UNDERSTANDING THE RURAL BUILT ENVIRONMENT FROM THE PERSPECTIVES OF PARENTS OF PRESCHOOL-AGED CHIDLREN

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

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ABSTRACT

Obesity prevention interventions targeting the built environment are an emerging area of research, but few studies have been applied in rural communities or among preschool-aged children, despite being high-priority populations. This study aimed to identify barriers to accessing nutritious foods and physical activity opportunities from the perspectives of parents of preschoolers living in low-income, rural communities. A mixed methods study design guided by a social ecological model incorporated quantitative surveys and qualitative interviews to gain a comprehensive understanding of the rural built environment.

Results indicate proximity to recreation spaces, traffic safety, availability of public indoor space, and the consumer food environment are influential in utilization of resources and possible areas of improvement. However, interventions should be tailored to the community's stage of readiness, evidenced by the theme "cognitive reactions to barriers." Strong social networks in rural communities should be considered an asset for community change in these regions.

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CHAPTER 1. INTRODUCTION

Nationwide, obesity rates among children and adolescents have nearly tripled over the past 30 years. Since 1980, obesity rates among children 6-11 years old have increased from 7.0% to 19.6%, and from 5.0% to 18.1% among 12-19 year olds (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008). Additionally, 20% of children 2-5 years old are overweight or at risk of becoming overweight (Ogden et al., 2010). These climbing obesity trends appear to be more predominant among children living in rural areas. Joens-Matre et al. (2008) found obesity rates among children in rural areas to be higher than state and national averages, and Lutfiyya, Lipinski, Wisdom-Behounek, and Inpanbutr-Martinkus (2007) concluded rural children are 25% more likely to be overweight than children living in urban areas.

Researchers have shown that children with a high body mass index (BMI) at the early ages of 4-6 years are likely to have an increased BMI as adults (Dietz & Gortmaker, 2001), and an increased risk for developing chronic disease such as diabetes and hypertension (Field et al., 2001). The serious risks associated with childhood obesity and their potential to perpetuate into future generations have provoked the urgent need for innovative prevention and treatment strategies.

Recent approaches to obesity prevention involve preschoolers, children between the ages of three and five years. Approximately 15% of preschool-aged children among low-income populations are already considered obese (Centers for Disease Control and Prevention [CDC], 2009), and nearly a quarter of all children in this age group are at risk of becoming obese (Birch & Ventura, 2009). By the time they are of school age, children have already developed taste preferences and dietary behaviors that could negatively influence weight status (Birch &

Ventura, 2009), suggesting that infancy and early childhood present prime opportunities for obesity prevention.

Current obesity intervention strategies are beginning to shift away from individual-based behavior change efforts and towards community-wide interventions, driven by the theory that individual-based strategies do not effectively benefit future generations while community-wide interventions have the potential for affecting whole populations and increased sustainability (Sallis et al., 2006). Researchers have trialed school-based interventions as an intermediate attempt of executing this concept, but with little success (Birch & Ventura, 2009). Not only do school-based interventions fail to reach preschool-aged children, but they also capture only one aspect of the community or environment that influences a child's weight status (Birch & Ventura, 2009).

The Ecological Model of Childhood Overweight, first developed by Davison and Birch (2001), incorporates multiple aspects of a child's environment and is often the guiding framework in community-wide obesity prevention efforts (Galvez, Pearl, & Yen, 2010). A child's weight status is at the center of the model and is surrounded by three rings representing different aspects of the child's environment (see Figure 1). The model visually represents how community-wide characteristics influence all other factors embedded within it, including a child's weight status. Factors of the built environment, defined as the neighborhoods, roads, walkways, buildings, food sources, recreational facilities, parks and public spaces where people live, work, are educated, eat and play (Galvez et al., 2010; Sallis et al., 2006), shape many community-wide characteristics. For instance, neighborhood safety, accessibility of food sources and recreational spaces, and how families spend time together are influenced by the availability of resources and whether there are safe routes, roads and walkways by which to access them.

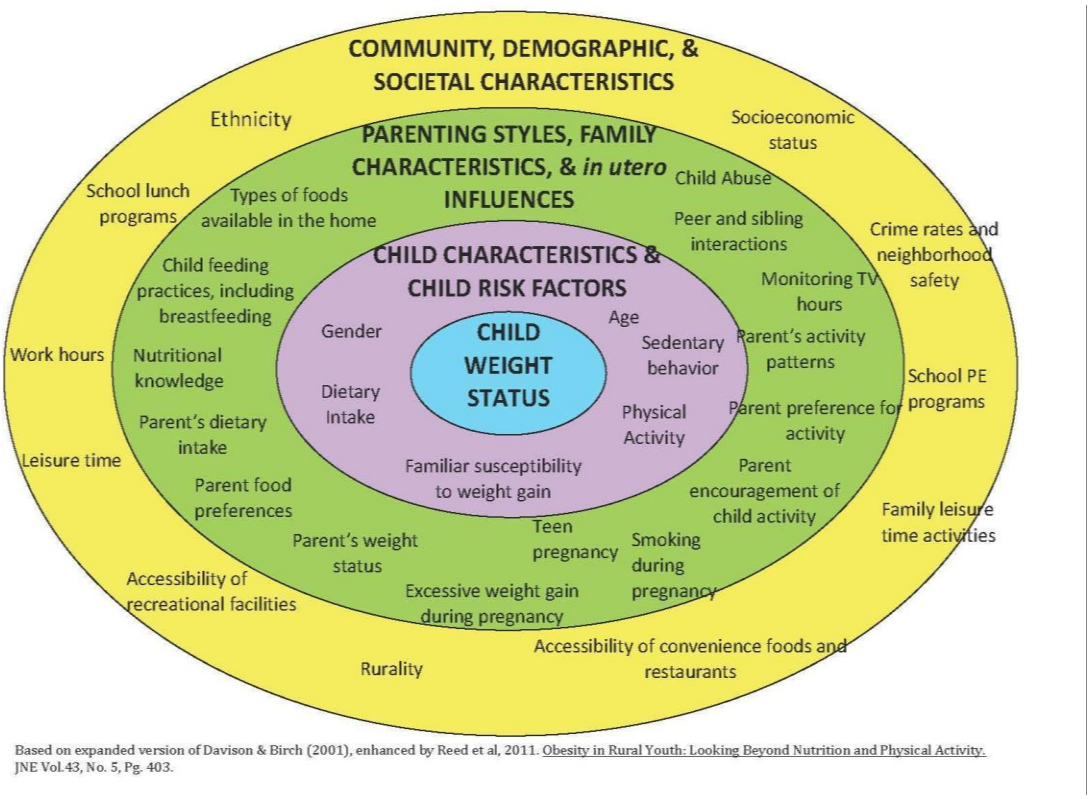

Figure 1. The Ecological Model of Childhood Overweight.

Although a popular tool in current obesity prevention research, application of the ecological model is limited in rural settings (Yousefian, Ziller, Swartz, & Hartley, 2009). Researchers who have implemented it in studies focusing on rural environments have done so by assessing factors through direct observation, by interviewing key informants and parents, or a combination of both (Davison & Lawson, 2006; Salois, 2012; Yousefian et al., 2009). Davison and Lawson (2006) concluded in their review of studies assessing the relationship between the built environment and physical activity among children that future studies should include perspectives of parents of age-specific children, especially perceptions of neighborhood safety. Yousefian et al. (2009) drew similar conclusions in their study assessing physical inactivity in rural youth. They emphasized that just observing the rural environment does not result in an

accurate assessment; perceptions must be applied to capture the true nature of how those factors interact (Yousefian et al., 2009).

The purpose of this study is to understand the rural built environment from the perspectives of low-income parents with preschool-aged children and identify barriers to providing a nutritious diet and opportunities for physical activity for their families.

CHAPTER 2. LITERATURE REVIEW

The obesity epidemic in America affects not only adults, but children of all ages and continues to be a primary concern for researchers (Ogden et al., 2008; Ogden et al., 2010). However, traditional school-based obesity prevention programs have done little to intervene climbing obesity rates (Salois, 2012). Innovative approaches to childhood obesity prevention involve preschool-aged children and focus on altering the built environment, encompassing policy and the physical aspects of the places children live, learn, and play (Davison & Lawson, 2006; Yousefian et al., 2009). The relationship between the built environment and the weight status of children is an area of emerging research, and even less is known about how this relationship differs regionally. This literature review explores the relationship between factors of the built environment and the dietary practices and physical activity patterns of preschool-aged children living in rural, low-income communities.

Prevalence of Childhood Obesity

In the United States, obesity rates among children and adolescents have nearly tripled over the past 30 years (Ogden et al., 2010; Ogden et al., 2008). A child is considered obese if his or her BMI-for-age is greater than the 95th percentile based on the Centers for Disease Control and Prevention (CDC) gender-specific growth charts (CDC, 2012). Since 1980, obesity rates among children 6-11 years old have increased from 7.0% to 19.6%, and from 5.0% to 18.1% among 12-19 year olds (Ogden et al., 2010; Ogden et al., 2008). Additionally, 21.2% of all children 2-5 years old are overweight or at risk of becoming overweight (Ogden et al., 2010). A child is considered overweight if his or her BMI-for-age is between the 85th and the 95th percentiles based on the CDC gender-specific growth charts (CDC, 2012).

Data from the CDC's Pediatric Nutrition Surveillance System (PedNSS) indicate a similar trend among low-income preschool-aged children, showing a steady increase of obesity prevalence from 12.4% in 1998 to 14.6% in 2008 (CDC, 2009). Although this increase does not appear as dramatic as obesity rates of preschool-aged children reported by Ogden et al. (2010, 2008) the PedNSS data was collected exclusively from children enrolled in the Supplemental Nutrition Program for Women, Infants, and Children (WIC), an analysis that includes only 21.0% of children ages 2-4 years old (CDC, 2009). The PedNSS data may have resulted in an underrepresentation of the prevalence of obesity among low-income preschool-aged children, however, it is the only source of nationally compiled data at the state level among this demographic.

These climbing trends in obesity prevalence appear to be more predominant among children living in rural areas. Joens-Matre et al. (2008) found prevalence of childhood obesity among children living in rural communities to be 10% higher than the national average, and Lutfiyya et al. (2007) concluded rural children are 25% more likely to be overweight than children living in urban areas. These findings combined with previously noted statistics from PedNSS suggest that children ages 3-5 years living in low-income, rural communities should be considered a priority population for obesity prevention efforts.

The Built Environment and Obesity Prevention Interventions

Children who have a BMI-for-age in the overweight or obese range at the early ages of 4-6 years are likely have a BMI in the overweight or obese range as adults (Dietz & Gortmaker, 2001), and an increased risk for developing chronic disease such as diabetes and hypertension (Gee, Mahan, & Escott-Stump, 2008). Overweight status is due, in part, to consuming more energy than is expended (Gee et al., 2008). Traditional childhood obesity prevention intervention

efforts attempt to change children's individual dietary and physical activity behaviors to correct this imbalance. Steadily increasing obesity rates among children, adolescents, and adults indicate that these behavior-change efforts are not sustainable and fail to affect entire populations.

Current obesity prevention intervention strategies are beginning to shift away from individual-based behavior change efforts toward community-wide interventions that consider factors of the built environment (Casey et al., 2014; Committee on Environmental Health, 2009; Maziak, Ward, & Stockton, 2007). The built environment is defined as the neighborhoods, roads, walkways, buildings, food sources, recreational facilities, parks and public spaces where people live, work, are educated, eat and play, extending into the policies that influence these factors (Sallis et al., 2006; Sallis & Glanz, 2006). These interventions are guided by the theory that the built environment presents barriers or opportunities that influence dietary practices and physical activity patterns that ultimately affect weight status. The majority of childhood obesity prevention interventions focus on the environment of school settings, but these intermediate attempts have had little success (Birch & Ventura, 2009). Not only do school-based interventions fail to reach preschool-aged children, but they also capture only one aspect of the environment that influences a child's weight status (Birch & Ventura, 2009).

The Ecological Model of Childhood Overweight

Individual dietary and physical activity behaviors are influenced by the interaction of many aspects of the environment; therefore, effective obesity prevention intervention strategies must target multiple levels of the environment (Sallis & Glanz, 2009). Studies that incorporate multiple aspects of the built environment often utilize the Ecological Model of Childhood Overweight, first developed by Davison and Birch (2001), as a guiding framework and visual representation of how the built environment can influence a child's weight status (Birch &

Ventura, 2009; Davison & Lawson, 2006; Galvez et al., 2010; Sallis & Glanz, 2006; Salois, 2012; Schwarte et al., 2010; Silva-Sanigorski et al., 2010; Yousefian, Leighton, Fox, & Hartley, 2011).

A child's weight status is at the center of the model and is surrounded by three rings representing different aspects of the environment that child exists in: community and demographic factors, parenting and parent characteristics, and child behavior (Birch & Ventura, 2009). The first ring, child behavior, has the most direct influence over a child's weight status (Birch & Ventura, 2009). The next ring, parenting and parent characteristics, directly affects child behavior (Birch & Ventura, 2009). These factors include rules parents have for TV viewing, playing outside, and mealtimes; parents' own eating and physical activity patterns; knowledge of nutrition; encouragement of activity; and foods parents make available within the home environment. The outer ring of the model influences parenting characteristics and includes the following community-wide factors: accessibility of recreational facilities, accessibility of food outlets, neighborhood safety, and worksite and school wellness programs (Birch & Ventura, 2009).

