	○	○	○	○	○	○	1/2	1	2
Glasses of milk	○	○	○	○	○	○	1 glass	2 glasses	3+glasses
Real fruit juice, like orange juice, apple juice, or Mexican fruit drinks like licuados (DO NOT include soda)	○	○	○	○	○	○	1 glass	2 glasses	3+glasses
Drinks like Coke or 7-Up, Sunny Delight, Hawaiian Punch, or aguas frescas (DO NOT include diet soda)	○	○	○	○	○	○	1 bottle	2 bottles	3+bottles
Apples, bananas, or oranges	○	○	○	○	○	○	1/2	1	2
Applesauce, fruit cocktail	○	○	○	○	○	○	A little	Some	A lot
Any other fruit, like strawberries, grapes	○	○	○	○	○	○	A little	Some	A lot
French fries, hash browns, tater tots	○	○	○	○	○	○	A little	Some	A lot
Other potatoes, like mashed or boiled	○	○	○	○	○	○	A little	Some	A lot
Ketchup or salsa	○	○	○	○	○	○	A little	Some	A lot
Lettuce salad	○	○	○	○	○	○	A little	Some	A lot
Tomatoes, including on salad	○	○	○	○	○	○	1/4 tomato	1/2 tomato	1 tomato
Green beans or peas	○	○	○	○	○	○	A little	Some	A lot
Other vegetables, like corn, carrots, greens, broccoli	○	○	○	○	○	○	A little	Some	A lot
Vegetable soup, tomato soup, any soup or stew with vegetables in it	○	○	○	○	○	○	A little	Some	A lot
Chili beans, pinto beans, black beans, including in burritos	○	○	○	○	○	○	A little	Some	A lot

Turn this page over -------->

	HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?						HOW MUCH IN ONE DAY?		
	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week			
Refried beans	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Hamburgers, cheeseburgers	○	○	○	○	○	○	○ 1 small	○ 1 large	○ 2 large
Hot dogs, corn dogs, or sausage	○	○	○	○	○	○	○ 1	○ 2	○ 3
Lunch meat like boloney, ham, Lunchables	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3+ slices
Pizza or pizza pockets	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Spaghetti or ravioli with tomato sauce	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Macaroni and cheese	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Chicken, including nuggets, wings, tenders, also in sandwiches or stew	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Fish, fish sticks or sandwiches, tuna, shrimp	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Burritos or tacos	○	○	○	○	○	○	○ 1/2	○ 1	○ 2
Beef like roast, steak or in sandwiches	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Meat balls, meat loaf, beef stew, Hamburger Helper	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Pork, like chops, roast, ribs	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Popcorn	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Snack chips like potato chips, Doritos, Fritos, tortilla chips	○	○	○	○	○	○	○ A few	○ Small bag	○ Large bag
Ice cream	○	○	○	○	○	○	○ 1 scoop	○ 2 scoops	○ 3 scoops
Candy, candy bars	○	○	○	○	○	○	○ Mini	○ Small	○ Large
Cookies, donuts, cakes like Ho-Hos	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Cheese. Remember cheese in sandwiches or nachos with cheese or quesadillas	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3+ slices
Whole wheat bread or rolls (NOT white bread)	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3 slices

What kind of cereal did you eat? (MARK THE ONE YOU ATE THE MOST OF)

- ○ Plain Cheerios, Grape Nuts, Shredded Wheat, Wheaties, Wheat Chex, Kix
- ○ Honey Nut Cheerios, Cap'n Crunch, Lucky Charms, Life, Golden Grahams, Frosted Mini Wheats, Raisin Bran
- ○ Other sweet cereals, like Frosted Flakes, Froot Loops
- ○ Any other cereal, like Corn Flakes, Rice Krispies

What kind of milk did you drink? (MARK ONLY ONE)
○ Whole milk ○ Low fat 1% milk ○ Chocolate milk ○ Lactaid milk
○ Reduced fat 2% milk ○ Nonfat milk ○ Soy milk ○ Don't know

Please tell us about yourself

Are you ○ Male ○ Female

How old are you? ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 ○ 13 ○ 14 ○ 15 ○ 16 ○ 17

APPENDIX G: THE LEAP HOME IDEA: CHAPTER 3 & 4

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Assessment of your Home Health Environment:

Please read all instructions before completing this form.

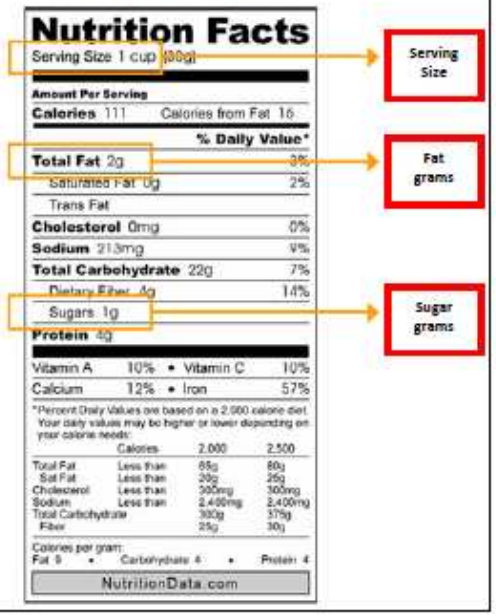
The purpose of the home health assessment is to see what foods and activity items are in the home. This information will help us understand how to make home based recommendations for improving the health of family members.

