Evaluation of Home Environmental Factors of Childhood Obesity: A Comparison of Assessors

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ABSTRACT

Evaluation of Environmental Factors of Childhood Obesity:

A Comparison of Assessors

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Objectives: The purpose of this study was to determine how accurately parents were able to assess the home environmental factors that may impact childhood obesity.

Methods: Parents of 81 families that had completed a baseline time point assessment in a broader Seattle Children's Hospital research study on childhood obesity were asked to rate the availability and accessibility of food and physical activity amenities and equipment in their home. Researchers then visited the home and conducted an inventory of the same factors that the parents were also asked to report. A quantitative analysis of the data using T-tests and regressions was conducted in order to determine how accurately the parents portrayed the home environment.

Result: The data analysis found statistically significant results that parents underestimated the amount of unhealthy foods and overestimated the amounts of healthy foods when

compared to the researchers' findings at the residence. The analysis also found statistically significant results that parents underestimated the amount of physical activity equipment in the home when compared the researchers' findings.

Conclusions: In general, what parents reported from memory was a substantially healthier home food environment for their child than was identified by independent evaluation conducted during home visits. Compared to what the staff member found within the home, parents underestimated unhealthy foods and overestimated healthy foods. Surprisingly, the opposite held true when evaluating physical activity equipment in the home, as parents underestimated the amount of physical activity equipment. Future qualitative analysis would be appropriate to further explore if parental misperception of the home environment is benign and due to general inaccuracy or measurement error, or if parental misperception is due to an actual skewed view of the overall healthiness of their home environment. Understanding why parents misperceived the home environment will help tailor future intervention efforts by providing answers about whether there is a need for parental education on how to accurately view the home.

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INTRODUCTION

The rise of childhood obesity is a serious problem that impacts public health in a significant manner and while its incidence is no longer increasing in magnitude, it is not falling either and remains one of the greatest public health challenges of the 21st century (Ogden, Carroll, Kit, & Flegal, 2014) (Karnik & Kanekar, 2012). Environmental factors, such as the availability of healthy food, unhealthy food, and physical activity equipment have been shown to impact childhood obesity rates (Papoutsi, Drichoutis, & Nayga, Jr., 2013). This research project adds to the body of research surrounding the convoluted and complicated issue of childhood obesity by looking at how the environmental factors of home food availability and activity environment are perceived by parents. Specifically, it sought to see if parents were able to accurately report on these environmental influences in their residence.

Problem Description

The childhood obesity epidemic has been growing for years, and unless measures are taken to address this problem, we will soon face a public health crisis. Childhood obesity is measured using a body mass index (BMI) percentile, which is determined using by height and weight relative to same age and sex peers. The Center for Disease Control notes that, "For children and teens, BMI is age and sex specific and is often referred to as BMI-for-age" (Center for Disease Control, 2014, p. 1). Overweight children in the United States are generally defined as those having a BMI over the eighty-fifth percentile for age and sex. Those who fall into the category of obese are those with a BMI over the

ninety-fifth percentile (Boles, Scharf, Filigno, Saelens, & Stark, 2013) (Cole, Bellizzi, Flegal, & Dietz, 2000) (Reilly, et al., 2003) (Wang & Beydoun, 2007).

The most recent prevalence estimates are that 16.9 percent of 2 to 19 years olds in the US are obese (Ogden, Carroll, Kit, & Flegal, 2014) and this is represents a nearly tripling rate over the past few decades. Furthermore, about seventy percent of obese adolescents grow up to become obese adults, and it is difficult to reduce excessive weight once it becomes established (Dehghan, Akhtar-Danesh, & Merchant, 2005). The negative impact of obesity on a child's well-being both as a child and as an adult is strong and well established, studies have shown that obese children are more likely to have physical and psychological problems such as cardiovascular disease, hyperlipidemia, hypertension, abnormal glucose tolerance, infertility, asthma, and diabetes (Dehghan, Akhtar-Danesh, & Merchant, 2005) (Reilly, et al., 2003) (Wang & Beydoun, 2007). Overweight children followed up for 40 and 55 years were more likely to have cardiovascular and digestive diseases, as compared with those who were lean (Dehghan, Akhtar-Danesh, & Merchant, 2005). From an emotional and psychological standpoint, depression, severe psychiatric problems, and low self-esteem are more common among overweight versus non-overweight children after controlling for other factors (Reilly, et al., 2003) (Dehghan, Akhtar-Danesh, & Merchant, 2005).

Efforts to improve the obesity problem in the U.S. have had some impact and rates are no longer climbing, but public health officials would certainly desire to lower the incidence of obesity. Ogden et al. note, "Although the prevalence of obesity in the

United States is high, with one-third of adults and seventeen percent of children obese, it appears to have leveled off between 2003 - 2004 and 2009 - 2010. Given the focus of public health efforts on obesity, surveillance of trends in obesity remains important" (2014, p. 806). Additional research is needed to understand the causes of childhood obesity and to understand how to improve the impact of intervention programs.

Research Overview

A study was conducted at Seattle Children's Hospital titled, *Familial Overweight Comparing Use of Strategies (FOCUS) Study*. *FOCUS* was a randomized clinical trial that included twenty weeks of family-based behavioral intervention for pediatric overweight. There were seven main assessment time points where physiological measurements for both parents and children were taken of height, weight, and waist circumference, physical activity measurements conducted using Actigraph accelerometers (model 7164) which measured intensity and length of bouts of physical activity, parent surveys (to measure treatment adherence and behavioral skills use, including perceptions of home environment), and independent (done by research staff) home environment assessments. Assessment occurred at study enrollment/baseline, treatment week ten, treatment week twenty, and at three, six, twelve, and twenty-four months after treatment. An additional two time points occurred at the week five and week fifteen time points during treatment where only surveys and weight were collected.