Recent review articles evaluating current childhood obesity prevention interventions advocate the use of ecological models, supporting the theory that targeting whole communities and multiple aspects of the environment is an effective obesity prevention strategy (Birch & Ventura, 2009; Bluford, Sherry, & Scanlon, 2007; Galvez et al., 2010; Maziak et al., 2007; Olstad & McCargar, 2009). In a midpoint review by Samuels et al. (2010) of the Healthy Eating, Active Communities (HEAC) Program, researchers concluded the use of an ecological model in obesity prevention programs is necessary to facilitate and sustain environmental changes influencing childhood obesity. After only two years of initiation of the 5-year HEAC program,

all six participating communities had implemented environmental changes across five contexts affecting children: school, after-school programs, the local neighborhood, healthcare settings, and local marketing and advertisements (Samuels et al., 2010).

Built Environment Factors that Influence Physical Activity

The majority of studies included in this literature review focus on built environment factors influencing physical activity levels. Although some studies also assess factors that influence dietary intake, there are many more outcome measures related to physical activity included (Burdette & Whitaker, 2004, 2005; Galvez et al., 2010; Maziak et al., 2007; Salois, 2012; Schwarte et al., 2010; Yousefian et al., 2009).

Neighborhood Safety

Neighborhood safety relates to levels of physical activity among children in several ways, such as neighborhood crime rate, the presence and quality of sidewalks, and other traffic-related factors. Burdette and Whitaker (2004) focused their research on the association of crime rate and child weight status. They found no association between safety, measured by the number of serious crimes and police calls per year in Cincinnati, OH, and the BMIs of children enrolled in WIC (Burdette & Whitaker, 2004). Furthermore, there was no association between crime rate and children's use of neighborhood playgrounds (Burdette & Whitaker, 2004). Their results are surprising, because studies reviewed by Davison and Lawson (2006) indicated a significant and negative relationship between crime rate and physical activity levels among children. Similarly, Salois (2012) found that a 10% increase in criminal activity (number of county arrests) was significantly associated with a 1.5% increase in childhood obesity in metropolitan areas and a 1.1% increase in rural areas. Authors of several review articles assessing neighborhood safety attributes of the built environment recommend incorporating parental perception of the built

environment in similar studies as the most consistent results occur with parent reports (Davison & Lawson, 2006; Galvez et al., 2010; Maziak et al., 2007).

Yielding to these recommendations, Burdette and Whitaker (2005) conducted a second study where they applied parent perception of neighborhood safety to the study design, yet similar results were found. Although children living in neighborhoods considered least safe by parents watched 10% more TV per day (an additional 20 min/d) compared with neighborhoods perceived as the safest, TV viewing time was not significantly correlated with time child spent playing outdoors or BMI (Burdette & Whitaker, 2005). Longitudinal studies are needed to assess whether this pattern of increased sedentary behavior results in increased energy imbalance, weight gain, and BMI over time. Lack of association between neighborhood safety and childhood weight status in Burdette and Whitaker's (2004, 2005) studies may also be due to lack of variability in safety measures, including measures of traffic safety and sidewalk quality, and safety of the area surrounding the child's home. The preschool-aged children included in Burdette and Whitaker's (2004, 2005) studies may be more likely to play near home rather than walking to a park, since children of this age group are not likely to walk to destinations outside of the neighborhood alone.

Amount and condition of sidewalks are factors of neighborhood safety that are, in general, positively associated with increased physical activity among children. Davison and Lawson (2006) found in their review a higher number of sidewalk miles and sidewalks of greater distances from street curbs were associated with increased objectively measured (using accelerometers) physical activity in children. In the same review, authors of both studies examining number of crosswalks found a significant and positive relationship between number of controlled crosswalks (appropriately indicated with signs and lighting) and physical activity

(Davison & Lawson, 2006). Consistent with these findings, Sallis and Glanz (2006) also determined a positive relationship between the number of sidewalk miles and physical activity, and found that after improving the safety of crosswalks, children reported a 64% increase in walking and a 114% increase in biking to school.

Traffic safety, determined by traffic speed and density, is another factor contributing to neighborhood safety that should be assessed in built environment studies. Heavy traffic and increased speed limits are consistently associated with decreased levels of physical activity in children (Davison & Lawson, 2006; Galvez et al., 2010; Sallis et al., 2006), yet this relationship was not apparent in study results from Yousefian et al. (2009). They compared objective environmental audits of rural communities in Maine with the themes extracted from focus group involving resident children, their parents and other key informants and found that many children were "used to" traffic hazards. Since there were few sidewalks in these rural areas, children resorted to biking and walking on the shoulders of roads, and were perhaps desensitized to traffic hazards (Yousefian et al., 2009).

Despite inconsistent findings related to the association of neighborhood safety and physical activity, the Central California Regional Obesity Prevention Program (CCROPP) aimed to increase physical activity among residents in this rural, low-income region by enhancing pedestrian safety. Efforts included installing walking paths and digital radar speed limit signs, repainting curbs and crosswalks, and decreasing crime by involving local police officials in developing intervention strategies (Schwarte et al., 2010). Authors have not yet published evaluation results of this project.

Walkability

Related to neighborhood safety is the walkability of neighborhoods, which is influenced by neighborhood design and layout and mixed land use. "Walkability" is defined as a person's ability to walk or cycle to destinations based on proximity to their home and presence of street networks that provide direct routes (Sallis & Glanz, 2009). Traditional neighborhood designs are the most "walkable," mainly because they were created before the mid 20th century, before owning a vehicle was common and active transportation (transportation via walking or biking) was a necessity (Sallis et al., 2006). These designs incorporate a grid pattern, where direct routes for pedestrians are available, and mixed land use, where residential, government services, stores, and retail food outlets are all near by each other (Committee on Environmental Health, 2009; Sallis et al., 2006; Sallis & Glanz, 2009). Conversely, modern neighborhood designs optimize automobile transportation instead of active transportation and feature disconnected street networks (Sallis et al., 2006). Zoning dictates land use, separating shopping centers, food retail outlets, schools and libraries from residential neighborhoods, making it nearly impossible to access by foot. The term "urban sprawl" is often used to describe the distances between these neighborhood features (Committee on Environmental Health, 2009; Maziak et al., 2007).

Multiple studies assessing neighborhood walkability and physical activity levels among adults indicate residents of high-walkable neighborhoods engage in more active transport and physical activity than those living in sprawling neighborhoods (Sallis & Glanz, 2009). Saelens, Sallis, Black, and Chen (2003) found that residents in high-walkable neighborhoods in San Diego engaged in 52 more minutes of moderate-intensity exercise per week than residents in low-walkable neighborhoods. They also found a higher percentage of these residents completed

daily errands by walking or cycling (85.2%) than residents of low-walkable neighborhoods (60.4%) (Saelens et al., 2003).

Fewer studies assess similar factors in children. Frank et al. (2006) reported increased neighborhood walkability was associated with 32% more time children engaged in physical activity, resulting in slight reductions in BMI (Frank et al., 2006). Galvez et al. (2010) found in their review that results of studies assessing neighborhood design consistently reported increased BMI among children living in neighborhoods built after 1969, a marker for modern neighborhood design and decreased walkability. Grafova (2008) found similar results when she compared measured BMIs of children ages 5-18 years living in traditional and urban neighborhoods, determining children living in neighborhoods built after 1969 were at an increased risk of obesity. Similarly, Lopez (2004) found that risk of obesity among children increased 0.5% for each point increase in the urban sprawl scale.

Clear associations exist between the walkability of a neighborhood, physical activity, and BMI of children, but many of these conclusions were drawn from studies observing urban or suburban communities. Yousefian et al. (2009) examined the walkability of three rural neighborhoods as it relates to the perceptions of residents and found that many opportunities for physical activity were not accessible. Town audits indicated a low level of mixed-land use; under developed town centers with few businesses and recreational facilities, little open public space, and widely dispersed residential areas were characteristic of all three rural communities (Yousefian et al., 2009). Parents reported they were required to drive to more populated towns and cities to do their shopping and seek entertainment (Yousefian et al., 2009). Similarly, children reported there was little to do in town, and even if opportunities were present, long

distances to destinations and dangerous terrain prevented them from walking or biking there (Yousefian et al., 2009).

Results from the child focus groups in Yousefian et al.'s (2009) study indicate that lack of public transportation in rural areas may play a bigger role in inhibiting physical activity than the neighborhood design. Because walking and biking to destinations is often not a realistic option for children living in rural communities, accessing other opportunities for physical activity such as recreational centers or organized community programs is limited. If children in rural areas had increased access to public transportation, they could decrease their reliance on parents for transportation to physical activity opportunities, breaking this barrier. No studies in this literature review assess access to public transportation among children in rural communities.

Parks, Playgrounds, and Recreational Facilities

Outdoor play is an important outlet for physical activity among preschool-aged children, since opportunities for structured physical activities in the public school system are not yet available (Committee on Environmental Health, 2009). Consistent with this theory, Grow et al. (2008) found that a higher percentage of young children use outdoor recreational facilities compared to adolescents (ages 11-18 years).

Although the presence of parks, playgrounds, and recreational facilities allows the opportunity for children to engage in physical activity, their use depends on other factors of the built environment (Committee on Environmental Health, 2009). Density of facilities within the community and their proximity to a child's home, traffic safety, and quality and safety of equipment are factors that may influence the use of these facilities and the results of the following studies.

Salois (2012) compared the density of recreational and fitness facilities with the BMIs of low-income preschool-aged children and found that they were not significantly correlated. This was a nationwide study with a large sample size, but proximity of the park was not assessed (Salois, 2012). Although Burdette and Whitaker (2004) did assess the proximity of neighborhood playgrounds to child's home, no significant association was found with child's BMI among low-income preschool children in Cincinnati, OH. Actual use of these playgrounds in both studies was not assessed; if quality and/or safety of playgrounds was lacking, it is a logical assumption that children would not desire to play there or their parents may not allow it. Actual levels of physical activity were also not assessed in either study, making a clear association difficult to determine.

Conflicting results were found in a study conducted in California, where access to parks was associated with increased physical activity in urban areas (Galvez et al., 2010). Improving the quality of parks through renovations such as painting and repairing equipment and implementing litter control increased the number of observed visitors. Renovations likely elicited increased utilization and therefore increases in physical activity, but improvement in physical activity was not assessed over time.

Grow et al. (2008) concluded proximity to public parks and open public space was associated with increased use among young children ages 5-11 years. Facility use was assessed with a parent survey. Parents who reported their child used recreational facilities frequently (more than once a week) also reported their child was able to walk and bike to the facility (Grow et al., 2008). Furthermore, parents' perception of traffic safety was found to be the strongest determinant of whether of not their children walked or biked to the facility (Grow et al., 2008).

The results of this study in particular support the Ecological Model of Childhood Overweight and its application to the built environment.

Aesthetics

Aesthetics of the built environment include a number of factors that together influence the natural appeal of a community. The presence of trees, landscaping and gardens; litter control; amount of open space; and regional weather patterns could all be considered aesthetic qualities of the built environment (Sallis & Glanz, 2009; Salois, 2012).

The majority of studies in a review by Davison and Lawson (2006) involving the assessment of weather conditions did not result in significant associations with physical activity levels of children. However, researchers conducting these studies did not assess weather patterns across an entire year, nor did they assess regional weather patterns.

Salois (2012) assessed two factors of the aesthetic characteristics of the environment as they relate to physical activity levels in low-income preschool-aged children: 1) the quality of the outdoor environment, measured by the Natural Amenity Index (1-7), and 2) environmental quality, measured by the air quality index. High natural amenity index scores indicate variations in bodies of water and terrain, high amounts of open space, and sunny weather patterns; in this study high scores were associated with low BMI in both urban and rural populations. Air quality index was not significantly associated with BMI.

Built Environment Factors that Influence Dietary Intake

Consistent with the Ecological Model of Childhood Overweight, a child's dietary intake is also influenced by factors of the built environment. Features of the community and consumer food environments influence what foods are brought into the home environment. Parenting

characteristics such as rules for snacks and meals determine which foods their children are allowed to eat, ultimately influencing weight status.

The community food environment is defined as the number, type, location, and accessibility of food outlets (i.e., food retail stores and restaurants) (Sallis & Glanz, 2006, 2009). The consumer food environment is an extension of the community food environment and includes factors related to what consumers encounter within each food outlet (Sallis & Glanz, 2009). Availability, price, and quality of nutritious food options; portion sizes; promotions, sales, and advertisements; and availability of nutrition information make up the consumer food environment (Sallis & Glanz, 2009).