The following guidelines will help you complete the form:
In Section 1: FOOD ITEMS

- Begin rating the foods that are below counter level. If you find two or more of the same kind of foods that in different locations, score the food that is closer to your child's reach. For example, you may have low-sugar cereal on top of the refrigerator and on a lower shelf. Use the cereal on the lower shelf to let us know that you had this kind of cereal and it was within reach, even though one box was not in reach of your child.
- If a food is *not in the home*, check "NO" and move on to the next item.
- Assume that your child can open a refrigerator, drawers, or a pantry door.
- A food is rated as in the home if it exists anywhere food is generally in the home, regardless of whether it is readily visible or if the child could or could not get to it. This includes food in the basement, deep freeze, or parent's bedroom.
- When examining foods, please move food around on shelves or in drawers to make sure you record all items. Be sure to check for food in a garage or basement.
- Before you begin, think about where food is kept at your house. Check all that apply:

☐Kitchen ☐Pantry ☐ Basement ☐ Garage ☐ Bedroom ☐Other room

Some foods ask about sugar or fat grams per serving. Use this picture to help you find this information on a container.



Thank you so much for taking the time to answer our questions. We sincerely appreciate your cooperation.

1

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 1: FOOD ITEMS

Definitions:
1. **In Home** = the food is currently in the kitchen or any other room in the house, garage, or basement.
2. **Child can reach it** = Your child can grab the food to eat by using their hands.
3. **Your child** = refers only to your child consented to participate in the study, not brothers or sisters.

	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?
Snacks / Treats / Nuts			
Chocolate and other sweet candy / candy bars	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Ready to eat cake, brownies, cookies, muffins (not English), donuts, breakfast bars, pastries, frozen waffles (≥ 3g fat per serving **OR** ≥ 7g sugar per serving)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Unprepared mixes for cake, brownies, cookies, muffins (not English)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Potato chips, corn chips, tortilla chips, pretzels, baked chips	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Whole grain crackers, triscuits, or wheat thins	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Saltine crackers (< 2g fat per serving **and** < 5g sugar per serving)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Fruit roll-ups or gummy fruit snacks	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Dried fruit (NOT chocolate or sugar coated)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Nuts (peanuts, walnuts, pecans, pistachio, almonds)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Rice cakes	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Ice cream and other frozen deserts	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Cereal			
Sweetened breakfast cereal (> 6g sugar per serving)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y
Unsweetened breakfast cereal (≤ 6g sugar per serving)	□ Always □ Sometimes □ Not very Often □ Never	□ N □ Y	□ N □ Y

ID:_____ Date: _____ Time point □ 1 □ 2 □ 3 □ 4 Administrator: _____

	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?
Drinks			
"100% Fruit Juice"	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Fruit drinks (NOT 100%)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Soda or pop ☐ Regular	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Diet	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Milk ☐ Whole	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ 2%	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ 1%	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Skim/Fat-free	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Goat Milk	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Butter Milk	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Sports Drinks (Like Gatorade drinks)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Rice drinks or alternative milks including soy and almond beverages	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Meats / Poultry / Fish			
Regular meat (frozen or refrigerated) includes deli-meat, bacon, sausage, hot dogs, bologna, fish sticks, chicken nuggets. Food must be > 5g fat per serving.	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Extra lean meat (frozen or refrigerated) includes deli-meat, turkey, chicken, fish. NOT CANNED	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Canned fish ☐ canned in oil	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ canned in water	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Dairy			
Yogurt or cottage cheese ☐ Regular ☐ low fat ☐ Fat-free	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Butter or margarine ☐ Regular ☐ Reduced fat ☐ Spray bottle	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Cheese ☐ Regular	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Reduced fat	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Fat-free	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Other Cheese ☐ Goat	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
. ☐ Gouda	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Eggs	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?
Breads / Beans / Pasta / Grains			
Garbanzo Beans	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Beans (Canned / Dry)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Lentils	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Tempeh	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Pita bread	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Pasta ☐Regular . ☐whole wheat	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y
Bread ☐whole wheat . ☐white . ☐other:_____	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y
Crisp or wasa bread	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Rice ☐Brown . ☐White	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y
Couscous	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Tortillas ☐Corn . ☐Flour . ☐Other	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y
Barley	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Quinoa	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Macaroni and cheese	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y

ID:_____ Date: _____ Time point □ 1 □ 2 □ 3 □ 4 Administrator: _____

	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?
Ready to eat meals (Pizza, microwave dinners)			
Pizza (frozen or in the refrigerator)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Boxed dinners (frozen, microwave, or ready to eat meals)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Boxed meals for kids ("Lunchables")	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Other Foods			
Peanut butter	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Potatoes ☐ raw/unpeeled . ☐ sweet . ☐ french fries / hash browns / tater tots	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y
Jams / jellies / syrups	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
Dressing ☐regular . ☐low-fat . ☐non-fat	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y ☐ N ☐ Y
Tofu (soy products, veggie burgers)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y
☐ shortening or lard . ☐ Cooking Oil	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y

1. **Is there a fruit basket out that you can see with at least one fruit or vegetable inside it?** ☐ N ☐ Y
2. **Is there a candy or sweet treat container out that you can see with at least one piece in it?** ☐ N ☐ Y
3. **Are you a WIC participant?** ☐ N ☐ Y
4. **Does your child ever use a chair or stool to reach food or drinks normally out of reach?** ☐ N ☐ Y

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Fruits and Vegetables	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?	
Mixed fruit/vegetables frozen with an added sauce Mixed fruit/vegetables frozen without an added sauce	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never ☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y ☐ N ☐ Y	☐ N ☐ Y ☐ N ☐ Y	
Apples / apple sauce	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Asparagus	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Avocado	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Bamboo shoots	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Bananas	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Beets	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Bell peppers	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Blackberries	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Blueberries	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Broccoli	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Cabbage	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Cantaloupes	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Carrots	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Cauliflower	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Celery	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Fruits and Vegetables	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?	
Cherries	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Corn	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Cucumber	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Currants (dried)	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Daikon Radish	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Dates	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Edamame	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Grapefruit	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Grapes	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Green beans	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Guava	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Honeydew melon	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Jicama	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Kiwi	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Lettuce	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Mangos	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Fruits and Vegetables	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?	
Mushrooms	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Nectarines	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Oranges	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Papaya	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Parsnip	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Peaches	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Pears	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Peas	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Pineapple	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Plums	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Radish	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Snap peas	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Raspberries	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Spinach	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Squash	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Strawberries	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Fruits and Vegetables	In the last 3 months, when you shopped for food how often did you purchase this food? (Please only check one box)	Is this food in the home?	Can your child reach this food?	
Tangerines	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Tomatoes	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Turnips	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Water chestnuts	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Watermelon	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	
Zucchini	☐ Always ☐ Sometimes ☐ Not very Often ☐ Never	☐ N ☐ Y	☐ N ☐ Y	