One of the intents of the *FOCUS* surveys was to better determine parents' perceptions of the availability and prevalence of home environmental factors that are

thought to impact childhood obesity and that were expected to change as a result of treatment. The same surveys were repeatedly administered across time to examine whether changes in these home environment factors would be related to children and parents' intervention outcomes. For the present analysis, only baseline data were examined. Specifically for the home environment, parents were asked questions about the availability of healthy foods, unhealthy foods, and physical activity equipment in their home (Appendixes A and B). At baseline (and a few other selected time points but for this paper the focus is only on baseline measurements) researchers went to the homes of the participants to evaluate the home environment using the same home environment assessment that the parents completed in their baseline survey packet. By assessing the presence, availability and quantity for the items identified in the questionnaire, from both the parent and the researcher perspective, researchers were able to obtain data that could lead to a better understanding of how the two different ratings compared between assessors for the home environment.

This thesis project looked to compare the parent survey about the home food and activity environment with the same survey from the researcher's home visits at the baseline time point in order to better determine how accurately parents perceive their home environment. In turn, this will help guide future research and intervention programs, impacting both research and policy.

Research Questions

This study explored three research questions regarding the home environmental factors that impact childhood obesity.

Question one (Q_1): What is the relationship between parent's assessment of unhealthy food availability in the home compared to the researcher's assessment?

Question two (Q_2): What is the relationship between parent's assessment healthy food availability in the home compared to the researcher's assessment?

Question three (Q_3): What is the relationship between the parent's assessment of the amount of physical activity equipment in the home compared to the researcher's assessment?

LITERATURE REVIEW

The two areas of prominence surrounding this thesis project are the environmental factors within the home that impact childhood obesity and how the assessments of these environmental factors compare when conducted by a parent from memory versus a researcher physically assessing the household. In general, there is a great deal of literature discussing how the environment that a child is raised in impacts the child's risk to become overweight or obese. There is less of a knowledge base regarding how these factors should be most effectively assessed.

Childhood Obesity Factors

Childhood obesity used to be on the rise, but has leveled off in recent years (Ogden, Carroll, Kit, & Flegal, 2014). It has been well documented that the existing childhood obesity rate has serious public health consequences (Dehghan, Akhtar-Danesh, & Merchant, 2005) (Reilly, et al., 2003) (Wang & Beydoun, 2007). However, unlike many diseases, childhood obesity cannot be simply overcome with a series of drugs or established treatment regimens. The causes of childhood obesity are multifaceted and range from poor food choices to sedentary activity levels to environmental issues such as the home environment, built environment, or even media and social networking influences (Papoutsi, Drichoutis, & Nayga, Jr., 2013). The impact of each cause varies greatly from child to child, but it has been seen that these factors can be best controlled and mitigated through a combination of change to a more healthy diet and exercise (Karnik & Kanekar, 2012). Furthermore, children who are overweight or obese often

grow up to be overweight or obese as adults (Strauss, 2002). This problem can become exponentially worse as the child grows older, with obese adolescents having a much higher rate of adult obesity than obese children (Etzioni, 2014). Children should therefore be considered the priority population for obesity intervention strategies (Dehghan, Akhtar-Danesh, & Merchant, 2005).

When looking at the problem of obesity, the primary causation factors are clear: diet and physical activity (Karnik & Kanekar, 2012). These behaviors are thought to be substantially impacted by environmental or cultural issues (Van Staveren & Dale, 2004), and perhaps especially among children (Dehghan, Akhtar-Danesh, & Merchant, 2005) (Reilly, et al., 2003) (Wang & Beydoun, 2007). The roles that diet and physical activity play in obesity have been understood for some time. Historically, the environment's impact on diet and exercise has been recognized, but was thought to be a smaller, more ancillary factor than diet and exercise. However, emerging research has shown that an individual's environment plays a more substantial role in obesity and related behaviors than was previously understood (Boles, Scharf, Filigno, Saelens, & Stark, 2013) (Couch, Glanz, Zhou, Sallis, & Saelens, 2014) (Birch & Ventura, 2009). As a result, more research is needed to look at how and how much environmental factors impact childhood obesity.

A significant area of the environmental picture is the home environment as people spend the majority of their time in the home (Brasche & Bischof, 2005). This is true of children as well (Kneeshaw-Price, et al., 2013). Although, there has been a trend towards

eating away from the home, most food consumption still occurs within the home (Anderson & Butcher, 2006). It is well established that the home environment is a dramatically important in the fight against childhood obesity. Couch et al. note, "Much of a child's eating behavior occurs in and around the home, so the potential impact of the [home food environment] on a child's energy intake and overall diet quality is particularly relevant" (2014, p. 1569). The Couch et al. study specifically found that the factors pertaining to the home food environmental explained twenty-eight percent of the variance in a child's BMI z-score, and noted that modifying a child's home food environment could have substantial impacts on their eating behavior (Couch, Glanz, Zhou, Sallis, & Saelens, 2014).

Traditionally, the home environment has been much more difficult to study than other environmental factors and measurement of home environment has relied predominately on interviews and questionnaires (Boles, Scharf, Filigno, Saelens, & Stark, 2013). Developing new methodology for measuring home environmental could have a substantial impact in the fight against obesity.

Home Assessment of Obesity Factors

The significant impact of the home environment on childhood obesity has been growing in prevalence (Van Staveren & Dale, 2004). As a result, evaluating the role that the home environment plays has been a focal point in the public health community, but typically this evaluation had been conducted through self-report (or parent report for children) means, rather than through direct systematic observation (e.g., home visits

made by researchers) (Brownson, et al., 2004) (Couch, Glanz, Zhou, Sallis, & Saelens, 2014).

More observational methods to assess the home environment are being worked into current and future studies (Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008). Boles et al. notes, "Assessing the home environment has typically included self-report inventories that include [an examination of] either food availability or activity devices. Researchers have begun to include observational methods to provide more objective measurements of the home food and activity environment in order to mitigate potential self-report bias" (2013, p. 223).

A thorough search of EBSCO, ProQuest, JSTOR, and Web of Science located very few instances where researchers physically travelled to the residence to conduct an assessment of the participant's home environment. Two of the studies, Bryant et al. (2008) and Fulkerson et al. (2008) were conducted in a similar fashion to the *FOCUS* study.