Restaurants

Several studies assess restaurant density as it relates to prevalence of childhood obesity. In a national study using county-level data from 2192 of 3107 counties in the United States, Salois (2012) found the density of full-service restaurants (establishments where patrons are seated while ordering, served by wait staff, and pay after eating) to be negatively associated with obesity among low-income preschool-aged children in rural and urban communities. For every additional full-service restaurant, a 1.0% and 0.9% decrease in the obesity rate was observed in urban and rural populations, respectively (Salois, 2012). An increase in full-service restaurant density was also associated with lower density of fast-food restaurants (establishments where patrons order and pay for their food before they eat); however, fast-food density was not associated with obesity prevalence (Salois, 2012). These findings may be explained by the possibility that individuals seeking healthier foods choose to eat at full-service restaurants more often than fast-food restaurants.

Burdette and Whitaker (2004) compared proximity of fast-food restaurants with the BMIs of low-income children ages 3-4 years in Cincinnati, Ohio and found no significant correlation. Results may have been skewed since nearly half of the children included in the study (44%) did not have a fast-food restaurant in their neighborhood (Burdette & Whitaker, 2004). In contrast, Oreskovic, Kuhlthau, Romm, and Perrin (2009) found proximity to fast-food restaurants to be significantly and negatively associated with obesity prevalence among children ages 2-5 years in both high and low income neighborhoods in eastern Massachusetts. They also assessed density of fast-food restaurants and found a significant and positive relationship with obesity among children ages 2-5 years, but only in low-income neighborhoods (Oreskovic et al., 2009). Density of fast-food restaurants may have more influence over weight status of children in low-income neighborhoods because nutritious alternatives may be fewer in comparison. Nutrient-dense foods such as low-fat dairy products, poultry and lean meat, and fresh fruits and vegetables have been found to be less available and of less quality in low-income neighborhoods compared to higher-income neighborhoods (Sallis et al., 2006).

Food Retail Outlets

Food retail outlets such as grocery stores, supermarkets, convenience stores, and specialty food stores also contribute to the community food environment. Salois (2012) assessed the density of specialty food stores and found that it was positively associated with obesity among low-income preschool-aged children in rural and not urban communities. Specialty food stores were defined as establishments that sell a particular line of food such as bakeries, meat/seafood markets, dairy stores, and produce markets (Salois, 2012). Salois (2012) did not assess each store's line of products in this study. The difference found between urban and rural populations

may be due to the different types of specialty food stores found in these areas. For instance, there may be more bakeries and ice cream stores compared to produce markets in rural areas.

Salois (2012) also assessed the density of grocery and convenience stores and found a significant and positive association with obesity rates of preschool-aged children in urban areas, but not rural. A similar study by Grafova (2008) found increased density of convenience stores was associated with increased risk of overweight among a national sample of children ages 5-18 years. These results remained significant when population density was applied to the analysis (Grafova, 2008), indicating this relationship may exist in older children and adolescents residing in rural areas (Grafova, 2008). Convenience stores typically sell more energy-dense foods and processed snacks, so this may explain the positive relationship between convenience store density and obesity.

The positive association between grocery store density and obesity prevalence in Salois' (2012) study is more difficult to explain as this relationship is somewhat counterintuitive, and other researchers have found increased availability of supermarkets to be associated with better quality diets (Sallis & Glanz, 2009). The grocery store variable in Salois' (2012) study combined supermarkets and small-end grocery stores, which may contain a similar food selection as convenience stores. In the same study, density of grocery stores authorized to accept WIC benefits was also assessed, and was found to be significantly and negatively associated with obesity prevalence among preschool-aged children in urban areas (Salois, 2012). Knowing these grocery stores were WIC-authorized is indicative of the foods available there. WIC benefits may only be used to purchase WIC-approved foods, which are selected based on the nutritional needs of preschool-aged children and include many low-fat, high fiber options.

It should be noted that Salois (2012) found a significant relationship between WIC-authorized grocery store density and obesity prevalence only in urban areas, not rural. The density of WIC-authorized grocery stores was six times higher in urban areas than rural areas, which could explain the lack of association in rural areas. Rural communities involved in the Central California Regional Obesity Prevention Program (CCROPP) recently implemented policies to increase the number of grocery stores and farmer's markets that accept WIC-benefits (Schwarte et al., 2010). Authors have not yet published evaluation results of this study, but they hypothesize this change to the built environment will impact the weight status of preschool-aged children in these communities (Schwarte, et al., 2012).

Supercenters and warehouse clubs also contribute to the community food environment. Salois (2012) assessed density of supercenters/warehouse clubs and found it to be significantly and negatively associated with obesity rates among preschool-aged children in low-income urban areas, but not rural. He speculated the distance required to travel to these supercenters presents a barrier for rural residents (Salois, 2012); however, supercenters and large chain supermarkets were identified as the major food source among rural residents in a study by Yousefian et al. (2011). Participants in this focus group explained they were required to travel long distances for groceries due to lack of availability within their local community, and supercenters were an economical option (Yousefian et al., 2011).

It is important to note that among all of these studies assessing factors of the community food environment, the consumer food environment was not assessed. Results may be interpreted differently if more was known about food availability and factors influencing which food choices are made. Assessing which foods are actually available would be a key variable to add to these study designs, as one can only choose foods that are available. Food availability may be more

important in studies targeting rural populations as many rural communities exist in food deserts (Yousefian et al., 2011). Food deserts are areas where residents live far from a grocery store or supermarket, limiting access to nutritious and affordable food (Sallis & Glanz, 2009; Schwarte et al., 2010; Yousefian et al., 2011).

The Built Environment of Rural Communities

The built environment of rural communities hosts unique challenges in creating opportunities for physical activity and nutritious dietary behaviors compared to the built environment of urban areas.

Food Environment

The food environment of rural communities is significant because many rural communities exist in "food deserts." Families living in a food desert must travel long distances to access full-service grocery stores (Schwarte et al., 2010; Yousefian et al., 2011). Their ability to travel depends on a reliable source of transportation, which is limited without the presence of public transportation. In the absence of public transportation, families must budget more for the expense of gas to travel. The cost of gas was identified as the number one barrier to accessing affordable food among rural low-income families in Maine, the eleventh most rural state in the country (Yousefian et al., 2011).

Money spent on gas tightens the budget remaining for food, influencing food purchases. Rural low-income parents in a focus group participating in Yousefian's (2011) study explained that because of dramatic fluctuations in gas prices, they haven't been able to afford healthy foods every trip to the grocery store. Researchers of this study defined healthy foods as low-fat dairy, whole grains, fruits, and vegetables (Yousefian et al., 2011). Furthermore, obtaining high-quality healthy foods was an even bigger challenge for these participants as cost increased with

perceived quality (Yousefian et al., 2011). If families cannot afford to travel to full-service grocery stores or supermarkets, they must resort to obtaining food at local convenience stores, where there is a limited variety of foods and quality of nutritious options is lacking (Salois, 2012).

Physical Activity Environment

Factors of the built environment influencing physical activity affect children living in rural communities differently than those in urban communities. Transportation plays a critical role in making opportunities for physical activity accessible or inaccessible. Mixed land use in rural communities is limited, restricting the ability of families to run errands on foot (Yousefian et al., 2009). Furthermore, many businesses families rely on, such as grocers or retail outlets, do not exist in their community, so they must drive to their destination (Yousefian et al., 2009). For children, greater distances to destinations make walking or biking an unrealistic option, and the lack of public transportation limits opportunities to access parks and recreational facilities (Yousefian et al., 2009). Since driving themselves is not an option for this demographic, children ultimately rely on their parents to access many opportunities for physical activity in rural communities.

Even if families and children do attempt to be active in their community, their safety is threatened by several factors. The presence or absence and quality of sidewalks vary (Yousefian et al., 2009). Rural children participating in a focus group reported they often walk and bike on the shoulders of roads or on streets because the sidewalks are either disconnected, poorly maintained, or don't exist at all (Yousefian et al., 2009). If walking and biking trails do exist, they are seldom designated for pedestrian use; competition with ATVs for trail use is a reality in rural areas, and another potential threat to the safety of children (Yousefian et al., 2009).

Perception of neighborhood safety may influence physical activity levels among children in rural neighborhoods more than in urban areas, according to study results from Yousefian et al. (2009). Rural parents and children participating were interviewed about physical activity habits; both groups identified fear of strangers and sex offenders as a major determinant of whether or not they are (or allow their children to be) active in certain areas. This heightened sense of fear may be due to perceived increased risk in remote and isolated settings (Yousefian et al., 2009).

Summary

This literature review reveals that current research on the built environment as it relates to preschool-aged children living in low-income neighborhoods is limited, and research targeting preschool-aged children living in low-income rural neighborhoods and research assessing the rural built environment in general is only beginning to take shape. Results from built environment studies targeting school-aged children and adolescents indicate many implications for future research as it relates to a younger demographic, and the minimal exploration of comparisons between urban and rural environments unveils important differences that must influence considerations and perspectives of future investigation.

Across all studies examined in this literature review, it is apparent that parents of preschool-aged children are vital mediators of their use and exploration of the built environment. Unique challenges in providing adequate nutrition and physical opportunities for their children persist among parents residing in rural communities. These challenges must be explored further and clearly defined in order to implement effective community-wide obesity prevention strategies in these regions.

Research Questions

1. How do parents of preschool-aged children living in low-income, rural communities perceive the built environment as it relates to encouraging a healthy lifestyle for their preschool-aged children?
    a. What barriers exist in rural communities for parents of preschool-aged children to obtain and provide fresh fruits and vegetables for their preschool-aged children?
    b. What barriers exist in rural communities for parents of preschool-aged children to provide opportunities for physical activity for their preschool-aged children?
    c. What are common themes described by parents in low-income, rural communities when they describe the built environment as it relates to providing nutritious foods and physical activity opportunities for their preschool-aged children?

CHAPTER 3. METHODS

Following the theoretical framework of the Ecological Model of Childhood Overweight, parents function as mediators between the environment and their preschool-aged children, influencing which factors of the built environment children have access to. The purpose of this study is to examine the rural built environment from the perspectives of parents with preschool-aged children and identify barriers in providing a nutritious diet and opportunities for physical activity for their families.

Preliminary results from a cross-sectional, descriptive research study using the Active Where? Parent Survey (Kerr et al., 2008) inspired the need for a qualitative, semi-structured interview. Researchers with the Agriculture and Food Research Initiative grant-funded project Communities Preventing Childhood Obesity (CPCO) have used this survey to assess parents' perceptions of the rural built environment across 14 data collection sites (2 in North Dakota). The CPCO project combines the efforts of Extension specialists across seven states (IN, KS, MI, ND, OH, SD, WI) in the areas of nutrition, physical activity, community development and family and youth development, all with the common goal to start a community development intervention to prevent childhood obesity. While managing data for this project, it became apparent that participants had more to share as they included additional written comments next to the survey questions.

In an effort to gain a deeper understanding of participants' perceptions of the built environment, this researcher developed a series of semi-structured interview questions. A pilot study guided by these questions unveiled themes that were not evident in preliminary results from the Active Where? Parent Survey.

To explore more themes related to rural built environment, the qualitative interview process will be used to enhance results of the Active Where? Parent Survey. These two data collection methods serve a development purpose with complementary intent. In this mixed-method study design, results of one method are used to inform development of the other method, and results of the second method then enhance results of the first method in a dialectic stance (Greene, 2007). Combining results of the self-administered structured survey with a semi-structured interview will produce a richer description of how parents of preschool-aged children living in rural communities perceive the built environment than either method alone. The following sections detail data collection procedures.

Active Where? Parent Survey

Participants

Participant recruitment for the Active Where? Parent Survey was managed by project directors of the CPCO team in 2012. Participants were recruited from rural areas among seven states (KS, IN, MI, ND, OH, SD and WI). Rural areas are defined as areas that encompass all population, housing, and territory not included within an urban area (U.S. Census Bureau, 2010). An urban area is considered a central city and the surrounding densely settled territory that together have a population of 50,000 or more and a population density generally exceeding 1,000 people per square mile (U.S. Census Bureau, 2010). Sixty participants from each state completed the survey, resulting in a total sample size of 420 participants; however, complete demographic information is available for 377 participants. Surveys were completed September-October, 2012.

Participants were included in the study if they were at least 18 years of age, could speak and/or read English, were parent or legal guardian of a child between the ages of 3 and 5 years, resided in a rural area and were of low-income status. Enrollment in programs such as Head

Start, SNAP (Supplemental Nutrition Assistance Program) or WIC (Special Supplemental Nutrition Program for Women, Infants and Children) was used as a proxy of eligibility of low-income status (Early Childhood & Learning Center Web site, 2008; USDA Food and Nutrition Service, 2012; WIC Web site, 2011).

Data Collection

The Active Where? Parent Survey was used as a quantitative assessment of participants' perceptions of the built environment. This survey was adapted, with permission, from the Active Where? Parent-Child Survey developed by Kerr et al. (2008). Individual item reliability for the original survey ranged from fair to good (ICC = 0.32 to 0.75) (Grow et al., 2008). The adapted version contains the addition of a demographics section and 11 of the original 23 sections (see Appendix B)(Communities Preventing Childhood Obesity, 2013). The demographics section includes questions regarding participant's gender, age, level of education, ethnicity and marital status; number of people living in participant's household; number of children and children under the age of 18 years; type of residence and whether participant owns or rents the household; and number of drivable motorized vehicles per household. The following remaining sections assess home and neighborhood environment characteristics:

(1) Section A has 16 items assessing the frequency participant's child is active in various recreation locations; items are based on a four-point scale ranging from 0 (*never*) to 3 (*once a week or more).* Participants are also asked whether or not their child walks or bikes to each location described by answering "yes" or "no."