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 2: Child's Bedroom Electronic Environment

Instructions: Please count and record the number of the following electronic devices in your child's bedroom even if the child does not use them or shares the room with another brother or sister or parent. **Please go to the child's bedroom-do not rely on your memory.** If an electronic device has multiple functions, please indicate that the device is part of a combination of devices. For example, a stereo could have a radio, cd player, and tape player. Each of these functions would be counted as belonging to a combined device compared to being by itself. If the item is not in the house, move to the next item on the list.

NOTES

- DVD/CD players should have these symbols: 
- Portable items are those that require batteries & removable electric cord and plug in to the wall.
- If the device is not physically broken then accept it as "working"

Electronic device	In the bedroom?	The number of items in the child's bedroom (anywhere including under the bed and closet)	Is the device by itself without other functions?	Is the device combined with other functions?
TV □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
VCR □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
DVD player / Blu-ray player □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
CD player □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Radio □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Cassette player □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Computer □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Digital TV recorder (TIVO) □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Video game player (X-box, play station, game boy) □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
IPOD, ZUNE, or MP3 player □portable □non-portable	□ N □ Y		□ N □ Y	□ N □ Y
Other:	□ N □ Y		□ N □ Y	□ N □ Y
Do you have a portable DVD player?	□ N □ Y			

10

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 3: Activity Environment

Instructions: Please read each item below and decide if the item is located at your home (inside or outside/backyard/storage shed).Count the item even if you or your child does not use it.

Item	Available?
Bike/trike/3-wheeler	☐ N ☐ Y
Basketball hoop (including child size versions)	☐ N ☐ Y
Jump rope	☐ N ☐ Y
Sports equipment (bats, balls, racquets, sticks, golf clubs)	☐ N ☐ Y
Swimming pool (including plastic kiddy pool)	☐ N ☐ Y
Roller skates, skateboard, scooter	☐ N ☐ Y
Swing set, play house, jungle gym	☐ N ☐ Y
Home aerobic equipment (treadmill, cycle, cross trainer, stepper, rower, workout video, medicine ball)	☐ N ☐ Y
Weight lifting equipment, toning devices (free weights, pull up bar, ankle weights)	☐ N ☐ Y
Water or snow equipment (skis, skates, canoe, row boat, surf board, boogie board, windsurf board, slip-n-slide, snow shoes)	☐ N ☐ Y
Yoga, exercise mats, exercise balls, exercise/resistance bands	☐ N ☐ Y
Exercise, play, recreation room	☐ N ☐ Y
Trampoline	☐ N ☐ Y
Seated toy cars powered by child's feet on the ground (not motorized)	☐ N ☐ Y
Hula hoop	☐ N ☐ Y
Outdoor equipment (fishing, tents, backpacks, climbing gear)	☐ N ☐ Y

What type of home do you live in (check one box): ☐Apartment ☐ Duplex ☐ Condominium/townhome ☐ House ☐ Mobile home

Form completed by: ☐ Mother ☐ Father ☐ Both ☐ Other: _____

APPENDIX H: THE HOME IDEA-2: CHAPTER 4

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Assessment of your Home Health Environment:

Please read all instructions before completing this form.

The purpose of the home health assessment is to see what foods and activity items are in the home. This information will help us understand how to make home based recommendations for improving the health of family members.

The following guidelines will help you complete the form:

- The form will take you about 30 minutes to complete.
- There are **3 sections** to this form: **Food, Child's Bedroom Electronics, and Physical Activity**
- Each section has its own instructions, which are at the top of each new section.
- Some items have examples next to them. They are in parenthesis.

TIPS

DO This:

- Get up to find items.
- **Record all** items (even if you do not have it).
- Look for hints and special reminders.

DO NOT Do This:

- Rely on your memory (no one can remember all the foods they have in their home).
- Skip any item.

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Before you begin tell us:

- Where food is kept at your house. **Check all that apply:**

  □ Kitchen □ Pantry □ Basement □ Garage □ Bedroom □ Other room

- When was the last time you went grocery shopping?

  □ Within the last 2 days □ Recently □ Been a long time

- What amount of food do you have in your house?

  □ More than usual □ Usual □ Less than usual

- What type of home do you live in **(check one box)**:

  □ Apartment □ Duplex □ Condominium/townhome □ House □ Mobile home

- Who is completing the form:

  □ Mother □ Father □ Both □ Other: _____

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 1: Food Items

Instructions:

- A food is rated as "in the home" if it can be found **anywhere** that food is generally kept in the home, regardless of whether it is out in plain sight. This includes food in the **basement, deep freeze, or parent's bedroom**.
- When looking for foods, please **move food around** on shelves or in drawers to make sure you **record all items**.
- When more than 1 food is listed in ( ), you do **Not** need to have all the examples in **( )**, you only need 1 to mark "Yes".
- If a food is **Not** in the home, check **"No"** and move on to the next item.