Fulkerson et al. (2008) looked at a wide variety of food environmental factors in the home as they pertained to obesity. This study did not conduct a survey based on participant recall (as was done in the *FOCUS* study), but instead asked the participant to conduct an inventory of their residence. This inventory and the researcher's home assessment were conducted simultaneously. Their analysis showed that their strategy for home environment analysis could be replicated by future studies, noting "home food inventory is valid, participant-friendly, and may be useful for community-based

behavioral nutrition and obesity prevention research" (Fulkerson, et al., 2008, p. 63). The study assessed nearly 393 participants and measured 13 different categories of food in the home. Researchers also provided the participants with a questionnaire which was filled out by participants at the same time as that the researcher home visit was conducted. In this study, the researcher's observations of the home food environment were viewed as the "gold standard" when compared to the participant questionnaire. An analysis of the data collected revealed that the questionnaire results and the home visit results were very similar. As a result the authors suggested that, "high correlations between participants' and staffs' reports of foods in the home suggests that the instrument could be used effectively for data collection by participants, thus, alleviating the need for staff home visits which are expensive, time-consuming and potentially intrusive" (Fulkerson, et al., 2008, p. 63).

Another study looked at the comparison between participant self-reporting via phone interview and researcher observation. Bryant et al. (2008) conducted a study of 85 families comparing a phone interview of parents about home environment followed by a home assessment conducted by researchers. The study addressed a wide variety of home environmental factors, such as food availability and quantity, eating practices, physical activity, and media environment. Of particular interest to this thesis project is how the study collected data regarding the home food environment and physical activity environment, which was conducted in a similar fashion as the *FOCUS* study.

This study found that there was substantial agreement between the parental assessment (obtained via a phone interview) and the researchers' findings in the home assessment of the residence. However, Bryant et al. also noted that due to complicated categorization issues and timing between the interview and the home assessment, some reliability and validity concerns existed (2008). When evaluating the categorization concerns, Bryant et al. noted that, "in order to calculate the number of servings, these general sizes had to be translated into more exact volume or weight quantities. This methodology likely affected the reliability and validity of these items." (2008, p. 28) The study's authors recommended that future studies attempt to provide families with categories that are easier to understand and quantify. They also recommended that the home assessment be more immediate so that conditions such as food availability did not change in the time between the interview and the home visit. The *FOCUS* study from which the data was collected for this thesis project utilized the same methodology of conducting the parent survey/interview at a different time than the in-home assessment. Despite these concerns from the researchers, the results of the Bryant et al. study yielded predominately the same results as the Fulkerson et al. study.

Gaps in the literature

As indicated previously, there are very few studies that have used in-home assessments conducted by researchers to evaluate the home environment. Accurately understanding the home environment of a child is a key aspect of any childhood obesity intervention or study. As a result, the field needs to understand the best way to obtain

this information. At this point, the lack of studies in this arena lends itself to greater analysis, especially given some validity and reliability concerns identified by authors of the Bryant et al. study (2008).

Furthermore, in-home assessments conducted by researchers require substantial resources. The analysis of whether researcher home visits are truly necessary for future research and intervention programs so that resources can be allocated in the most efficient and effective method. Literature to this point has somewhat indicated that there is a high degree of correlation between participant assessment of the home environment and researcher observation of the same environment. However, as has also been noted, some studies have suffered from methodological issues that lessen the impact of the results.

It is apparent that research is needed to determine if the participant can, with a high degree of validity, provide the researcher with a clear picture of the home environment. This thesis project will add to the literature on this issue by analyzing data collected during the *FOCUS* study. Specifically, T tests and regression analyses will be used to compare results of the parent survey of home environment with the findings of the researcher's in-home assessment. This will determine how accurately parents were able to assess the home environmental factors that may impact childhood obesity.

METHODS

Data Collection

Data was collected through a parent survey and home environment assessments as part of the *FOCUS* study. The Home Environment Assessment (HEA) instrument was completed by parents at or soon after the time of enrollment into the FOCUS study. Independently this instrument was also completed by trained research assistants during a visit to the family home as near in time as possible to competition of the survey by the parents. The HEA instrument consisted of items around sedentary activity items, physical activity items, and presence, availability and amounts of different foods. The data for the sedentary items within the household for parent and researcher, and other aspects of the surveys from the parents (e.g., their readiness to help change their child's eating and activity) at the enrollment visit were not analyzed in this thesis. Also at baseline, a trained research associate completed the Home Environment assessment form. The two assessments were completed as near (in time) to each other as possible. Sometimes the home assessment was conducted before the parent self-report portion was completed and sometimes this was conducted after. In general, the two events happened within two weeks of one another, with the median date range difference between parent and researcher being +13.5 days (N=70, range = 17 before to 53 days after). Additionally, in twenty-two percent of the sample (N = 18), a second trained independent research associate also completed the home environment assessment as the same time as the first rater to assess inter-rater reliability.

Prior to the home assessment, parents were informed that drawers, doors and cupboards would be opened to identify specific indicator items, but that contents would not be touched or moved. In addition, any drawers deemed or requested to be "private" by the participants would not be opened. Researchers checked all areas of the home, rating items room by room including basements, unattached storage areas, yards and play areas available to housing developments and complexes. The entire home assessment lasted approximately 60-90 minutes. After all study information had been completed for the baseline measures, parents were given $10 for their participation.

Scale construction

The two sections analyzed from this assessment survey consisted of 79 questions; 13 questions relating to the physical activity environment and 66 questions relating to the food environment. The food environment questions consisted of three questions asked for each of the 22 food categories. The questions consisted of a yes/no question about the presence or absence in the home for each food category, a yes/no question about the immediate availability of the food to the child , and a three category response about the amount of food available ("a little" was identified as enough for up to two people to eat at a snack/meal, "some" was identified as enough for three to eight people to eat at a snack/meal, and "a lot" was identified as more than a little or some).