(2) Section B has 22 items assessing barriers to being active in the local neighborhood, specifically parks and streets/roads. Items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(3) Section C has 6 items assessing how easily services in the neighborhood can be accessed by walking; items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(4) Section D has 3 items assessing the condition and features of neighborhood streets; items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(5) Section E has 3 items assessing different places for walking/biking; items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(6) Section F has 4 items assessing aesthetic features of the neighborhood; items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(7) Section G has 13 items assessing participant's perception of neighborhood safety; items are based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*).

(8) Section H has 5 items assessing how frequently participant's child is active in the local environment surrounding the child's home (e.g. the yard, driveway, neighbor's yard, etc.); items are based on a four-point scale ranging from 0 (*never*) to 4 (*once a week or more*).

(9) Section I has 9 items assessing the amount of time the child spends in physical activity in various sectors of the child's daily life (e.g. at preschool, at home, at daycare, etc.). Participants are asked to report the number of days per week their child is physically active for at least 60 minutes. Responses will be categorized as "never," "1-2 days per week," "3-4 days per week," "5-6 days per week," and "every day."

(10) Section J has 29 items assessing rules participants have for their child related to playing outside and eating; items are based on a three point scale ("*yes*," "*no*," and "*sometimes*").

(11) Section K has 2 items assessing how many servings of fruits and vegetables participant's child consumes daily, which are based on a four-point scale ranging from 0 (*none*)

to 4 (*4 or more*). Participants are given examples of serving sizes. This section also contains 17 items assessing the availability of certain foods and beverages within the household; items are based on a five-point scale ranging from "never" to "always."

Procedures

The project director in each state involved in the CPCO project assigned an Extension Agent to administer the Active Where? Parent Survey. All assigned Extension Agents were instructed on interview protocol. Surveys were administered face-to-face at site of recruitment (Head Start, SNAP, or WIC facility) and each participant completed the survey once; each survey was completed in approximately 45-60 minutes.

The Extension Agent read the consent form to the participants and allowed them to ask questions before beginning the survey interview. Many of the survey questions are about the participant's child's activities, therefore participants were asked to respond to questions as they apply to their child (e.g., When asked "Are there many places for your child to go within walking distance of your home?" participants considered whether or not there are places of interest their 3-4 year old are capable of walking to from his/her home). The Extension Agent administered the survey to each participant separately, reading all questions and answer options out loud and recording all responses on the form. All information is anonymous, but the following information was included on each survey: state and county participant resides, initials of interviewer, date (month/year), and participant ID number (assigned in order of interviews, beginning with "01" and ending with "60"). Participants were given $30 after completing the survey. All procedures were approved by the North Dakota State University Institutional Review Board.

Analysis

Chi-square tests were used to analyze responses from the Active Where? Parent Survey. Qualitative interview findings informed variables of interest. The sample size of 377 was adequate to satisfy conditions required to apply Chi-square tests (i.e., the total number of frequencies per response option is expected to be at least 20) (Vincent, 1999). Statistical analysis was performed with SAS 9.4 software (SAS Institute Inc.). Significance was set at $p \leq 0.05$.

Semi-structured Interview

Participants

In order to compare interview results with the Active Where? Parent Survey data, interview participants compatible in terms of demographics were recruited. Coordinators of the CPCO Project instructed not to recruit participants from the two North Dakota communities in which the Active Where? Survey was administered to prevent contamination of the original, on-going research project. However, the same inclusion criteria established for the Active Where? Parent Survey was used, and parents of preschool-aged children residing in low-income, rural communities were invited to participate.

Interview participants were recruited either through a flier sent home with children enrolled in Head Start sites located in rural eastern North Dakota communities or through word of mouth. Fifteen parents took part in an audio-recorded interview between November 2013 and January 2014 at a time and location of their choice.

Data Collection

The interview questions and protocol were developed and pilot tested among parents with preschool-aged children residing in rural communities in eastern North Dakota to fulfill requirements of a qualitative research methods course at NDSU. Questions were modeled after

the Ecological Model of Childhood Overweight, designed to provoke thought about the participant's community and home environment and personal beliefs related to nutrition and physical activity. Similar aspects of a child's environment are included in the Active Where? Parent Survey, but dialogue that occurs during the interview process encourages participants to share rich descriptions of their lived experiences. Each interview began by collecting the following demographic information: age, marital status, educational attainment, number of children, age of children, number of operating vehicles, and length of residency at current address, and neighborhood type (in town, out of town). Interview questions were developed with a peer-reviewed process and guided the remainder of the interview (see Appendix C).

Procedures

Before conducting the interview, each consenting participant received a $25 gift card and a consent statement. Interviews were audio recorded and took approximately 45 minutes to complete.

Data Analysis

To enhance trustworthiness, or the truthfulness of findings and conclusions, simultaneous data collection and analysis was implemented, reflecting on initial interpretations of each interview before conducting another (Hays & Singh, 2012). After all interviews were completed, recordings were transcribed using ExpressScribe 5.50 software (NCH Software, Denver, CO), a tool used to control audio playback with a transcription foot pedal.

Transcribed interviews were organized and coded using ATLAS.ti 7 software (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany). Constant comparison was incorporated into data analysis, identifying codes for each participant before analyzing the next transcript (Hays & Singh, 2012). Codes identified from the participant/transcript prior were used

to guide code identification in the next (Hays & Singh, 2012). New codes were added as they appeared and collapsed among all participants in the final codebook (Hays & Singh, 2012). Patterns among codes were identified to develop themes related to barriers to accessing food and physical activity opportunities in rural communities.

Final Analysis

Findings from the Active Where? Survey and interviews were combined to gain a deeper understanding of how parents living in low-income, rural communities view the built environment. Themes lifted from the interviews informed analytical procedures for survey data. Survey results were then compared with themes, offering explanations of why certain results occurred. This process of comparison worked to clearly identify barriers related to accessing nutritious, affordable foods and physical activity opportunities experienced by this population. Major findings were then related to current literature in an effort to determine possible areas for community-based improvements in rural areas related to food access and physical activity. Conclusions and this study's limitations helped inform recommendations for future areas of research.

CHAPTER 4. ARTICLE

Introduction

Nationwide, obesity rates among children and adolescents have nearly tripled over the past 30 years. (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008). Additionally, 20% of children 2-5 years old are overweight or at risk of becoming overweight (Ogden et al., 2010), and 15% of preschool-aged children among low-income populations are considered obese (CDC, 2009). Interestingly, these climbing obesity trends appear to be more predominant among children living in rural areas. Joens-Matre et al. (2008) found rates of childhood obesity to be higher than state and national averages in rural areas, and Lutfiyya, Lipinski, Wisdom-Behounek, and Inpanbutr-Martinkus (2007) concluded rural children are 25% more likely to be overweight than children living in urban areas.

Current approaches to childhood obesity prevention involve preschool-aged children and focus on altering community-wide factors of the built environment, encompassing policy and the physical aspects of the places children live, learn, and play (Davison & Lawson, 2006; Yousefian et al., 2009). Community-wide interventions have the potential to benefit entire populations and future generations, a sustainable solution to the limitations of individual behavior change and school-based interventions (Sallis et al., 2006).

The Ecological Model of Childhood Overweight illustrates how community-wide characteristics impact multiple aspects of the environment a child exists in, ultimately influencing behaviors and weight status (Davison & Birch, 2001). The model depicts community-wide characteristics as influential in shaping parenting styles and family characteristics, demonstrating how parents act as mediators of their children's use and exploration of the community and factors of their environment. Although a popular tool in

emerging obesity prevention research, application of the ecological model is limited in rural settings (Yousefian, Ziller, Swartz, & Hartley, 2009).

Davison and Lawson (2006) concluded in their review of studies assessing the relationship between the built environment and physical activity among children that future studies should include perspectives of parents of age-specific children, especially perceptions of neighborhood safety. Yousefian et al. (2009) drew similar conclusions in their study assessing physical inactivity in rural youth. They emphasized that just observing the rural environment does not result in an accurate assessment; perceptions must be applied to capture the true nature of how those factors interact (Yousefian et al., 2009).

The overall purpose of this study is to understand the rural built environment from the perspectives of low-income parents with preschool-aged children and identify barriers to providing them a nutritious diet and opportunities for physical activity. The specific aims of this study are to 1) determine barriers to accessing fruits and vegetables for low-income parents of preschool-aged children living in rural communities, 2) determine barriers to providing physical activity opportunities for their preschool-aged children, and 3) summarize themes identified by low-income parents when they describe the rural built environment as it relates to providing nutritious foods and opportunities for physical activity for their preschool-aged children.

Methods

Data collection methods selected for this mixed-methods study serve a development purpose with complementary intent (Greene, 2007) in an effort to gain a comprehensive picture of how low-income parents of preschool-aged children living in rural communities view the built environment. The Active Where? Parent Survey provides a quantitative descriptive assessment of participants' perceptions. Qualitative, semi-structured interview results guide statistical

analysis of quantitative survey responses, but also complement the survey results, producing a richer description of themes than either method alone could achieve.

Participants were included in the study if they resided in a rural county or town, had a child between the ages of 3-5 years, and were of low-income status. Rural status was determined by population density, defined as areas that encompass all population, housing, and territory not included within an urban area (U.S. Census Bureau, 2010). An urban area is considered a central city and the surrounding densely settled territory that together have a population of 50,000 or more and a population density generally exceeding 1,000 people per square mile (U.S. Census Bureau, 2010). Enrollment in programs such as Head Start, SNAP (Supplemental Nutrition Assistance Program) or WIC (Special Supplemental Nutrition Program for Women, Infants and Children) was used as a proxy of eligibility of low-income status (Early Childhood & Learning Center Web site, 2008; USDA Food and Nutrition Service, 2012; WIC Web site, 2011).

Active Where? Parent Survey

Participants. Survey participants were recruited from rural counties in seven Midwestern states (KS, IN, MI, ND, OH, SD, and WI). A total of 377 participants completed a survey and provided complete demographic information in Fall 2012. A consent statement was read aloud before administering the survey, which took place in person at site of recruitment (Head Start, SNAP, or WIC facility). Participants were given $30 after completing the survey, which took approximately 45-60 minutes. All procedures were approved by the North Dakota State University Institutional Review Board.

Measures. The Active Where? Parent Survey was adapted, with permission, from the Active Where? Parent-Child Survey developed by Kerr et al. (2008). Individual item reliability for the original survey ranged from fair to good (ICC=0.32 to 0.75) (Grow et al., 2008). The

adapted version contains the addition of a demographics section and 11 of the original 23 sections (Communities Preventing Childhood Obesity, 2013). Included sections assess home and neighborhood environment characteristics. Section titles follow: 1) recreation places and sports facilities where your child plays, 2) barriers to activity in the local neighborhood, 3) access to services, 4) streets in my neighborhood, 5) places for walking/biking, 6) neighborhood surroundings, 7) neighborhood safety, 8) local environment, 9) physical activity, 10) rules, and 11) food. Participants were asked to respond to questions as they applied to their preschool-aged children.

Variables of interest include distance (*in town, out of town*), active transportation ability (*yes, no*), recreation place use (range from 0 [*never*] to 3 [*once a week or more*]), activity in local environment settings (range from 0 [*never*] to 3 [*once a week or more*]), neighborhood safety (*disagree, agree*), barriers to activity in the neighborhood (range from 1 [*strongly disagree*] to 4 [*strongly agree*]), ease of accessing services (range from 1 [*strongly disagree*] to 4 [*strongly agree*]), and availability of fruits/vegetables in the home (range from 1 [*never*] to 5 [*always*]).

Data analysis. Qualitative interview results aided development of the following research questions which determined statistical analysis of survey results, a mixed-methods analytical approach referred to as data importation (Greene, 2007):

1. Is distance from recreation places related to how frequently families utilize them?
2. What are major barriers to being active in the local neighborhood (parks and streets)?
3. Is neighborhood safety related to how frequently children are active in the local environment?
4. Is there a relationship between whether or not stores are within easy walking distance of home and how often fruits and vegetables are available in the home?

Frequencies were calculated to assess general response patterns, and chi-square tests were used to evaluate relationships between categories of interest. All statistical procedures were conducted using SAS 9.4 software (SAS Institute Inc.). Significance was set at $p < 0.05$.

Semi-Structured Interview

Participants. Interview participants were recruited either through a flier sent home with children enrolled in Head Start sites located in rural eastern North Dakota counties or through word of mouth. Recruitment continued until data saturation was achieved. Fifteen parents took part in an audio-recorded interview between November 2013 and January 2014 at a time and location of their choice. Participants were read aloud a consent statement and received a $25 gift card at the beginning of each interview, which took approximately 45 minutes to complete.

Measures and instruments. Qualitative interview questions were modeled after the Ecological Model of Childhood Overweight, designed to provoke thought about the participant's community and home environments and personal beliefs related to nutrition and physical activity. Participants were asked to consider how each question applied to their preschool-aged child. Interview questions were peer-reviewed and pilot-tested with three parents of preschool-aged children living in a rural community in eastern North Dakota.