Snacks and Sweet Treats	**Is this food in the home?** ☐ No ☐ Yes
Chocolate and candy	☐ ☐
Unprepared mixes (like cake, cookie, brownie, muffin, biscuit, or pancake)	☐ ☐
Chips (like potato, tortilla, corn, baked, or pretzels)	☐ ☐
Whole grain crackers (like Triscuit® , Wheat thins®, or Ritz® whole grain crackers) **(See picture)**	☐ ☐
Saltine crackers	☐ ☐
Rice cakes	☐ ☐
Gummy fruit snacks (like gummy snacks, or fruit roll ups)	☐ ☐
Dried fruit (**Not** chocolate, yogurt, or sugar coated)	☐ ☐
Nuts (like peanuts, almonds, pistachios, mixed nuts, cashews or walnuts)	☐ ☐
Frozen sweets (like ice cream, popsicles, fudgesicles , push-pops, frozen yogurt, sorbet, sherbet)	☐ ☐

Hint: Look for the words **"whole grain"** on the box

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Child Friendly Food	Is this food in the home? ☐ No ☐ Yes
Pizza (frozen or refrigerated)	☐ ☐
Packaged dinners (frozen, refrigerated, or boxed)	☐ ☐
Packaged child's meals (such as Lunchables® or Chef Boyardee®)	☐ ☐
Mac and cheese (box, frozen, or refrigerated)	☐ ☐
Instant Noodles (like Ramen® noodles)	☐ ☐
Apple sauce	☐ ☐
Chicken nuggets, fish sticks, corn dogs, or hot dogs	☐ ☐
French fries, tater tots, or hash browns	☐ ☐

Cereal	Is this food in the home? ☐ No ☐ Yes
Sweetened breakfast cereal (more than 6g per serving) **(See label)**	☐ ☐
Unsweetened breakfast cereal (less than or equal to 6g per serving) **(See label)**	☐ ☐

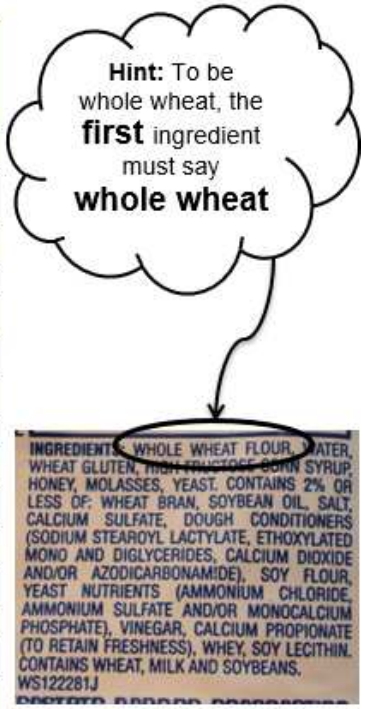
How many boxes of each type of cereal do you have?

- Sweetened Breakfast Cereal (greater than 6g per serving) _____
- Unsweetened Breakfast Cereal (less than or equal to 6g per serving) _____

Grams of Sugar per Serving

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Beans and Grains	**Is this food in the home?** ☐ No ☐ Yes
Refried Beans	☐ ☐
Beans-canned or dried (like black, pinto, kidney, navy, garbanzo, lentils, great northern, or lima)	☐ ☐
Quinoa, barley, or couscous	☐ ☐
Whole wheat bread **(See picture)**	☐ ☐
White bread	☐ ☐
Other bread:_____	☐ ☐
Whole wheat bagel **(See picture)**	☐ ☐
White bagel	☐ ☐
Other bagel:_____	☐ ☐
Whole wheat pasta **(See picture)**	☐ ☐
Regular pasta	☐ ☐
Other pasta:_____	☐ ☐
Corn tortillas	☐ ☐
White flour tortillas	☐ ☐
Whole wheat tortillas **(See picture)**	☐ ☐
Other tortillas:_____	☐ ☐
White rice	☐ ☐
Brown rice	☐ ☐



ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Fruit (Fresh, Frozen, Or Canned)	Is this food in the home? ☐ No ☐ Yes
Apple	☐ ☐
Banana	☐ ☐
Pear	☐ ☐
Grapes	☐ ☐
Orange, tangerine, grapefruit, or clementine/cuties	☐ ☐
Pineapple, mango, kiwi , guava, or papaya	☐ ☐
Blueberries, strawberries, blackberries, or raspberries	☐ ☐
Watermelon, cantaloupe, or honeydew	☐ ☐
Plums, peaches, nectarine, or cherries	☐ ☐
Vegetable (Fresh, Frozen, Or Canned)	**Is this food in the home? ☐ No ☐ Yes**
Bell pepper	☐ ☐
Broccoli	☐ ☐
Carrot	☐ ☐
Celery	☐ ☐
Corn	☐ ☐
Cucumber	☐ ☐
Green beans	☐ ☐
Mushrooms	☐ ☐
Tomatoes	☐ ☐
Asparagus	☐ ☐
Avocado	☐ ☐
Raw/unpeeled potato	☐ ☐
Sweet potato	☐ ☐

Hint: Fruits & Vegetables can be:

Fresh

Frozen

Canned

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Vegetable continued (Fresh, Frozen, Or Canned)	Is this food in the home? ☐ No ☐ Yes
Beets, radish, turnips, jicama, daikon radish, or parsnip	☐ ☐
Cauliflower, cabbage, or brussel sprouts	☐ ☐
Lettuce, spinach, collards, kale, chard, or turnip greens	☐ ☐
Yellow squash or zucchini	☐ ☐
Butternut, acorn, or spaghetti squash	☐ ☐
Peas, snap peas, or edamame	☐ ☐

Meat	Is this food in the home? ☐ No ☐ Yes
Regular meat (like, ground beef and chuck; ribs; pork roast; poultry with skin; or ground turkey)	☐ ☐
Lean Meat (like beef, select or choice, trimmed of fat; ground round, roast, round, sirloin, tenderloin; or poultry without skin: chicken, turkey)	☐ ☐
Deli meat (like ham, turkey, roast beef, or bologna)	☐ ☐
Breakfast meat (like bacon or sausage)	☐ ☐
Fish (fresh, frozen, or canned like tuna)	☐ ☐
Shellfish (like shrimp, clams, scallops, crab, or lobster)	☐ ☐
Game (like deer, elk, moose, quail, duck, goose)	☐ ☐

Hint: If the ground meat says **lean** or **extra lean**, then it is a lean meat.