The physical environment questions consisted of yes/no questions about the availability of 13 specific items in the household such a jump rope, free weights, yoga mat, etc.

The home environment survey questions are included in appendices 1 and 2.

A physical activity item scale was constructed as the number of specific items in the household marked as available (range 0 to 13).

Food category questions were grouped into questions about healthy foods (10 questions) and questions about unhealthy foods (12 questions). The division of categories for healthy versus unhealthy food can be found in Appendix Three. From the survey questions six scales were constructed: unhealthy food present in the home scale, healthy food present in the home scale, unhealthy food immediately accessible to kids scale, healthy food immediately accessible to kids scale, the amount of unhealthy food scale, and the amount of healthy food scale. The food present in the home scales were measured as the number of food categories marked as present in the home, separately for both the healthy (scale range, 0 to 10) and unhealthy (scale range, 0 to 12) questions. The immediately accessible to kids scales were measured as the number of food categories marked as immediately available to kids, separately for both the healthy (scale range, 0 to 10) and unhealthy (scale range, 0 to 12) scales questions. The amount of food scales were measured as the sum of the food categories marked with a little (coded as '1'), some (coded as '2') or a lot (coded as '3'), separately for both the healthy (scale range, 0 to 30) and unhealthy (scale range 0 to 36) questions. Anything not present would not have been added to the sum total for the scale, and thus would be considered to be coded as a '0'.

Because the 'immediately available' and 'how much' questions were only answered for a category if the category was marked as present, mean scales for these four

questions were also constructed by dividing the total scores for each scale by the number of responses for the 'immediately available' or 'how much' questions. This resulted in four scales the average of food immediately available to the child scales for both healthy (scale range 0 to 1) and unhealthy (scale range 0 to 1) categories, and the average of the amount of food scales for both the healthy (scale range 1 to 3) and unhealthy (scale range 1 to 3) categories. When averaging data from these four scales, if data were missing it was not factored into the denominator of the average, and so the result will be an average only for items that had data available.

Researcher assessment training

Research associates were trained for household assessments using "test" households (often a household of another staff member) and as the assessments were conducted they were able to ask questions and receive on the job training. After the assessments were completed the data between the seasoned raters and the newer raters were then discussed to allow for better understanding of the principles and methodology used when assessing the households for the various items and categories of focus. Once raters felt comfortable assessing on their own, they were still considered as in-training until they had evaluated a few households of actual study subjects with another seasoned rater and their results closely matched those of the more seasoned raters. Upon training completion, these raters became available to assess households on their own, either as the primary and sole rater or as the secondary and reliability rater.

Reliability data collection

Reliability assessments were collected for 40 households at the baseline time point. There was a goal to obtain a reliability assessment for a minimum of 25% of the households assessed at each time point. These reliability ratings were conducted by raters assessing the same household independently, but at the same time.

Reliability analysis

Inter-rater reliability was assessed for each of the 22 food categories by calculating Kappa for yes/no questions and Cronbach's Alpha for the quantity questions (Viera & Garrett, 2005) (Cronbach, 1951). Inter-rater reliability was assessed for the physical activity environments, but was not analyzed as a part of this project.

Cronbach's Alpha was used to assess whether there was sufficient agreement between the raters in the category of "how much was there. Cronbach's Alpha was the selected statistical method because the variables are continuous in their outcome measure, and internal consistency needed to be assessed (Cronbach, 1951). When analyzing whether the item was in the home, Kappa was used (Viera & Garrett, 2005). In this case it was used for the yes/no answers for whether it was in the home or not and whether or not it was immediately available to the child. Kappa was selected because the variables were categorical instead of continuous data.

Home Environment Analysis

The questions previously stated (Q_1, Q_2, and Q_3) were tested by conducting a statistical analysis of the data gathered in the *FOCUS* study. In agreement with other similar studies, the researchers' observations were viewed as the "gold standard" when analyzing the data (Fulkerson, et al., 2008) (Bryant, et al., 2008).

Agreement between the parental assessment and the research associate assessment of each of the 10 food scales and the physical activity environment was conducted using paired T-tests to examine the difference between researcher and parental assessments and linear regression to examine further the relationship between the researcher assessment and the parental assessment.

Each of the categories were analyzed separately in order to isolate the differences in ratings between parent and researcher and to present a clearer picture of the assessment results. Specifically, when using paired T tests for either averaged or summed scores, the parent assessment for healthy food was compared to the researcher assessment for healthy food, the parent assessment for unhealthy food was compared to the researcher assessment for unhealthy food, and the physical activity assessment for the parent was compared to the physical activity assessment for the researcher.

RESULTS

Table 1 shows summary scores for the seven summed scales and four averaged scales, separately for researchers and parents.

Table 1. Summary Statistics

	Scale	N	Min	Max	Mean	SD
Researcher	Physical Activity	81	2	13	8.3	2.0
	Home Unhealthy	81	1	12	7.1	2.3
	Home Healthy	81	2	10	7.5	1.6
	Reach Unhealthy	81	1	9	5.2	1.8
	Reach Healthy	81	0	9	6.3	1.8
	How Much Unhealthy	81	2	32	18.1	6.7
	How Much Healthy	81	5	29	19.1	5.1
Researcher Average	Reach Unhealthy	81	0.4	1.0	0.8	0.1
	Reach Healthy	81	0.0	1.0	0.8	0.2
	How Much Unhealthy	81	1.9	3.0	2.6	0.3
	How Much Healthy	81	1.6	3.0	2.6	0.3
Parent	Physical Activity	80	2	13	7.7	2.4
	Home Unhealthy	81	2	12	6.6	2.1
	Home Healthy	81	2	10	7.9	1.6
	Reach Unhealthy	81	0	10	4.1	2.4
	Reach Healthy	81	0	10	6.3	2.2
	How Much Unhealthy	81	3	22	11.0	4.9
	How Much Healthy	81	4	25	14.9	4.4
Parent Average	Reach Unhealthy	81	0.0	1.0	0.6	0.3
	Reach Healthy	81	0.0	1.0	0.8	0.2
	How Much Unhealthy	81	1.0	2.8	1.6	0.4
	How Much Healthy	81	1.1	2.8	1.9	0.4

Food Environment

The two research questions that pertained to the food environment were Q_1: What is the relationship between parent's assessment of unhealthy food in the home compared to the researcher's assessment and Q_2: What is the relationship between parent's assessments of healthy food in the home compared to the researcher's assessment?