Data analysis. Constant comparison, or simultaneous data collection and analysis, was exercised to enhance trustworthiness (Hays & Singh, 2012). Transcribed interviews were organized and coded using ATLAS.ti 7 software (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany). Codes were examined for relationships and patterns among each other. Themes were generated systematically by observing which codes occurred frequently together across all participants using the co-occurrence tool, taking into consideration measures included in the Active Where? Parent Survey. Visual displays of how codes in each family relate

to each other were developed with the network view feature. Exemplary quotes corresponding to code relationships and themes were extracted using the query tool. Themes informed variables of interest and statistical analysis of survey results.

Results

The majority of participants in both samples were female (87.0% [n = 328] of survey participants, and 100.0% [n = 15] of interview participants) and white (96.7% [n = 365] of survey participants and 100.0% [n = 15] of interview participants). Approximately 70.0% (69.7% [n = 263]) of survey participants lived in town, while 40.0% (n = 6) of interview participants lived in town versus out of town. The mean age of participants' preschool-aged children was 3.91 years (SD = .91) for survey participants and 3.6 years (SD = .74) for interview participants. Additional participant characteristics are presented in Table 1.

Themes: Qualitative Interview Results

Four major themes emerged from the fifteen semi-structured interviews, describing barriers to accessing nutritious foods and opportunities for physical activity in rural communities. Figure 2 illustrates how the following themes are related to each other: availability and utilization of resources, neighborhood safety, interpersonal relationships, and cognitive reactions to barriers.

Barriers to accessing food and physical activity opportunities are categorized in the theme availability and utilization of resources. Convenience of accessing resources, knowledge of resources, and perceived value all prompt behaviors related to utilization of available resources. A family's social network, or interpersonal relationships, aids in overcoming certain barriers and promotes utilization of resources, because information about availability and how to access resources is often discovered through word of mouth. However, lack of interpersonal

Table 1

Participant Characteristics

	Survey participants				Interview participants			
Characteristic	n	%	M	SD	n	%	M	SD
Age	372	98.67	30.88	6.88	15	100.00	32.67	4.12
Household size	376	99.73	4.46	1.34	15	100.00	4.80	1.66
Number of children	376	99.73	2.60	1.24	15	100.00	3.20	1.52
Number of drivable motor vehicles	363	96.27	1.97	1.07	14	100.00	2.18	0.72
Level of education	377	100.00			14	93.33		
Less than high school	28	7.42			0	0.00		
High school/GED	116	30.77			2	13.33		
Some college	111	29.44			1	6.67		
Associate's degree	48	12.73			6	40.00		
Bachelor's degree or more	74	19.63			5	33.33		
Marital status	377	100.00			15	100.00		
Single, never married	67	17.77			0	0.00		
Married	224	59.42			13	86.67		
Widowed, divorced, or separated	48	12.73			1	6.67		
Living with partner	35	9.28			0	0.00		
Other	3	0.80			1	6.67		

relationships within the community could be considered a barrier to accessing resources for some families. Factors contributing to neighborhood safety were found to influence how or if resources were utilized. For instance, traffic discouraged some families from walking or biking to certain outdoor recreational facilities, but fences around a playground promoted its use.

Participants' perspectives on certain barriers conjure distinct cognitive reactions, influencing how they interact with their environment. Some barriers to accessing or utilizing resources were not always viewed as issues worth addressing in the community, but treated as an inevitability or unavoidable consequence of living in a rural community.

The next section provides detailed descriptions and visual representations of how codes within each of these themes relate to each other. Exemplary quotations accompany theme descriptions; names have been changed to protect participants' anonymity.

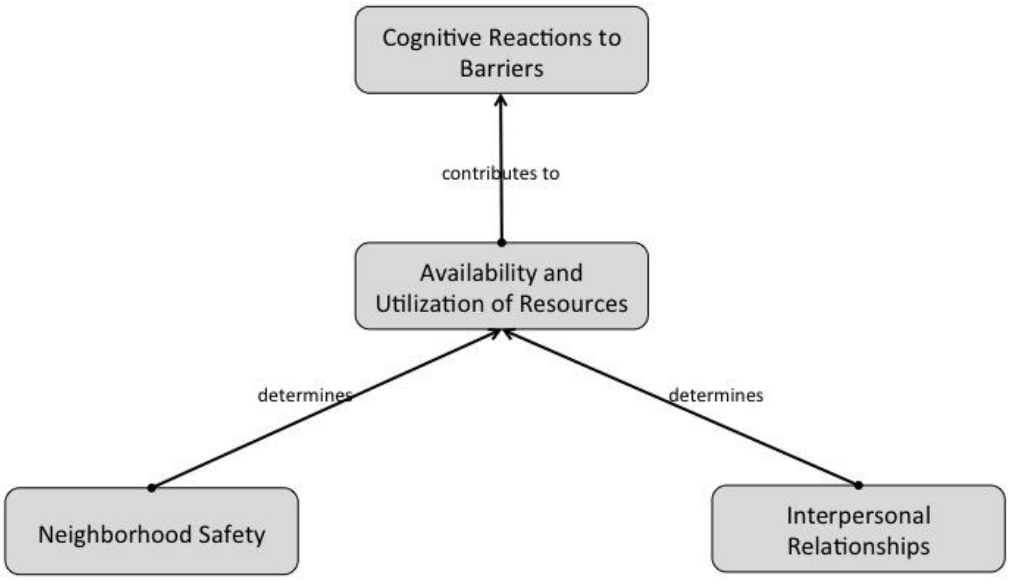

Figure 2. Relationships among semi-structured interview themes.

Accessibility and utilization of resources. This theme summarizes identified factors that influence how existing opportunities for physical activity and accessing food are utilized. In terms of food access, most parents had access to a local grocery store, but not everyone chose to utilize it. All participants acknowledged that selection, affordability, and quality determine purchases, but foods meeting those criteria were not always available locally. Many prefer to shop in urban communities to get the best value, often coordinating trips with another errand to justify the time and costs of travel and buying in bulk to last until the next trip. Ashley explains:

> In [Urban Town] it's like half the price to get the same thing. Just starting, price-wise. The quality is *much* better, and the variety also. I mean there's so much more. You know? . . . And it's hard to get fresh stuff in [Rural Town]. . . . It's a small town, there's only one grocery store; if you're not going to buy it there you have to drive to [Urban Town], which is an hour. . . so when I'm up here I stock up. But I'm not going to drive up here *just* for groceries.

The convenience of having a grocery store in close proximity is appreciated, and parents will utilize it when it is not convenient to travel. Convenience comes with a price, however, compromising value, quality, and affordability. Ashley continues:

> Some nights after work you stop and you get food, but it's rotten. And by the time you get home, or a day or two later it's mushy. You know? So I think living in a rural community people probably *do* give up quality fruits and vegetables, you know? It's convenience. It's that you *pay* for the convenience, too. And you pay as far as losing quality.

Nancy shares a similar view:

That is a big compromise I guess. Like even considering milk. Milk is almost $6 a gallon. . . . [B]ut I mean you can go to [Urban Town] or Sam's Club even and get it for $2.50. And that's—that's huge. And especially having young kids we go through QUITE a bit of milk. So I mean it's just kind of one of those things you just kind of suck it up and do it [just to] keep the convenience.

Other options for food access such as farmers markets, delivery services, and online ordering of groceries are sometimes described as ambiguous, where it is unclear how these resources can be utilized, but knowing others in their community have done so. Helen elaborates:

I had to actually call one of my girlfriends and ask her how to go about ordering and such. . . . I've never ordered from them, but that's on the back burner. You know it's always something I might do. But I asked the one gal who *really* does it if she's ever gotten weird produce because it comes from such a distance. . . . And I don't know how long it takes from there to there. . . . [M]aybe it's every other month? I don't know, so maybe it's every month, I'm not sure.

In terms of accessing opportunities for physical activity, seasonality was a major point of discussion when describing physical activity patterns and utilization of indoor and outdoor recreational spaces. Parents were quick to identify summer as a time filled with outdoor activities that generally require higher levels of activity. Beyond playing outdoors in their local neighborhood, most recreational programs available for preschool-aged children are offered in the summer. Outdoor recreational facilities (parks and swimming pools) are also utilized more often. Holly anticipates summertime activities:

You know, in the summertime it will be really nice. In the summertime we had a swing set, and we're gonna get a swing set from my parents' house, I think, too, with a slide and

a climbing wall and all that kind of stuff. She loves that, too. Summer is so much easier to get some sort of activity. You know, swimming lessons and that kind of stuff.

Briana talks about utilizing summer programs and outdoor recreational facilities:

Especially in the summertime because of the pool, and Cory will have baseball, so we'll have to be at the baseball field a lot. Otherwise, I mean, the park in [Rural Town] is really nice, too.

During the winter, children engage in more indoor activities because it can be too cold to play outside regularly or for extended periods of time. Examples of indoor activities are typically sedentary activities such as crafts and gaming. Exergaming was identified as an attempt of indoor exercise, but was limited by parents because of its close association with screen time.

Participants suggested limited indoor space restricts their children's ability to stay active in the winter months. Naomi shares her strategies to keep her children active in the winter:

What did we do all winter? They're at a fun age, too, right now that they're getting more into the trucks and we have a ton of trains so they're down on the floor playing trains, using their imagination and things like that. We paint a lot. I mean it's not great sort of (pause) In terms of exercise, boy we've been kind of lacking. . . . Inside it's going to be more like play dough time, color time. We don't have a lot of room to move in here.

Daria expresses her desire to provide fun, physical activities for her children in the winter rather than sedentary activities:

Yeah, I don't know it's—sometimes it's hard because you tell 'em to try and go find something to do, but it just gets hard. Just because it's limited space. . . . That's where I would like something in the winter to try to find something that'd be fun for them because they're always glued to either iPods or the TV. You try to find something fun for

them, but even on the iPod you try to find fun learning games for them—puzzles and other stuff, but it's still not the activity that they're getting.

Utilization of the few indoor recreational spaces that are available for preschool-aged children and families is limited due to the ambiguous nature of accessibility. It is often unclear who is allowed to use certain facilities and when they are available. Daria shares what she knows about accessing a local indoor gym:

> And I'm not even sure how that works, but I know if you want to use it, for instance a rummage sale, you have to pay for it. So I don't know if you just—if like if you want to use it for a big birthday party or something if you have to pay for that? So I'm not sure about that. Or if you just want to take your kids there if you have to pay?

Although accessing and utilizing certain recreational facilities depends on what is known about them, some parents are satisfied with their children engaging in physical activity in their local neighborhood because it is convenient, affordable, and doesn't require travel. Alison talks about why she prefers her children play at home:

> They do have a really big park. We've been to it a few times. But as far as keeping them busy, if I can do that without having to drive them into town I'd prefer to do it at home.

Even if parents were well-informed of how to access available facilities and programs, utilization was limited by affordability and the travel required for some families. For Helen's family who lives in city limits, enrollment fees are a barrier for participating in indoor recreational programs:

> So there's taekwondo and dance indoors—if you want. But again it comes down to money. So we've never taken part in those because the costumes alone for dance for the recitals are unbelievable.

For Amanda who lives 20 miles outside of city limits, travel required to access programs prevents utilization of them:

> Yeah, we don't go to any of them. I mean there's options, but we don't participate. . . . We don't like to come to town if we don't have to because of the drive. And I don't know, I've just never really looked into it.

Some parents weren't aware of indoor spaces available to preschool-aged children, but suggested the possibility of repurposing abandoned buildings into indoor play spaces. Others expressed a need for more age-appropriate programs offered in the winter. Holly, who recently relocated from an urban community, shares her thoughts on the idea:

> This sounds really silly, but we used to go to the mall in [Urban Town] a lot because they had this little brand new indoor play area. There's nothing really like that indoors around here. We can go to the mall in [Urban Town] and she can just run around, but there's not like a play place for kids, you know? Like an indoor place. I'm thinking like the place in the mall is not big. . . . I feel like there are a lot of open places in [Rural Town] that I feel like you could fit something like that in.

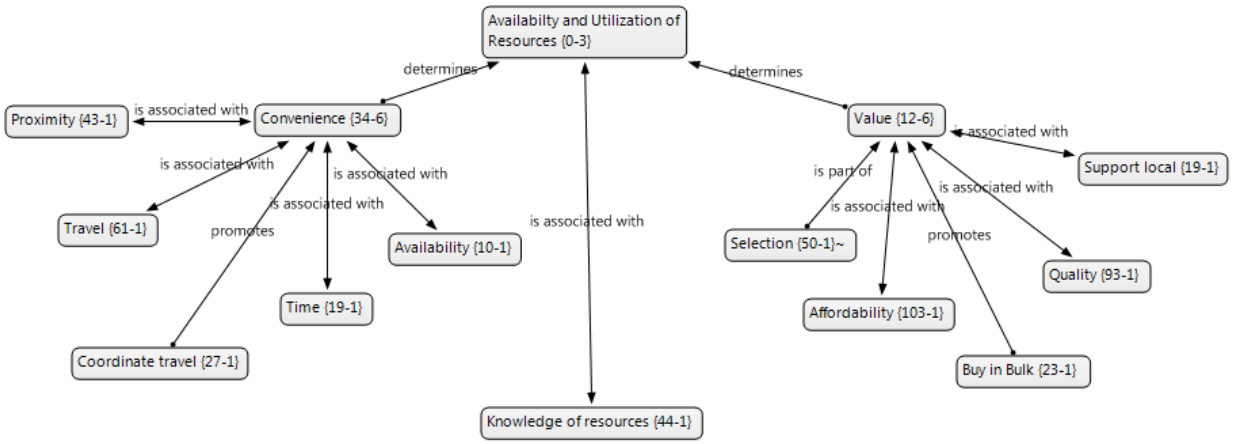

Figure 3. Availability and utilization of resources theme. Note: Lines connecting codes define the direction of the link; words on the line define the nature of the relationship. Numbers within the brackets indicate first, how many quotations were assigned to that code, second, how many other codes it is linked to. The symbol ~ indicates a memo or comment made by the researcher is connected to the code.