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Vegetarian products	**Is this food in the home?** ☐ No ☐ Yes
Soy Products (like tofu, tempeh, textured vegetable protein (TVP), soy crumbles, or veggie burgers)	☐ ☐
Cheese Alternatives (like rice, soy, almond, or cashew cheese)	☐ ☐
Eggs	☐ ☐

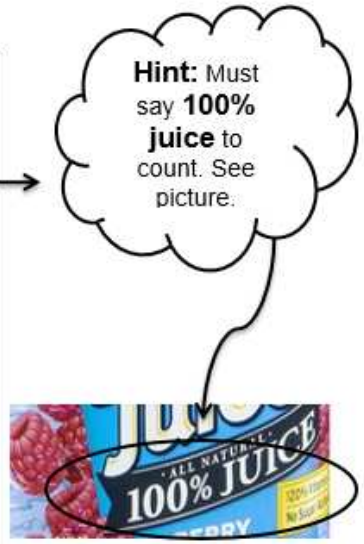
Dairy	**Is this food in the home?** ☐ No ☐ Yes
Regular yogurt	☐ ☐
Reduced fat or fat free/lite yogurt	☐ ☐
Regular cottage cheese	☐ ☐
Reduced fat or fat free/lite cottage cheese	☐ ☐
Regular cheese	☐ ☐
Reduced fat or fat free/lite cheese	☐ ☐

Hint: For **regular** dairy items look for words like **Original** or **Full Fat**

Hint: For **reduced fat** or **fat free** dairy items look for words like **Low Fat** or **Light**

ID:_____ Date: _____ Time point: ☐ 1 ☐ 2 ☐ 3 ☐ 4 Administrator: _____

Beverages	**Is this food in the home?** ☐ No ☐ Yes
100% Fruit Juice (**must** say **100%** juice)	☐ ☐
Fruit juice/drinks (**Not** 100% juice)	☐ ☐
Drink mixes (like Carnation® instant breakfast, hot cocoa, Kool-Aid®, and ice tea)	☐ ☐
Sugar free drink mixes (like Crystal light®)	☐ ☐
Whole milk (Vitamin D milk)	☐ ☐
2% milk	☐ ☐
1% milk	☐ ☐
Skim/fat free milk	☐ ☐
Other milks (like powdered milk, butter milk or goat milk)	☐ ☐
Milk alternatives (like soy, almond, coconut, rice)	☐ ☐
Chocolate milk	☐ ☐
Regular soda	☐ ☐
Diet soda	☐ ☐
Sports Drinks (like Gatorade®, Powerade®)	☐ ☐
Bottled water	☐ ☐



ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Other Foods	Is this food in the home? ☐ No ☐ Yes
Nut butters (like peanut, almond, or cashew)	☐ ☐
Jam, jelly, syrup, or honey	☐ ☐
Regular dressing	☐ ☐
Reduced fat or fat free/lite dressing	☐ ☐
Regular mayonnaise	☐ ☐
Reduced fat or fat free/lite mayonnaise	☐ ☐
Regular margarine	☐ ☐
Reduced fat or fat free/lite margarine	☐ ☐
Butter	☐ ☐
Cooking oil (like canola, vegetable, olive oil, or peanut)	☐ ☐
Shortening (like Crisco®) or lard	☐ ☐

List any other foods you have: _____

Additional Questions:	☐ No ☐ Yes
Is there a fruit basket out that you can see with at least one fruit or vegetable inside it?	☐ ☐
Is there a candy or sweet treat container out that you can see with at least one piece in it?	☐ ☐
Are you a WIC participant?	☐ ☐
Does your child ever use a chair or stool to reach food or drinks normally out of reach?	☐ ☐

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 2: Child's Electronic Bedroom Environment

Instructions:

- Please **go to your child's bedroom** (do not rely on your memory) to complete this section.
- Count an electronic device in your child's bedroom even if the child does not use them, they aren't in sight (under bed or in a closet), or shares the room with another brother or sister or parent.
- An electronic device can have lots of uses. For example, a radio can also have a CD player. Each of these would be counted.
- If the device is not physically broken then accept it as "working".
- If the device is **used only by the child** (for example they have their own computer), mark "**Used only by this child**". If the device is **shared** among other family members, mark "**Shared with other children/adults**".

Electronic device	In this Child's Bedroom?		Who uses this device?	
	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
TV	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
DVD player, Blu-ray player, or VCR	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Digital TV recorder (TIVO)	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Video game player (like X-Box, play station, or game boy)	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Music devices (like IPOD, ZUNE, MP3 player, or CD player)	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Radio	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Computer	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Tablet, IPAD, Kindle, or LEAP Pad	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults
Other:_____	☐ No	☐ Yes	☐ Used by this child only	☐ Shared with other children/adults

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Section 3: Physical Activity Items

Instructions:

- Please read each item below and decide if you have the item at your home (**inside or outside, backyard, or storage shed**).
- Count the item even if your child does not use it.