Table 2 summarizes the mean difference in scales between researchers and parents. Compared with researchers, parents on average underestimated the number of unhealthy food categories present (mean difference = 0.46, 95% CI 0.03 to 0.89) and overestimated the number of health food categories present (mean difference = -0.38, 95% CI -0.68 to -0.09). Similarly parents underestimated the number of unhealthy food categories immediately available to children (mean difference = 1.15, 95% CI 1.70 to 4.16); however no systematic difference in mean number of healthy food categories available to children was observed (mean difference = 0.05, 95% CI -0.44 to 0.54).

Total amount of unhealthy food was underestimated by parents (mean difference = 7.19, 95% CI 5.98 to 8.39), however, unlike the number of healthy food categories present, which parents overestimated, parents underestimated the amount of health food present (mean difference = 4.28, 95% CI 0.34 to 5.16).

When looking at the mean paired differences of the averaged scales, at the times when parents and researchers agreed that the foods in a particular category were in the home and available, parents underestimated the amount of food for both the unhealthy

(mean difference = 0.94, 95% CI 0.90 to 1.03) and healthy (mean difference = 0.70, 95% CI 0.61 to 0.79) categories of food. When looking at the averaged scales, for the times when parents and researchers agreed foods for a particular category were in the home, parents slightly underestimated whether or not the food was considered to be immediately available for the unhealthy categories (mean difference = 0.15, 95% CI 0.09 to 0.21), and no systematic difference was observed for the mean paired difference of the healthy food categories that were immediately available (mean difference = 0.04, 95% CI -0.02 to 0.10).

For each of the 6 food scales the regression analyses suggested that parents over-estimated the number or amount of items when fewer items were present and underestimated the number of amount of items when more items were present (beta < 1 and alpha > 0 for all regressions).

Table 2. Food and Physical Activity Environment Paired T Tests

	Mean	SD	95%CI Lower bound	95%CI Upper bound	t	Sig. (2-tailed)
Summed total – In home – Unhealthy	0.46	1.94	0.03	0.89	2.12	0.04
Summed total – In home – Healthy	-0.38	1.33	-0.68	-0.09	-2.59	0.01
Summed total – Immediately available to Child – Unhealthy	1.15	2.49	0.60	1.70	4.16	<.001
Summed total – Immediately available to Child – Healthy	0.05	2.22	-0.44	0.54	0.20	0.88
Summed total – how much in home – Unhealthy	7.19	5.46	5.98	8.39	11.85	<.001
Summed total – how much in home – Healthy	4.28	3.97	0.34	5.16	9.71	<.001
Summed total – Physical activity items in home	0.54	1.59	0.18	0.89	3.02	0.003
Mean – Immediately available to Child – Unhealthy	0.15	0.28	0.85	0.21	4.70	<.001
Mean – Immediately available to Child – Healthy	0.04	0.26	-0.02	0.10	1.30	0.201
Mean – How much in home – Unhealthy	0.94	0.42	0.90	1.03	20.42	<.001
Mean – How much in home – Healthy	0.70	0.40	0.61	0.79	15.90	<.001

* All of these are paired comparisons and are measured as Researcher – Parent. Thus, when a paired difference in this table is positive, it indicates that the researcher's score was higher than the parent's score, the n for each of these T tests was 80

The results of the regression analyses can be seen in the Table 3:

Table 3. Regression Analyses

P = Dependent R = Independent	β	α	t(β)	t(α)	R^2	F	df	p
Activity	0.88	0.42	9.98	0.56	0.56	99.68	78.00	<.001
In Home Unhealthy	0.55	2.74	7.00	4.71	0.38	48.90	79.00	<.001
In Home healthy	0.66	2.89	7.90	4.50	0.44	62.39	79.00	<.001
Reach Unhealthy	0.41	1.95	2.97	2.58	0.10	8.82	79.00	<.001
Reach Healthy	0.51	3.06	3.98	3.68	0.17	15.85	79.00	<.001
How Much Unhealthy	0.43	3.12	6.65	2.48	0.36	44.17	79.00	<.001
How Much Healthy	0.57	3.93	7.82	2.72	0.44	61.21	79.00	<.001
Reach Unhealthy Average	0.37	0.33	1.62	1.88	0.03	2.63	79.00	0.11
Reach Healthy Average	0.03	0.78	0.18	5.68	0.00	0.03	79.00	0.86
How Much Unhealthy Average	0.47	0.43	2.90	1.03	0.09	8.13	79.00	0.01
How Much Healthy Average	0.31	1.08	2.42	3.19	0.07	5.86	79.00	0.02

*Parent as dependent variable and Researcher as independent variable for seven separate linear regressions.

Physical Activity Environment

The research question that pertained to the physical activity environment was Q_3: What is the relationship between the parent's assessments of the amount of physical activity equipment in the home compared to the researcher's assessment?

Parents generally under-estimated the amount of physical activity items present (mean difference = 0.54 95% CI 0.18 to 0.89, table 2). This was consistent with the regression analysis which showed a consistent under-estimation of number of physical activity items present (Beta = 0.88).

Reliability Analysis

Alpha and Kappa scores across the vast majority of categories were higher than 0.7 and thus were well within the acceptable range (0.7 or higher) to validate the inter-rater reliability (George & Mallery, 2003). A reliability analysis for the availability to children items was not conducted due to insufficient variation between researchers.