Neighborhood safety. Families are most active outdoors, but only when parents feel it is safe enough to do so. While most parents believe their local neighborhood is generally safe for their preschool-aged children to play in, several threats to safety were repeatedly mentioned, which merit the need for supervision**,** enforcement of boundaries, and rules for outdoor play. Briana describes her family's rules and boundaries for outdoor play on a farm:

> They know their boundaries, and then they have a ditch there, but they can only go so far. The garden—that's their stopping point. And then if they happen to go in front of the house where the gravel is, in front of the shop, they have to make sure they have someone with them. So we have rules. . . . You never know if somebody's going to pull in or something, so you gotta make sure you can see them at all times.

Traffic was the major threat to safety identified among all participants. Helen describes the need to for strict supervision because of the threat of traffic:

> I live on Main Street . . . it's the busiest. It's not highway 200, but it is another one of the main roads. I mean I've had cars drive across my lawn before, so I'm very conscientious of things that could occur and so I absolutely have some sort of supervision.

Pedestrian and biking trails were viewed as a component of the built environment that would enhance safety of outdoor play, creating safe routes to other outdoor recreational spaces and providing some protection from highway traffic, alleviating the need to bike or walk on the road. Parents who lived near a highway without sidewalks admitted they would walk or bike more with their family if a trail was available, but sometimes resigned to the belief their community did not have the financial resources to implement it. Kristen describes trying to be active with her family at home near a busy highway:

> I mean we live out of town so it—we don't go for a walk or even go for a bike ride we can't do out there, because you can drive 55 miles per hour. And there's not much of a shoulder, so that's why we had to bring our bikes to town.

Strangers were thought of as a threat most often by parents living "in town," whereas natural amenities (rivers and canals), and farm hazards such as farm equipment and farm animals posed threat to "out of town" residents. Ashley describes the dangers of living on a large farm:

> It's pretty supervised. There is *a lot* going on. It isn't like a small home town farm. It's a *big* operation. And there's people in and out of there with tractors and manure spreaders. . . . So there's a lot of help and equipment. It's too dangerous.

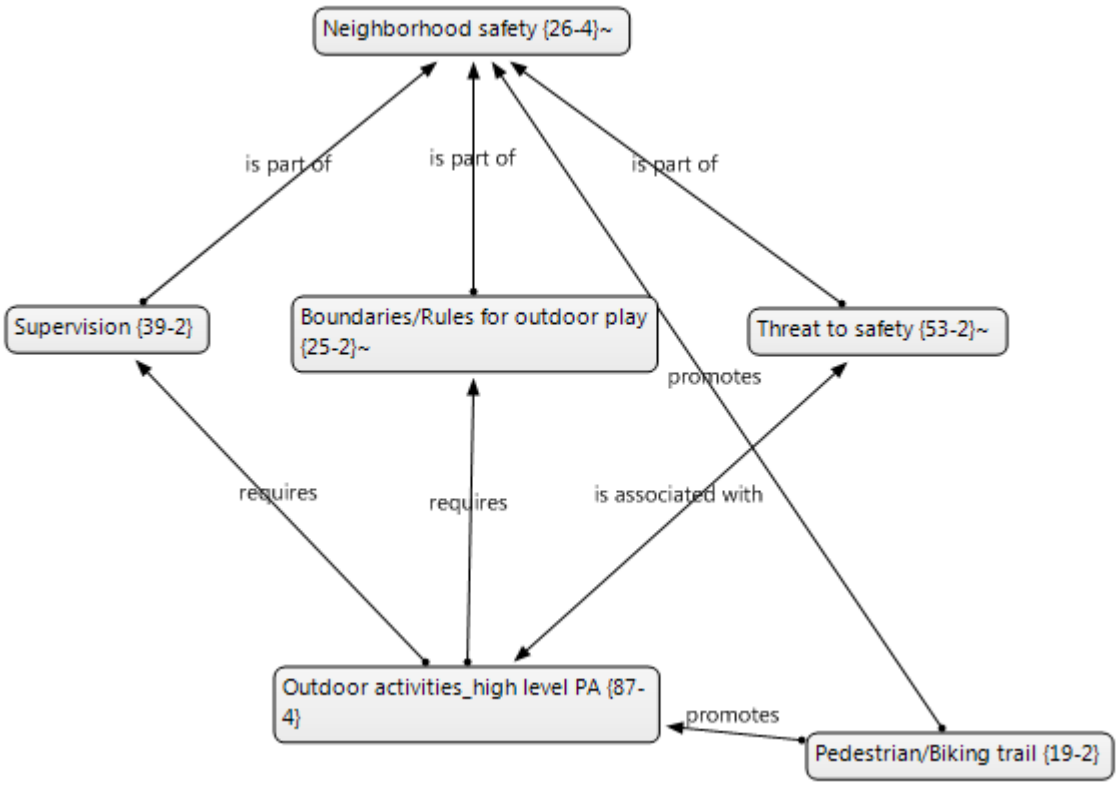

Figure 4. Neighborhood safety theme.

Interpersonal relationships. A family's social network, or number and strength of interpersonal relationships, could be considered both a barrier to and a facilitator of accessing food and opportunities for physical activity in rural communities.

Few formal resources exist that inform the public of available resources or programs and upcoming community events. This information is communicated largely through word of mouth by neighbors and friends. Those without a strong local social network, or few interpersonal relationships (for instance, those new to the community), describe resources as ambiguous, not knowing what programs are available, who can access certain recreational spaces, or when they are accessible. Even parents who describe themselves as well-established in the community are

unaware how to access some resources, but rely on their social ties to get the information they need. Daria, who has lived her entire life in the community she resides in today, explains how she accesses an indoor gym:

> Yeah it's kind of open to the public. You just pretty much have to find someone with a key and ask them to go play in there. . . . I think they said there are like 5 or 6 people out there with [a key], so it's—yeah it's just finding someone who has one.

Alison, who recently relocated from an urban community, expressed her desire for a resource listing upcoming programs her children could participate in:

> [I]t's *really* hard here to find the activities. Like the soccer camps and the volleyball camps and things like that. You really have to look and get word of mouth. I thought maybe if I got the paper, the local paper, that that might help, but it didn't really do much. I don't know if I'm just too new to the area and I'm missing a source that I don't know exists, but as far as I can tell it's mostly word of mouth there, or if they happen to get something from school.

The value placed on developing interpersonal relationships was clear among participants. Parents expressed the need for more community events or family programs to connect them with other families, opening the door for future play dates and fostering social development among their children. Enrolling children in early childcare programs was recognized as another method of establishing interpersonal relationships. Daria explains why she chooses to enroll her preschool-aged children in daycare:

> So that's kind of why they go to daycare, just to get involved with other people, or other kids their age, and get to know them. Because then—'cause I don't really know a whole lot of people, especially their age. So it's convenient that they go over there to Betty's

> because then I kind of know who they hang out with so then we can actually call and make a play date.

Amelia talks about participating in family programs to promote her daughter's social development:

> [W]e understand that our kids *should* get to meet more people. And I think Amber—she loves to be around other kids. And I think that's healthy, too. Or just as far as your work, or who she might meet, or another family, or a church group, or a softball team, or whatever! You know, just more ways to interact with other people.

Developed interpersonal relationships also promote food access. While few families talked about gardening themselves, many are able to obtain affordable fruits and vegetables locally through friends' and neighbors' garden surplus. Other unique food access options unveiled through social contacts include community-supported agriculture (CSA) programs and food delivery services. Similarly, affordable, second-hand physical activity equipment is commonly obtained via friends and neighbors who no longer need it. Helen enthusiastically recalls how she learned about a local farmer's garden surplus:

> She stopped by my house on her way home from work and told me to come and pick pumpkins, because in the fall they do free pumpkins and they don't care who picks. . . . And then she told us when we were there, "next summer, make sure you come because you can have *any* of it. It's free, I don't care. This is extra!" So in the summer we'll go pick produce. He has romaine, and beans and peas and tomatoes and corn and carrots and—everything! And so it's quite fabulous!

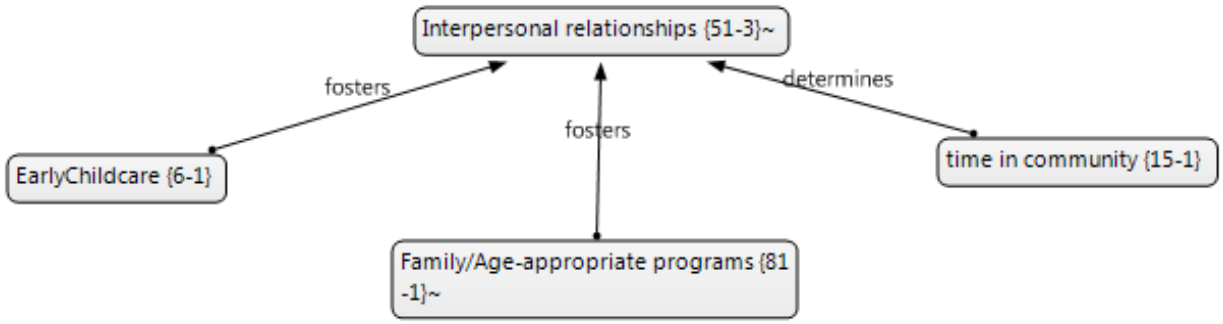

Figure 5. Interpersonal relationships theme.

Cognitive reactions to barriers. At times, participants did not recognize the barriers they were describing as barriers, but did express attitudes regarding challenging aspects to living a healthy lifestyle in a rural community. Resign and cognitive dissonance are major cognitive reactions to barriers communicated. Resign reflects an attitude of unwillingly accepting something undesirable, but inevitable. Cognitive dissonance refers to a feeling of discomfort resulting from a situation involving conflicting attitudes, beliefs, or behaviors, leading to an *alteration* in attitudes/beliefs/behaviors to reduce discomfort (Johnson & Levin, 2009).

An attitude of resignation regarding local food access and availability was apparent when participants explained how they must compromise quality, affordability, and selection when shopping locally. They express the desire for more local food access options, but believe the situation will not change and "put up with" paying high prices for inferior quality in exchange for the convenience of shopping locally. Others have feelings of resignation regarding the time and costs associated with traveling further distances to get the value and selection they want. Kristen expresses frustration with the local selection, but unwillingly accepts the situation:

I'm frustrated when you go to get something here and they don't have it. 'Cause you

> don't have another choice to go, so you really have to change everything you were going to do. The whole menu. (pause) I think we're lucky to have a store here, 'cause some places don't have a store, so I'm lucky that it's just a couple blocks away and I can go get something, but like when they run out of an item, or a lot of times things are on sale but they don't ring up as a sale item, *then* I get frustrated! Because that happens a lot!

Karmen's attitude regarding the limited selection of produce at the local grocery store:

> [Rural Town] doesn't quite have that many to choose from. So it's (pause) I don't know I guess that's just the way we grew up. So I'm like, "well this is it." So I'm not mad, because I understand it's [Rural Town], and it's just like "OK, make due with what we got. I'll be going somewhere soon."

Naomi desires more nutritious options at local eating establishments, however, she's somewhat resigned to the belief that it's not feasible in a small town:

> There's not an eating establishment in town that offers a wide variety of vegetables without getting a salad. You know? And which, I mean for them I'm sure it's a convenience issue, too, to have that all on hand. And that's part of being in a small town. I mean you can't have it all on hand.

For similar reasons, accessing and utilizing recreational programs are met with an attitude of resignation. Traveling to participate in programs compounds the required participation fees, but some families will pay the price in order to grant their children the opportunity to stay active and build relationships. Daria shows feelings of resignation regarding cost of travel required to access recreational programs:

> I mean I still want to keep THEM active and playing. I don't want the gas to be the reason they can't do something. You know it's just something that you just kind of shake your head at and shake your fist at. But you just do it anyway.

Lauren would appreciate a local indoor recreational facility, but dismisses the idea:

> But that would cost [Rural Town] a lot of money. I don't think they have the money for that. I don't know. I think it could happen, but yeah, I don't think it will! Because you just never hear of it. You know? You could bring it up, but I think there's other things that they need more. I think they've put a lot of money into the pool and the parks . . . more summertime things than winter.