Item	The item is located at my home (inside or outside) ☐ No ☐ Yes
Bike/trike/3-wheeler	☐ ☐
Seated toy cars powered by child's feet on the ground (**not motorized**)	☐ ☐
Basketball hoop (including child size versions)	☐ ☐
Jump rope	☐ ☐
Hula hoop	☐ ☐
Sports equipment (like bats, balls, racquets, hockey sticks, or golf clubs)	☐ ☐
Roller skates, skateboard, or scooter	☐ ☐
Swing set, play house, or jungle gym	☐ ☐
Trampoline	☐ ☐
Snow equipment (like skis, snow shoes, or ice skates)	☐ ☐
Outdoor equipment (like hunting, fishing, tents, backpacks, climbing or gear)	☐ ☐
Water equipment (like Swimming pool (including plastic kiddy pool), slip-n-slide, canoe, row boat, or boogie/surf board)	☐ ☐
Home aerobic equipment (like treadmill, cycle, cross trainer, stepper, or rower)	☐ ☐
Weight lifting equipment/Toning devices (like free weights, pull up bar, or ankle weights)	☐ ☐
Yoga/exercise mats, exercise balls, exercise/resistance bands, or medicine ball	☐ ☐
Workout DVD (like aerobic, dance, or yoga)	☐ ☐
Exercise, play, recreation room (a designated area for the child to play)	☐ ☐

ID:_____ Date: _____ Time point: □ 1 □ 2 □ 3 □ 4 Administrator: _____

Thank you for your time in filling out this home assessment. We really appreciate you helping us learn more about homes with young children.

Your comments and concerns are important to us. Please let us know if you have any other comments:

_____
_____
_____
_____
_____
_____

APPENDIX I: QUALITATIVE INTERVIEW QUESTION SET: CHAPTER 4

Interview Questions:

Introduction:

Hi my name is alex and I am a PhD student at CSU and this is (RESEARCH TEAM MEMBER), we really appreciate you taking the time to talk with us today. Today we are going to discuss the food and activity items in your home. We will be looking over the survey you filled out and I will ask you questions related to items on the survey. We are intending to use this survey or something similar so that we can better understand the home food and activity environment of preschoolers. We are not interested in the specific foods you have in your home but rather the process in which you filled out the survey. There are no right or wrong answers. We are interested in how we can make the survey better and your opinions and questions are very important. We will be tape recording the interview so that we can capture your thoughts and your own words.

Your participation is completely voluntary and any information you give us will be very beneficial. You will be compensated $20 for your time. At any point during this interview you can stop the interview and still be compensated. Do you have any questions about this? If anything comes up as we are going through this, feel free to stop and ask your questions.

Make sure to collect consent form and demographic sheet.

Ice Breakers:

1. How was your summer? Did you go anywhere?
    a. Probe for information about family: who went? What did they do?
    b. Probe about child: What was their child's favorite thing?
2. Now I would like to talk to you about the Survey you filled out. When you get home from shopping, where do you put your groceries?
    a. Probe for other locations: garage, basement, freezer, pantry, bedrooms, or other rooms?

Questions:

1. Now Let's spend some time talking about filling out the survey, Can you tell me how you filled out the survey?
    a. Probe: Where did you start?
    b. Probe: Did you complete a full section and then move on OR did they jump around between sections?
    c. Probe: Did you physically check each item or go off of memory?
    d. Probe: Did you complete the survey at one time or have to do part and come back later to finish?
    e. Probe: Did you skip items?

i. Probe: If so, Why did you skip these items?

f. Probe: Did you leave items blank?
    i. Probe: If so, Why did you leave these items?

g. There are some items that can be found in different forms and different locations, for example corn can be frozen, canned, or fresh. Were there places that you went only to look for certain items?

h. There are some items in our homes that we always have on hand, while filling this survey out, were there any sections that you did not have to get up to check for items?
    i. Probe: What were those sections/items?
    ii. Probe: Why did you not have to get up to check for those items?

2. As you probably noticed, the survey is divided into different sections with food or activity items under these sections. We are going to go through each section and I will ask you how the experience of filling out each section was. You will use this scale to answer each question: Present Likert here. (Participant should have home assessment as we walk through each item)
    a. Snack/treat/nut, cereal, drinks, meat/ poultry/fish, dairy, breads/beans/pasta/grains, ready to eat meals, other foods, fruits and vegetables, child's bedroom electronic environment, and activity environment. **(Talk about each section Individually)**
        i. Probe: Why did you find this section (INSERT RESPONSE HERE)?
    b. Now we are going to talk about how to group foods together. On this sheet of paper, I have some examples the first example is foods by their state (like whether they are fresh, frozen or dried), the second example is foods by location of where they are in your house, and the third example is how the foods are grouped now, by food group. Think about filling out this form, which one of these groups would make it easier to fill out this form?
        i. Probe: Why does (INSERT RESPONSE HERE) make it easier for you?
        ii. Probe: What about this group makes the most sense to you?
        iii. Probe: Is there any other way that you think the foods could be grouped that would make this survey easier to fill out?
            1. Probe: Would it be helpful if the sections were broken in to sub categories, such as Drinks broken down to Sweet drinks and milk

OR Fruits and vegetables broken down to just fruits and just vegetables? Or fruits, vegetables, dairy etc. in the refrigerator?