The results of the Alpha and Kappa statistical analyses for inter-rater reliability can be seen in Table 4:

Table 4. Inter-Rater Reliability Analysis

Variable	*How much is there?*		*In home?*	
	Alpha	*N**	*Kappa*	*N*
chocolate or other candy (can include chocolate chips, marshmallows)	.878	35	.640	40
already made cakes, brownies, cookies, muffins (not English)	.742	23	.635	38
boxed mixes for cakes, brownies, cookies, muffins (not English)	.321	26	.765	40
regular chips (e.g., potato chips, corn chips)	.767	22	.794	40
pretzels or baked chips	.778	14	.552	40
fruit roll-ups or other dried fruit (including raisins)	.848	24	.640	39
sweetened breakfast cereal ($\geq$ 7g sugar/svg)	.985	33	.874	38
unsweetened breakfast cereal (< 7g sugar/svg)	.852	27	.935	40
Non-butter crackers (e.g., saltines, graham crackers, wheat crackers, rye crispbread, plain: matzo, melbo, or toast rye wafers)	.931	28	.773	38
fresh bananas, oranges, pineapple, melons	.774	27	.795	40
fresh apples, grapes, celery, lettuce	.768	32	.805	40
potatoes, corn on the cob, whole tomato, frozen vegetables	.835	34	-.026	40
"100% fruit juice"	.564	27	.806	40
juice (e.g., punch)	.557	24	.780	40
regular sodas	.441	13	.833	38
sports drinks (e.g., Gatorade, (mix not readily available))	1.00	5	.418	38
regular (whole) or 2% milk	.714	11	.717	39
frozen or unprepared bacon, sausage, or other breakfast meat (not turkey or low-fat meat based	.875	16	.641	39
ice cream or other frozen desserts	.941	31	.908	39
non-fat cheese or yogurt	.707	20	.897	39
hot dogs or bologna (not turkey or low-fat meat based)	.962	14	.696	40
turkey, chicken, fish, tofu or other lean labeled meat	.238	39	1.00	40

* Responses for how much is present were compared only for items which both raters agreed were present at all.

DISCUSSION

Analysis of Results

The purpose of this study was to look at the difference in assessment results between parents and researchers. As was discussed earlier in this paper, the results of the researchers were viewed as the gold standard. The researcher was assumed to be the most objective party with the least amount of bias. One category (the category of 'potatoes, corn on the cob, whole tomato, frozen vegetables', for whether or not they were in the home) had a Kappa score that was very close to zero. When examined further it was observed that this item was almost always marked present by both raters. This low Kappa score is a result of degenerate behavior of Kappa for situations where one category in the contingency table has a probability close to zero. The Kappa values (0.72) and the Alpha values (0.75) suggest that most the values are within the acceptable range of scores for inter-rater reliability (George & Mallery, 2003).

The findings showed that in general, parents presented a more positive picture of the home food environment than was directly observed. In general, parents portrayed a home that had more healthy food than was observed and less unhealthy food than was observed by the research team. The statistical analysis suggests that parents underestimated the amount of unhealthy food at a greater rate than they overestimated healthy food. The regression analyses suggest that for the food categories, the parents overestimate more, when the amounts are low. While the parent generally presented a more positive picture of the home food environment, results showed that parents actually

presented a less positive view of the home physical activity environment than found by the researchers.

The present results were generally the opposite of what was found in the Fulkerson et al. (2008) and Bryant et al. (2008) studies. Both of these studies found that the parents' picture of the home environment was very similar to the researchers' findings. However, there were some methodological differences in each project that could have impacted the results, thus making it a less than perfect comparison between studies. The Bryant et al. (2008) study described a limitation of the quantification of foods not being easily or consistently understood by participants. The *FOCUS* study tried to alleviate this problem by categorizing into "a little" (enough for up to two people to eat at a snack/meal), "some" (enough for three to eight people to eat at a snack/meal), and "a lot" (more than a little or some), but quantifying how much that might be for each food category. However, other than placing the information on the form, *FOCUS* did not make the relative categories readily apparent to the parent.

The Fulkerson et al. study conducted the parent self-report and the home assessment at the same time. This brought a high degree of validity to the parent presentation of the home environment in comparison to the researcher assessment because the environment did not have the opportunity to change (2008). However, it also meant that parents were able to assess their home environment while conducting the self-report, which resulted in a situation where the parents were not required to recall what was in the house. Parents instead inventoried their house and reported the results. Not

surprisingly, the researchers and parents found predominately the same results because they were conducting the same inventory at the same time, with neither relying upon recall. Attempting to compare the Fulkerson et al. study to the *FOCUS* study in terms of parental assessment of the home environment is quite difficult to do because the parents conducted dramatically different activities in the self-report section of the study.

The Bryant et al. study found that categorization of food items was difficult to standardize and that the validity suffered as a result. Additionally, the home assessment was conducted approximately seven days after the parents were interviewed regarding the home environment, leaving time for the environment to change and for the parent to possibly adjust the environment to mirror the self-report (2008). In the *FOCUS* study, the home assessment was sometimes conducted before the parent self-report and sometimes was conducted after, which broadened the range of home assessment results collected. The median date range between the parent and researcher assessment was 13.5 days, and the mean date range was 15.7 (N=70).

Strengths and Weaknesses of the Study

One of the strengths of this study is that the data collection methodology was well supported by the inter-rater reliability analysis. The reliability results were clearly within the statistically acceptable range, further reinforcing the objective and unbiased performance of the researchers.

A weakness of the study is the sample size. If a larger sample size were used, it was further validate the findings of the study. Biau, Kerneis, & Porcher note, "Significant results issued from larger studies usually are given more credit than those from smaller studies because of the risk of reporting exaggerating treatment effects with studies with smaller samples or of lower quality" (2008, p. 2286). Additionally, as was seen in the Bryant el al. study, categorization of the home food environment was a challenge (2008). While researchers underwent substantial training on how to categorize the various food items in the survey, parents did not. This could have led to reporting differing results for the same item between parents and researchers. As a result, the validity of the findings was not as strong as it could have been otherwise.