Cognitive dissonance was expressed frequently when participants talked about their decision to shop in more populated communities. They acknowledged supporting local businesses would ensure their success and secure local food access, but could not justify sacrificing the value they find in urban communities or the budget they use to afford other opportunities for their children. Helen explains:

> I couldn't afford to buy *all* my groceries here. We *do* buy occasional things here, and I'm glad we have a store. So we feel that you *should* support the stores, but we have to be wise with all of our crew as well, so we don't (pause) You know, because we have children who like to do other activities like music and orchestra so we have to (pause) Those cost money, too.

Ashley, after explaining why she shops primarily at urban grocers:

> So it makes sense, but yet you want to support local to the point, too, because if it wasn't there you know, some night after work when I need milk or a loaf of bread and eggs, I'd have nowhere to go.

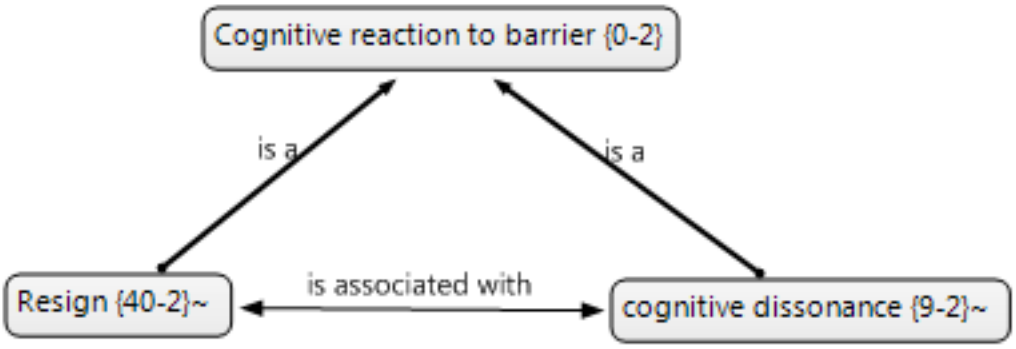

Figure 6. Cognitive reactions to barriers theme.

Active Where? Parent Survey Results

A total of 420 participants completed the survey, but only 377 completed the demographic portion. Results represent data from these 377 participants. Research questions were developed to further investigate qualitative themes and code relationships using quantitative survey data. The theme "neighborhood safety" and code relationships in the theme "availability and utilization of resources" related to proximity and availability were represented by survey items and therefore incorporated into research questions. However, there were no survey items accurately corresponding to themes "interpersonal relationships" or "cognitive reactions to barriers," and no further statistical procedures were performed.

Question 1: Distance from recreation places. Results from 16 separate 2 x 4 chi-square tests for independence indicated there was a significant relationship between neighborhood type and how frequently children were active at small public parks (χ^2 [3, n = 371] = 16.57, $p < .01$, Cramer's V = .21), large public parks (χ^2 [3, n = 366] = 13.09, $p < .01$, Cramer's V = .19), and public playgrounds with equipment (χ^2 [3, n = 371] = 15.53, $p < .01$, Cramer's V = .20). No significant relationships were found between neighborhood type and the remaining thirteen

recreation places. Table 2 displays frequencies and percentages for significant test results. Frequencies and percentages for non-significant test results indicate the majority (>50%) of participants from both neighborhood types are never active at indoor recreation facilities, basketball courts, the YMCA, a boys and girls club, or a walking/running track, however, most are active at friend's or relative's house at least once a week. Table 3 displays chi-square test results for all 16 recreation places by neighborhood type.

A 4 x 4 chi-square test for independence indicated the relationship between how frequently children are active at indoor and outdoor recreation places and whether or not they could walk/bike there was significant, χ^2 (9, n = 5676) = 1073.84, $p < .0001$, Cramer's V = .25. The 16 recreation places in the section "recreation places and sport facilities where your child plays" were divided into either "indoor recreation places" or "outdoor recreation places" and combined, then grouped by whether or not respondents indicated their children walked there. This resulted in four variables: indoor-can't walk, indoor-can walk, outdoor-can't walk, outdoor-can walk.

Table 2

Frequency of Recreation Place Use by Neighborhood Type

		Frequency of Recreational Place Use			
Recreation place		Never	Once a month or less	Every other week	At least once a week
Small public park	In town (*n* = 262)	10, 3.82	51, 19.47	80, 30.53	121, 46.18
	Out of town (*n* = 109)	11, 10.09	34, 31.19	34, 31.19	30, 27.52
Large public park	In town (*n* = 257)	76, 29.57	57, 22.18	60, 23.35	64, 24.90
	Out of town (*n* = 109)	46, 42.20	32, 29.36	18, 16.51	13, 11.93
Public playground with equipment	In town (*n* = 261)	13, 4.98	55, 21.07	81, 31.03	112, 42.91
	Out of town (*n* = 110)	15, 13.64	34, 30.91	30, 21.27	31, 28.18

Note: Cell values are presented as n, row %.

Table 3

Chi-square Test Results for Recreation Place Use by Neighborhood Type

Recreation Place	df	n	χ^2	P-value
Indoor recreation or exercise facility (public or private)	3	370	0.28	0.96
Beach, lake, river, or creek	3	365	4.42	0.22
Biking/hiking/walking trails	3	369	0.76	0.89
Basketball court	3	368	1.39	0.71
Other playing fields/courts (football, softball, tennis)	3	369	2.62	0.45
YMCA	3	369	0.28	0.96
Boys and girls club	3	367	2.00	0.57
Swimming pool	3	369	7.15	0.07
Walking/running track	3	371	2.75	0.43
Small public park	3	371	16.57*	<.01
School with recreational facilities open to the public	3	365	2.39	0.50
Large public park	3	366	13.09*	<.01
Public playground with equipment	3	371	15.50*	<.01
Public open space (grass or sand/dirt) that is not a park	3	372	0.77	0.86
Shopping mall, plaza	3	369	7.28	0.06
Friend/relative's house	3	371	1.29	0.73

* $p < 0.05$

Question 2: Barriers in the local neighborhood. Frequencies were computed for all 22 items in the section "barriers to activity in the local neighborhood" to identify major barriers to being active in the local park and streets/roads in the local neighborhood. Nearly one-third (n = 104, 27.6%) of participants somewhat agreed or strongly agreed that "no adult supervision" was a barrier to being active at the local park. Traffic was the most frequently reported barrier to being active in the local street/road, with the majority (n = 232, 61.5%) somewhat agreeing or strongly agreeing.

Question 3: Neighborhood safety. Frequencies were calculated for neighborhood safety and local environment items to assess general response patterns. The majority of participants reported traffic density made it difficult for their child to walk in the neighborhood (n = 140, 55.2%) and drivers drive faster than the posted speed limit in their neighborhood (n = 301, 79.8%). The majority (>50%) of participants reported strangers were a concern when their children play alone or with friends in the local neighborhood and parks, however, most (>50%) disagreed that strangers were a concern when children played around the home. Most participants' children (>50%) were active in the home (n = 307, 97.3%), yard (338, 89.7%), and driveway (n = 224, 59.4%) at least once a week, while 66.8% (n = 252) were never active in the street.

Thirty-five 2 x 4 chi-square tests for independence were calculated to evaluate the relationship between neighborhood safety and how frequently children are active in the local environment. Results are displayed in Table 4.

Question 4: Fruit and vegetable access. Results from two 4 x 4 chi-square tests for independence indicate there is no significant relationship between ease of accessing stores by

walking and how often fresh fruit is available in the home (χ^2 [9, n = 375) = 3.97, p = .94, Cramer's V = .06), or how often fresh vegetables are available in the home (χ^2 [12, n = 375) = 6.60, p = .88, Cramer's V = .08).

Table 4

Chi-square Test Results for Neighborhood Safety by Activity in Local Environment

Safety issue-local place	df	n	χ^2	P-value
There is so much traffic nearby that it is difficult for my child to walk in our neighborhood.				
Inside home	2	372	2.35	0.31
In our yard	2	359	3.40	0.18
Our driveway	3	323	3.47	0.33
At neighbor's yard/driveway	3	371	4.84	0.18
In local streets/vacant lot	3	372	9.95*	0.02
The speed of traffic on most nearby streets is usually slow (<30 mph).				
Inside home	2	373	1.28	0.53
In our yard	2	360	2.56	0.28
Our driveway	3	324	9.11*	0.03
At neighbor's yard/driveway	3	372	4.92	0.18
In local streets/vacant lot	3	373	2.95	0.40
Most drivers go faster than the posted speed limits in our neighborhood.				
Inside home	2	373	1.62	0.44
In our yard	2	360	0.73	0.69
Our driveway	3	324	14.19*	<0.01
At neighbor's yard/driveway	3	372	0.70	0.87
In local streets/vacant lot	3	373	8.47*	0.04

* $p < 0.05$

Table 4 continued

Safety issue-local place	df	n	χ^2	P-value
I am worried about letting my child play alone around my home because I am afraid of them being taken or hurt by a stranger.				
Inside home	2	373	3.67	0.16
In our yard	2	360	8.18*	0.02
Our driveway	3	324	9.72*	0.03
At neighbor's yard/driveway	3	372	16.63*	<0.01
In local streets/vacant lot	3	373	7.79	0.05
I am worried about letting my child be outside with a friend around my home because I am afraid my child will be taken or hurt by a stranger.				
Inside home	2	373	0.25	0.88
In our yard	2	360	3.50	0.17
Our driveway	3	324	12.77*	<0.01
At neighbor's yard/driveway	3	372	10.45*	0.02
In local streets/vacant lot	3	373	11.97*	<0.01
I am worried about letting my child play alone or with a friend in my neighborhood and local streets because I am afraid my child will be taken or hurt by a stranger.				
Inside home	2	372	0.12	0.94
In our yard	2	359	2.53	0.28
Our driveway	3	323	11.09*	0.01
At neighbor's yard/driveway	3	371	10.06*	0.02
In local streets/vacant lot	3	372	7.09	0.07
I am worried about letting my child be in a local park because I am afraid they will be taken or hurt by a stranger.				
Inside home	2	372	0.74	0.69
In our yard	2	359	1.66	0.44
Our driveway	3	323	0.84	0.84
At neighbor's yard/driveway	3	371	10.75*	0.01
In local streets/vacant lot	3	372	7.16	0.07

* $p < 0.05$

Discussion

The overall purpose of this study is to identify barriers to accessing physical activity opportunities and fruits and vegetables in low-income, rural communities from the perspective of parents of preschoolers. Research questions 1, 2, and 3 address barriers to accessing physical activity opportunities; and question 4 addresses issues related to food access. In the following sections, survey results for each question are related to qualitative findings and current literature.

Question 1: Distance from Recreation Places

Distance from public parks and playgrounds was related to how frequently children were active at these recreation places, specifically, survey participants that lived in town utilized parks more frequently than those that lived out of town. Interview participants in this study that lived out of town explained that they did not visit the park regularly unless it was convenient or a special occasion, supporting the understanding that proximity impacts convenience and determines utilization of some resources. Convenience aside, traveling into town for reasons deemed "unnecessary" was also minimized to save on fuel costs.

Grow et al. (2008) also found proximity of parks to be associated with how frequently children ages 5-11 years used them in urban cities. Parents living in rural communities participating in a study by Moore et al. (2010) shared a similar view, identifying distance from recreational places and associated transportation costs as major barriers to their children accessing physical activity opportunities. In the same study, social influences were identified as facilitators of physical activity and were often described as interdependent, where relationships created more opportunities for unstructured play, and engaging in play with peers supported development of children's social skills (Moore et al., 2010). Interpersonal relationships were

valued for similar reasons among interview participants in this study, and local friends' and neighbors' homes were identified as another important recreation place among survey participants, discovered after assessing frequency of recreation place use among neighborhood type.

Question 2: Barriers in the Local Neighborhood

Traffic was identified as the major barrier to being active in local streets/roads among survey participants, but also a prominent concern of neighborhood safety for interview participants. Consequently, interview participants' rules and boundaries for outdoor play prohibited their children from being active in streets and roads. By eliminating local streets as a route to accessing local parks, traffic could indirectly become a barrier to being active at local parks. Supporting this notion, Grow et al. (2008) found perceived traffic safety to be the strongest correlate with whether or not children ages 5-11 years walked or biked to parks.

While survey results indicate there are no notable barriers to being active at local parks, interview themes reveal travel required to access them may be prohibitive, but this was not included as a survey item. Parents in a study by Moore et al. (2010) expressed desire for a public transportation system in their rural communities to alleviate costs associated with traveling to recreation places, where distance was a major barrier to being active there.

Question 3: Neighborhood Safety

Traffic and a fear of strangers were cited as neighborhood safety concerns among interview participants that resulted in the need for supervision for outdoor play. Similarly, Carver, Timperio, and Crawford (2008) identified road safety and "stranger danger" as key safety concerns in their review of neighborhood safety and physical activity among youth.

Survey results of the present study explore the relationship between these concerns and child activity in the local environment.

Traffic density and speed of traffic were related to how frequently children were active in streets and their home driveway. Survey results and interview findings both confirm that parents instruct their children not to play in the street due to the threat of traffic. Although traffic safety is a concern, it does not impede children from playing in their yard, the outdoor local setting where children are most frequently active.