3. On the front page with the instructions, there is a nutrition label. How did you use the nutrition label to help you fill out this survey?
    a. Probe: were their certain items that you used the nutrition label to help you answer?
    b. Generally speaking, How do you use nutrition labels?
        i. Probe: Do you use them in the store or at home?
        ii. Probe: What kind of information do you look at on a nutrition label?
        iii. Probe (if they say they don't use a nutrition label):
            1. Many people find the nutrition label confusing or hard to understand, Why do you not use the nutrition label?
    c. What would make using the nutrition label to fill out the survey easier to understand?
        i. Probe: not using a nutrition label?
        ii. Probe: more explanation on how to use a nutrition label?
4. Now I would like to talk about the instructions on the survey, when did you read the instructions?
    a. Probe: Did you read them before starting the survey when you were looking it over or refer back to them later?
    b. Did you refer back to the instructions while filling out the survey?
        i. Probe: When did you refer back to the instructions?
        ii. Probe: Why did/didn't you refer back to the instructions?
    c. How helpful did you find the instructions? (Use the Likert scale)
        i. Probe: Why were the instructions (INSERT THEIR RESPONSE HERE)?
        ii. Probe: Do you have any suggestions on how to improve them?
    d. Is there anything that would have made the instructions easier to understand?
        i. Probe: Ask if pictures, reminders, less wording
    e. In addition to having instructions in writing, how helpful would you find the following options:
        i. Probe: video instructions either in DVD format or online (internet)?
        ii. Probe: photo instructions-having pictures to help explain items on the survey

iii. Probe: an opportunity to ask questions to a person familiar with the survey
iv. Probe: other, are there any other methods that would make the instructions better?

5. So overall, how would you describe the experience of filling out this survey?
    a. Probe: was it easy/hard?
    b. Probe: was it boring/fun?
    c. Probe: What did you think about the length
        i. Probe: Just right?
        ii. Probe: Too long?
        iii. Probe: Too short?
    d. Probe: What about the font?
        i. Probe: Was it to large/small?
    e. Probe: If it were more spread out but longer, would that be easier to fill out?
    f. What would you add to survey that would make it easier to fill out?
        i. Probe: would it be electronic?
        ii. Probe: would it be shorter?
        iii. Probe: would it be longer?
        iv. Probe: would it contain fewer words or more pictures?
6. Is there anything else on this survey that we haven't talked about that I have missed or are there other questions or anything that you thought would be helpful that you would like to add?

APPENDIX J: CONFUSION, HUBBUB, AND ORDER SCALE (CHAOS): CHAPTER 5

Home Survey: This next section is about your home. These phrases ask for **your opinion** about what it is like to live in your home. Please read each sentence carefully and mark the number that reflects your level of agreement or disagreement.

Statement about your home	Very much agree	Agree	Slightly agree	Slightly disagree	Disagree	Very much disagree
There is very little commotion in our home.	☐	☐	☐	☐	☐	☐
We can usually find things when we need them.	☐	☐	☐	☐	☐	☐
We almost always seem to be rushed.	☐	☐	☐	☐	☐	☐
We are usually able to “stay on top of things”.	☐	☐	☐	☐	☐	☐
No matter how hard we try, we always seem to be running late.	☐	☐	☐	☐	☐	☐
It’s a real “zoo” in our home.	☐	☐	☐	☐	☐	☐
At home we can talk to each other without being interrupted.	☐	☐	☐	☐	☐	☐
There is often a fuss going on at our home.	☐	☐	☐	☐	☐	☐
No matter what our family plans, it usually doesn’t seem to work out	☐	☐	☐	☐	☐	☐
You can’t hear yourself think in our home.	☐	☐	☐	☐	☐	☐
I often get drawn into other people’s arguments at home	☐	☐	☐	☐	☐	☐
Our home is a good place to relax.	☐	☐	☐	☐	☐	☐

Statement about your home	Very much agree	Agree	Slightly agree	Slightly disagree	Disagree	Very much disagree
The telephone takes up a lot of our time at home.	☐	☐	☐	☐	☐	☐
The atmosphere in our home is calm.	☐	☐	☐	☐	☐	☐
First thing in the day, we have a regular routine at home.	☐	☐	☐	☐	☐	☐

APPENDIX K: FAMILY ENVIRONMENT SCALE (FES)- SYSTEM MAINTENANCE DIMENSION: CHAPTER 5

Family Survey: These next statements are about **your family**. You are to decide which of these statements are true of your family and which are false. If you think the statement is True or mostly True of your family, make an X in the box labeled T (true). If you think the statement is False or mostly False of your family, make an X in the box labeled F (false).

You may feel that some of the statements are true for some family members and false for others. Mark T if the statement is true for **most family** members. Mark F if the statement is false for **most family** members. If the members are evenly divided, decide what the stronger overall impression is and answer accordingly.

Remember, we would like to know what your family seems like to you. So do not try and figure out how the other members see your family for each statement.

Statement about your family	True	False
Activities in our family are pretty fully planned.	☐	☐
Family members are rarely ordered around.	☐	☐
We are generally very neat and orderly.	☐	☐
There are very few rules to follow in our family.	☐	☐
It's often hard to find things when you need them in our household.	☐	☐
There is one family member who makes most of the decisions.	☐	☐
Being on time is very important in our family.	☐	☐
There are set ways of doing things at home.	☐	☐
People change their minds often in our family.	☐	☐
There is a strong emphasis on following rules in our family.	☐	☐
Family members make sure their rooms are neat.	☐	☐
Everyone has an equal say in family decisions.	☐	☐
Each person's duties are clearly defined in our family.	☐	☐
We can do whatever we want to in our family.	☐	☐
Money is not handled very carefully in our family.	☐	☐
Rules are pretty inflexible in our household.	☐	☐

Statement about your family	True	False
Dishes are usually done immediately after eating.	☐	☐
You can't get away with much in our family.	☐	☐

APPENDIX L: TRIANGULATION RESULTS: CHAPTER 4

Themes from Triangulation Analysis:
February 6, 2013
1:00 PM
Alex Burdell, Ashley Lopez, Reanna Moore

7. Now let's spend some time talking about filling out the survey, Can you tell me how you filled out the survey?

- Parents go off of memory.
- They start at the front and go to the back.

***There are some items that can be found in different forms and different locations, for example corn can be frozen, canned, or fresh. Were there places that you went only to look for certain items?**

- Parents didn't really consider different forms, they just thought of the food as they bought it or had it in their home.

***There are some items in our homes that we always have on hand, while filling this survey out, were there any sections that you did not have to get up to check for items?**

- Parent's filled this out off of memory but there were sections like the snack section that they viewed as "staples" and did not feel the need to check.