Recommendations

Qualitative analysis would be very appropriate to explore results of this study. An exploration of why parents present a more positive home food environment would be appropriate. Do parents intentionally skew the results as a means of reducing possible embarrassment in the eyes of the researcher? Or do parents simply forget what types of food are in the house and how much food is present? Was a misunderstanding of the categorization of the amount of the foods? Or is there a genuine skewed viewpoint and parents unintentionally over report healthy items and under report unhealthy items, as their mind's eye views them? If the parent is unaware of actual amount of unhealthy food, does it change their eating choices and habits? These are important questions that need to be answered in order to impact the field in a greater fashion.

Another recommendation gleaned from this project is that future studies should continue to use researchers to evaluate the home environment. The question of whether or not self-reported methods of the home environment are accurate still has yet to be fully explored. It could be that advances in parent- or other self-report measures of home environment need to be developed that more accurately reflect an unbiased accounting of the home food environment. Until the body of research in this area grows, researchers will find more accurate results using staff to conduct home assessments instead of relying strictly on parents self-reporting on the home environment.

Conclusion

This thesis project has used three research questions to look at the differences between parental and researcher assessments of the home environment. Supported conclusions were able to be drawn, noting that it appeared that parents underestimated factors pertaining to unhealthy food in the home and parents overestimated factors pertaining to healthy food in the home when compared to the researcher's assessment. When looking at the physical activity equipment, it was found that parents underestimated the amount of physical activity equipment in the home compared to the researcher's assessment.

These findings differed from other studies in this area, but the field of research into this topic is extremely small. Further research into this subject is needed, both from quantitative and qualitative perspective. It is important to understand how self-report

results differ from research results, as this will have a substantial impact on how future research is conducted.

BIBLIOGRAPHY

Anderson, P. M., & Butcher, K. F. (2006). Childhood Obesity: Trends and Potential Causes. *The Future of Children*, 19-45.

Biau, D. J., Kerneis, S., & Porcher, R. (2008). Statistics in Brief: The Importance of Sample Size in the Planning and Interpretation of Medical Research. *Clinical Orthopedics and Related Research*, 2282-2288.

Birch, L., & Ventura, A. (2009). Preventing childhood obesity: what works? *International Journal of Obesity*, S74-S81.

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*, 222-231.

Brasche, S., & Bischof, W. (2005). Daily time spent indoors in German homes – Baseline data for the assessment of indoor exposure of German occupants. *International Journal of Hygiene and Environmental Health, 208*, 247-253.

Brownson, R. C., Chang, J. J., Eyler, A. A., Ainsworth, B. E., Kirtland, K. A., Saelens, B. E., & Sallis, J. F. (2004). Measuring the Environment for Friendliness Toward Physical Activity: A Comparison of the Reliability of 3 Questionnaires. *American Journal of Public Health*, 473-483.

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 hypothes. *International Journal of Behaviora lNutrition and Physical Activity*, 23-34.

Center for Disease Control. (2014, July 11). *Healthy Weight - it's not a diet, it's a lifestyle!* Retrieved from Center for Disease Control: http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html

Cole, T., Bellizzi, M., Flegal, K., & Dietz, W. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal, 320*(7244), 1240-1246.

Couch, S. C., Glanz, K., Zhou, C., Sallis, J. F., & Saelens, B. E. (2014). Home Food Environment in Relation to Children's Diet Quality and Weight Status. *Journal of the Academy of Nutrition and Dietetics*, 1569-1579.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

Dehghan, M., Akhtar-Danesh, N., & Merchant, A. (2005). Childhood obesity, prevalence and prevention. *Nutrition Journal, 4*(24), 1.

Etzioni, A. (2014). On Curbing Obesity. *Society, 51*, 115-119.

Fulkerson, J. A., Nelson, M. C., Lytle, L., Moe, S., Heitzler, C., & Pasch, K. (2008). The validation of a home food inventor. *International Journal of Behavioral Nutrition and Physical Activity*, 55-65.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Boston: Allyn & Bacon.

Karnik, S., & Kanekar, A. (2012). Childhood Obesity: A Global Public Health Crisis. *International Journal of Preventive Medicine, 3*(1), 1-7.

Kneeshaw-Price, S., Saelens, B., Sallis, J., Glanz, K., Frank, L., Kerr, J., . . . Cain, K. (2013). Children's Objective Physical Activity by Location: Why the Neighborhood Matters. *Pediatric Exercise Science*, 468-486.

McGinnis, J., Williams-Russo, P., & Knickman, J. (2002). The Case For More Active Policy Attention To Health Promotion. *Health Affairs, 21*(2), 78-93.

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. *The Journal of the American Medical Association, 311*(8), 806-814.

Papoutsi, G. S., Drichoutis, A. C., & Nayga, Jr., R. M. (2013). The Causes of Childhood Obesity: A Survey. *Journal of Economic Surveys, 27*(4), 743-767.

Reilly, J., Methven, E., McDowell, Z., Hacking, B., Alexander, D., & Stewart, L. (2003). Health consequences of obesity. *Arch Dis Child, 88*, 748-752.

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. (2008). Relationships between the home environment and physical activity and dietary patterns of preschool children: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity* , 31-43.

Strauss, R. (2002). Perspectives on Childhood Obesity. *Current Gastroenterology Reports*, 244-250.

Van Staveren, T., & Dale, D. (2004). Childhood Obesity: Problems and Solutions. *Journal of Physical Education, Recreation & Dance*, 44-54.

Viera, A. J., & Garrett, J. M. (2005). Understanding Interobserver Agreement: The Kappa Statistic. *Family Medicine, 37*(5), 360-363.

Wang, Y. (2001). Cross-national comparison of childhood obesity. *International Journal of Epidemiology, 30*, 1129-1136.

Wang, Y., & Beydoun, M. (2007). The Obesity Epidemic in the United States, A Gender, Age, Socioeconomic, Racial/Ethnic, and Geographic Characteristics: A Systematic Review and Meta-Regression Analysis. *Epidemiologic Reviews, 29*, 1-23.