2a. As you probably noticed, the survey is divided into different sections with food or activity items under these sections. We are going to go through each section and I will ask you how the experience of filling out each section was. You will use this scale to answer each question.

- **Snacks:** This section was viewed as easy. They do this type of shopping often. They found the description with items helpful to identify if they had the item we were asking for. There was some confusion on scratch made items. The parents were confused about whether they count it or not, since they did not buy it at the store.
- **Cereal:** This section was viewed as easy. They buy this often but found the sugar grams to be confusing.
- **Drinks:** This section was viewed as easy. They said it was self-explanatory.
- **Meat:** This section was split half and half for easy/hard. They said this is a section that they don't buy often and they were confused about what type of meat counted under each meat item we were asking. There was also a suggestion from several participants to include deer or elk, since many hunt.
- **Dairy:** This section was viewed as easy but there was confusion with the cheese section. They seemed to not understand the differences we present for regular, low fat, and fat free.

- **Breads:** This section was viewed as pretty easy. There was confusion in this section when it came to certain items they were unfamiliar with, quinoa, tempeh, tofu…liked that this section was broken down and they knew what we were asking for.
- **Ready to eat meals:** This section was viewed as easy. These are things they keep in the house and liked the description for the items. They knew what we were asking for.
- **Other foods:** This section was viewed as mostly easy. Some were confused about potatoes not being in vegetables, confusion on jam, does it count if it is not bought, and some wanted inclusion of other "condiment" type items.
- **Fruit and Vegetables:** This section was viewed as hard. They felt it was long, items over lapped, it required more time to think about what they had, and there was confusion about if it counted if it was not purchased at the store but brought in through a garden. Some mentioned that they were frustrated because items were not in season.
- **Electronic:** This section was viewed as mostly easy. But there was a lot of confusion with the combo and working section on this page.
- **Physical Activity items:** This section was viewed as easy. They knew what they had. They thought the list was simple.

2b. Now we are going to talk about how to group foods together. On this sheet of paper, I have some examples the first example is foods by their state (like whether they are fresh, frozen or dried), the second example is foods by location of where they are in your house, and the third example is how the foods are grouped now, by food group. Think about filling out this form, which one of these groups would make it easier to fill out this form?

- Most people were ok with how it is organized now but thought location would be helpful.
- Most thought that subcategorizing the sections would be helpful.

3. On the front page with the instructions, there is a nutrition label. How did you use the nutrition label to help you fill out this survey?

- They did not use the nutrition label to help them fill out the survey.
- They did not know they were supposed to use it.
- They do use nutrition labels in the store but not at home.
- Mostly they look at sugar, fat, and calories.
- They felt that we should tell them on every question that we want them to use the nutrition label to use it.

4. **Now I would like to talk about the instructions on the survey, when did you read the instructions?**
    - Most stated they read the instructions before they started the survey.
    - They had to refer back to them specifically for the child accessibility question, child's electronic bedroom, and the f/v section.
    - They found the instructions helpful but suggested breaking them into smaller sections, bolding or underlining items, and providing reminders.
    - The use of a DVD or internet was not liked as an addition to the instructions but a phone call was.

5. **So overall, how would you describe the experience of filling out this survey?**
    - They found the length ok for everything we were asking.
    - They liked the font.
    - They prefer paper over anything electronic.
    - They thought it was interesting.
6. **Is there anything else on this survey that we haven't talked about that I have missed or are there other questions or anything that you thought would be helpful that you would like to add?**

    - They did not like the child accessibility question, there was confusion on that.
    - They thought that involving the child would be helpful.
    - And that made from scratch should be an option.

APPENDIX M: QUESTIONNAIRE MODIFICATION SOURCES

Notes: Four main sources were used in the modification of the Home IDEA. These Include:

- Townsend, M. S., Sylva, K., Martin, A., Metz, D., & Wooten-Swanson, P. (2008). Improving Readability of an Evaluation Tool for Low-income Clients Using Visual Information Processing Theories. Journal of Nutrition Education and Behavior, 40(3), 181-186. doi: http://dx.doi.org/10.1016/j.jneb.2007.06.011.
- Dillman, D. A., Smyth, J. D., Christian, L. M. (2006). Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method (3 ed.). Chapter 4-6. Hoboken, NJ: Wiley, John & Sons, Incorporated.
- Center for Disease Control and Prevention. (2009). *Simply Put: A Guide for Creating Easy-to-Understand Materials*. Atlanta, GA.
- Qualitative Home Interviews: Chapter 4

Changes	**Source for Change**
Decreased reading level of instructions	CDC
Provided more examples for food items	Interviews
Used text accompanied with pictures	Townsend, CDC
Used real pictures of food	Townsend
Cue stimulation to facilitate understanding through hints and helpful reminders	Townsend, Interviews
Made enjoyable visuals and questionnaire layout	Townsend, Dillman
Sought participant input for questionnaire through qualitative home interviews	Dillman
Provide information about the questionnaire, why we were giving it to them and things they should and should not do	Dillman
Ask for their help: acknowledge that what they put is helpful to us	Dillman
Made answering easy and convenient	Dillman
Limited messages through the use of bullet points and breaking out information into smaller chunks	CDC
Put most important information first	CDC
Increased amount of white space	CDC
Applied several font considerations: serifs, avoided using all capitals, size, bold, and underline	CDC
Made sections shorter to eliminate confusion	Interviews
Nutrition label was moved next to the question it related to (cereal)	Interviews
Added a count to facilitate movement	Interviews
Reduced amount of questions that require the use of the nutrition label	Interviews
Deceased redundant information: child accessibility and frequency of food purchased	Dillman, Interviews
Thanked participants and offered opportunity for their comments	Dillman