Food Environment

Family ID: _____ **Date:** _____ **Rater Initials:** _____ **Week** _____

In home = The food can be in the kitchen, bedrooms, basement, garage, or other rooms

Child can immediately eat it = Is the food is in an opened container/package, or is the food is sealed up in a package/container that the child cannot open?

How much = *A little* (enough for up to 2 people to eat at a snack/meal), *Some* (enough for 3-8 people to eat at a snack/meal), *A lot* (more than a little or some)

FOOD	*In home?*	*Child can immediately eat?*	*How much is there?*
chocolate or other candy (can include chocolate chips, marshmallows)	*Yes No*	*Yes No*	*A little Some A lot*
already made cakes, brownies, cookies, muffins (not English)	*Yes No*	*Yes No*	*A little Some A lot*
boxed mixes for cakes, brownies, cookies, muffins (not English)	*Yes No*	*No*	*A little Some A lot*
regular chips (e.g., potato chips, corn chips)	*Yes No*	*Yes No*	*A little Some A lot*
pretzels or baked chips	*Yes No*	*Yes No*	*A little Some A lot*
fruit roll-ups or other dried fruit (including raisins)	*Yes No*	*Yes No*	*A little Some A lot*
sweetened breakfast cereal **(≥ 7g sugar/svg)**	*Yes No*	*Yes No*	*A little Some A lot*
unsweetened breakfast cereal **(< 7g sugar/svg)**	*Yes No*	*Yes No*	*A little Some A lot*
Non-butter crackers (e.g., saltines, graham crackers, wheat crackers, rye	*Yes No*	*Yes No*	*A little Some A lot*
fresh bananas, oranges, pineapple, melons	*Yes No*	*Yes No*	*A little Some A lot*
fresh apples, grapes, celery, lettuce	*Yes No*	*Yes no*	*A little Some A lot*
potatoes, corn on the cob, whole tomato, frozen vegetables	*Yes No*	*Yes No*	*A little Some A lot*
"100% fruit juice"	*Yes No*	*Yes No*	*A little Some A lot*
juice (e.g., punch)	*Yes No*	*Yes No*	*A little Some A lot*
regular sodas	*Yes No*	*Yes No*	*A little Some A lot*
sports drinks (e.g., Gatorade, (mix not readily available))	*Yes No*	*Yes No*	*A little Some A lot*
regular (whole) or 2% milk	*Yes No*	*Yes No*	*A little Some A lot*
frozen or unprepared bacon, sausage, or other breakfast meat (not turkey or low-fat meat based	*Yes No*	*Yes No*	*A little Some A lot*
ice cream or other frozen desserts	*Yes No*	*Yes No*	*A little Some A lot*
non-fat cheese or yogurt	*Yes No*	*Yes No*	*A little Some A lot*
hot dogs or bologna (not turkey or low-fat meat based)	*Yes No*	*Yes No*	*A little Some A lot*
turkey, chicken, fish, tofu or other lean labeled meat	*Yes No*	*Yes No*	*A little Some A lot*

APPENDIX TWO

FOCUS Physical Activity Environment Questionnaire

Physical Activity Equipment

Family ID: ____________ **Date:** ____________ **Rater Initials:** ____________ **Week** ____________

Which of the following things are available and in useable condition in the home or yard/common area?

Do not include things that are buried in boxes (except toy boxes) or buried in a closet.

	Not Available	Available
1. Bike	0	1
2. basketball hoop	0	1
3. jump rope, hula hoop	0	1
4. sports equipment (e.g., balls, racquets, bats, sticks, boxing gloves)	0	1
5. Swimming pool / Lake	0	1
6. roller skates, skateboard, scooter	0	1
7. fixed play equipment (e.g., swing set, play house, jungle gym)	0	1
8.home aerobic equipment (e.g., treadmill, cycle, cross trainer, stepper, rower, workout video, DVD or audiotapes)	0	1
9. weight lifting equipment, toning devices (e.g., free weights, pull up bars, exercise balls, ankle weights etc)	0	1
10. water or snow equipment (e.g., skis, skates, canoe, row boat, , surf board, boogie board, windsurf board, slip-n-slide, goggles)	0	1
11. yoga/exercise mats	0	1
12. exercise, play or rec room	0	1
13. trampoline	0	1

APPENDIX THREE

Table 5. Categorization of Healthy and Unhealthy Foods

chocolate or other candy (can include chocolate chips, marshmallows)	Unhealthy
already made cakes, brownies, cookies, muffins (not English)	Unhealthy
boxed mixes for cakes, brownies, cookies, muffins (not English)	Unhealthy
regular chips (e.g., potato chips, corn chips)	Unhealthy
pretzels or baked chips	Healthy
fruit roll-ups or other dried fruit (including raisins)	Healthy
sweetened breakfast cereal **(≥ 7g sugar/svg)**	Unhealthy
unsweetened breakfast cereal **(< 7g sugar/svg)**	Healthy
Non-butter crackers (e.g., saltines, graham crackers, wheat crackers, rye crispbread, plain: matzo, melbo, or toast rye wafers)	Healthy
fresh bananas, oranges, pineapple, melons	Healthy
fresh apples, grapes, celery, lettuce	Healthy
potatoes, corn on the cob, whole tomato, frozen vegetables	Healthy
"100% fruit juice"	Healthy
juice (e.g., punch)	Unhealthy
regular sodas	Unhealthy
sports drinks (e.g., Gatorade, (mix not readily available))	Unhealthy
regular (whole) or 2% milk	Unhealthy
frozen or unprepared bacon, sausage, or other breakfast meat (not turkey or low-fat meat based	Unhealthy
ice cream or other frozen desserts	Unhealthy
non-fat cheese or yogurt	Healthy
hot dogs or bologna (not turkey or low-fat meat based)	Unhealthy
turkey, chicken, fish, tofu or other lean labeled meat	Healthy