Ding, Sallis, Kerr, Lee, and Rosenberg (2011) found physical activity among children (ages 3-12 years) to be consistently inversely associated with traffic speed and volume in their review; Yousefian et al. (2009), however, suggest families in rural areas are desensitized to traffic danger, learning from parent and adolescent focus groups in rural Maine that traffic safety was a concern but did not significantly influence activity level. In the present study, traffic is a definite concern, but parents ensure their preschool-aged children are supervised when playing outdoors and enforce boundaries. Older children may not need constant supervision and may have wider boundaries for outdoor play, a context by which the association between traffic and frequency of activity should be interpreted.

Stranger danger was related to how frequently children were active in the yard, driveway, neighbor's yard/driveway, and streets. A fear of strangers was a concern for several interview participants, and survey results also indicate it is a threat that worries some parents, but not the majority. Responses to survey questions pertaining to strangers were widely distributed. It is possible these items were not interpreted as intended, because the survey was originally developed for young children and adolescents (ages 5-18 years). From the perspective of a parent

with a preschooler, the term "friend" (when asked if strangers are a concern when their child plays outdoors with a friend) could have been viewed as an adult friend of the parent's, rather another 3-5 year old. Interview participants felt their preschool-aged children were too young to play outdoors without adult supervision, contrary to survey results.

Question 4: Fruit and Vegetable Access

In terms of food access, survey results indicate there was no relationship between ease of walking to stores and how often fruits and vegetables were available within the home. This could be because many participants must travel to access local stores, especially if they reside outside of city limits. Furthermore, interview participants revealed that even if grocery stores are within walking distance of their home, they may not choose to shop there or purchase produce there because perceived poor quality and high prices of food available may prompt them to travel to grocery stores in more populated communities where perceived value is greater.

Similarly, Krukowski, McSweeney, Sparks, and West (2012) found in their qualitative study aimed to understand food store choice that participants in rural Arkansas were willing to drive further than necessary to obtain what they sought in terms of affordability, quality, and selection because local stores within close proximity rarely offered foods meeting this criteria. Additionally, Krukowski et al. (2012) reported participants acknowledged supporting local businesses would benefit the community, but chose to shop elsewhere to access greater value—a reaction to barriers of food access apparent among the present study's participants.

Jilcott, Moore, Wall-Bassett, Lui, and Saelens (2011) speculated those who value certain aspects of larger grocery stores are willing to travel further to shop there, based on their study results showing the frequency female SNAP participants in rural North Carolina shopped at

supermarkets and super centers was positively associated with average daily travel. An alternative explanation for findings by Jilcott et al. (2011) was those who are required to travel more are more likely to be within close proximity of these stores and shop there. These findings mirror the present study's qualitative results where coordinating travel with existing responsibilities/errands promotes convenience and likelihood of utilization of certain resources.

Limitations

Results of this study introduce new ways of considering barriers to accessing resources in rural communities and how young families experience them, however, limitations should be noted. First, this study sought to explore perspectives of parents living in low-income, rural communities, however, actual income data was not collected. Some interview participants were recruited through word of mouth via parents enrolled in SNAP, WIC, and Head Start, but these participants' enrollment in such programs or income level was not confirmed. Second, the Active Where? Parent Survey did not assess the retail food environment, characteristics discovered to be influential in where and how interview participants obtained food. Overall descriptions of barriers related to accessing fruits and vegetables utilizing the mixed-method approach may be lacking for this reason.

Implications for Research and Practice

This mixed methods study identified barriers to accessing fruits and vegetables and opportunities for physical activity in rural communities previously cited in the literature, but also offers new insights into how parents with young families react to these barriers, determining how they utilize available resources.

In terms of obesity prevention strategies incorporating community-wide interventions, findings from the mixed-methods approach highlight the need for improved ability to utilize available physical activity opportunities and local food retail outlets. Proximity and traffic safety are two important areas of focus for enhancing utilization of public recreation spaces. Creative solutions to public transportation options for families and preschoolers in rural areas should be investigated further. Instillation of sidewalks and traffic calming techniques in residential areas near highways could enhance neighborhood safety and the possibility of active transportation to recreation places (Committee on Environmental Health, 2009). Finally, an assessment of the local consumer food environment should be included in the design of future community-wide interventions, as quality and affordability of foods available rurally prohibited families from utilizing local food access options.

Although survey results provided an in-depth view of parenting characteristics and child behavior, interview findings suggest community readiness should be considered when developing obesity prevention strategies. The theme "cognitive reactions to barriers" revealed identified barriers were met with an attitude of resignation or conjured feelings of cognitive dissonance, indicating community change was not recognized as a need or feasibility. These attitudes and beliefs regarding barriers when applied to the Community Readiness Model (CRM) correspond with stages "no awareness, "denial, and "vague awareness" (Findholt, 2007). Interventions targeting identified barriers are not likely to succeed in a community that is not invested in or prepared for their implementation (Findholt, 2007).

The CRM developed by Tri-Ethnic Center for Prevention Research was found to be a useful tool in not only gauging community readiness for obesity prevention, but also increasing

awareness of barriers associated with its prevention (Findholt, 2007). Additionally, the strong social networks present in rural communities, illustrated by the theme "interpersonal relationships" in the present study, should be considered an asset for community change in these regions. Social capital, or interpersonal and organizational connections, is an essential component of community action (Agnitsch, Flora, & Ryan, 2006), and its value should be realized in future research endeavors and intervention strategies.

Acknowledgements

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CHAPTER 5. SUMMARY & CONCLUSIONS

The overall aim of this study was to identify barriers to accessing fruits and vegetables and physical opportunities for parents of preschoolers living in low-income, rural communities. The Ecological Model of Childhood Overweight was used as a theoretical framework to guide data collection and analysis. This social ecological model depicts parents as mediators between the environment and their children, determining which aspects of the community children have access to and ultimately impacting child behavior and weight status (Davison & Birch, 2001).

A mixed methods study design incorporated quantitative survey data and qualitative semi-structured interview findings to gain a comprehensive understanding of parents' perspectives and experiences of their rural communities as they relate to promoting healthy lifestyles for their families. Interview results informed analysis procedures for quantitative data, resulting in confirmation of several barriers to accessing physical activity opportunities previously cited in recent publications. Some themes related to utilization of resources lifted from interviews could not be related to quantitative results directly, but remain important considerations for future studies. In the following section, conclusions will be outlined by constructs of the Ecological Model of Childhood Overweight.

Community-wide Characteristics

Based on the Ecological Model of Childhood Overweight, obesity interventions targeting community-wide factors have the potential to impact entire populations and future generations. With sustainability as an end-goal, community-wide factors were main areas of focus.

Accessibility of Recreation Facilities

Proximity to recreation places was found to be influential in how they were accessed and how frequently they were utilized. Parks and playgrounds were recreation places available in most participants' communities and were considered important venues for outdoor activity, but those living outside of city limits did not use them regularly. Interview participants living out of town elaborated that their visits to the local park were seldom, due to the time and costs associated with traveling by car to access them.

Using a similar version of the Active Where? Parent Survey, Grow et al. (2008) also found an association between proximity of parks and utilization among children in urban cities. Moore et al. (2010) determined distance to be a major barrier to accessing parks in rural communities in their qualitative study, where participants noted transportation costs were of primary concern. Public transportation services are limited in rural communities (Shoup & Homa, 2010), but proximity persists to limit utilization of public recreation places; creative solutions to affordable transportation are worth considering further. Corbett, Gratale, Ellis, Revere, and Chang (2014) recommend partnering with local religious organizations or parent groups to organize car pools and van transportation, or with the regional transportation authority to develop public transportation options.

Neighborhood Safety

Most interview participants felt their neighborhood was generally safe, but traffic speed and density were major neighborhood safety concerns reported by both samples. The threat of traffic was not perceived as a factor that restricted physical activity in the local environment, however. Parent-established rules and boundaries for outdoor play keep children away from

streets and far from the threat of traffic, and adult supervision is often required. Most parents did not feel comfortable allowing their preschoolers to play outdoors alone, regardless of how safe they perceived their neighborhood to be. Neighborhood safety issues may be more prohibitive of outdoor play for older children, where constant supervision is relaxed.

Although many parents felt their children could still engage in physical activity near the home despite traffic concerns, those living near a highway acknowledged they'd be more willing to take family walks or bike rides if a walking trail or side walk was available. Instillation of sidewalks and traffic calming techniques in residential areas near highways could enhance neighborhood safety and the possibility of active transportation to recreation places (Committee on Environmental Health, 2009).

Availability of Resources

While it was not revealed directly from survey results, interview participants cited limited indoor space as a barrier to staying active in the winter months. Survey results indicate indoor recreational facilities are not utilized regularly, and one explanation could be that few indoor facilities exist in these rural communities. Some participants suggested repurposing abandoned buildings into indoor play spaces, a similar view shared by participants in a qualitative study conducted in rural North Carolina by Moore et al. (2010). Corbett et al. (2014) recommend rural communities establish partnerships between community colleges, schools, and churches to capitalize on available indoor space to stay active during inclement weather.

In terms of food access, utilization of local grocery stores was dependent on availability of high quality, affordable foods. Interview participants explained they prefer to grocery shop in urban communities because quality, selection, and affordability is superior than what is available

locally. Availability of fruits and vegetables in the home was not related to ease of grocery store access among survey participants, indicating food availability and the local consumer food environment may be more influential in determining food procurement practices. Similar findings in rural areas of Arkansas (Krukowski, Sparks, DiCarlo, McSweeney, & West, 2013) and North Carolina (Jilcott et al., 2011) indicate strategies to improve the rural consumer food environment could be one method to improve utilization of rural grocery stores.

Media and Advertisements

Few formal resources exist that serve to inform the public of available resources in the rural communities assessed through interviews. Much of this information is communicated through word of mouth, which may not reach those new to the community. Public communication channels such as newspapers, radio, or online social networks should be employed to expand knowledge of resources and their utilization among families in the community (Corbett et al., 2014).

Parent and Family Characteristics

Consistent with the Ecological Model of Childhood Overweight, results demonstrate the interaction between parent perspectives and characteristics, the community environment, and child behaviors. Children are most active outdoors, but their ability to utilize recreation spaces is dependent on their family's ability to travel to access outdoor recreational facilities, ability to afford program fees, and willingness to supervise and reinforce rules/boundaries for outdoor play in the local environment. Parents' preferences for food quality and affordability determine where and how often food is purchased; the relationship between food procurement practices and home food availability should be considered in future studies.

The theme “cognitive reactions to barriers” provides a context from which reported challenges should be viewed. Community-wide barriers to accessing food and physical activity opportunities, such as travel and affordability, were sometimes met with an attitude of resign. Parents expressed dissatisfaction with the situation, but accepted it as an inevitability of rurality. Other challenges, especially limited local food availability, bred feelings of cognitive dissonance, where the problem was recognized and caused discomfort, but there was little motivation to change it. Instead, parents altered their beliefs or attitude about the situation to justify their inaction. Viewing their communities from these perspectives indicates community change was not acknowledged as a need or feasibility. These attitudes and beliefs regarding barriers when applied to the Community Readiness Model (CRM) correspond with stages “no awareness,” “denial,” and “vague awareness” (Findholt, 2007). Interventions targeting identified barriers are not likely to succeed in a community that is not invested in or prepared for their implementation (Findholt, 2007).

The CRM developed by Tri-Ethnic Center for Prevention Research was found to be a useful tool in not only gauging community readiness for obesity prevention, but also increasing awareness of barriers associated with its prevention (Findholt, 2007). Additionally, the strong social networks existing in rural communities, illustrated by the theme “interpersonal relationships” in the present study, should be considered an asset for community change in these regions. Social capital, or interpersonal and organizational connections, is an essential component of community action (Agnitsch et al., 2006), and its value should be realized in future research endeavors and intervention strategies.

Child Characteristics

Parent reports provided estimations of child behaviors, although child behaviors were not the focus of this study and physical activity level and dietary intake were not objectively measured. Parents described their children as being most active outdoors, and survey results indicate children are frequently active at parks and local neighborhood settings. These activity patterns were seasonal, however, where outdoor activity took place regularly only in the summer months, according to interview participants. Fluctuation in activity patterns across season should be investigated further, especially across regions where there is great variation in weather patterns. Considering if there is a relationship between activity patterns, seasonality, and the presence of public indoor recreation spaces in rural areas would help determine if availability of indoor space promotes sustained activity levels for children year-round. Child dietary preferences and intake were not assessed in this study, but evaluation of relationships between these child characteristics, parent food procurement practices, and the consumer food environment may help further define how community-wide factors impact child eating behavior.

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APPENDIX A. IRB APPROVAL

NDSU NORTH DAKOTA STATE UNIVERSITY

Thursday, March 28, 2013 FederalWide Assurance FWA00002439

Jill Nelson
School of Education
SGC C121

Re: IRB Certification of Exempt Human Subjects Research:
Protocol **#HE13215 , "Understanding the rural built environment – Perspectives of parents"**

Co-investigator(s) and research team: **Brandy Buro**

Certification Date: 3/28/13 Expiration Date: 3/27/16
Study site(s): **NDSU/varied**
Funding: **n/a**

The above referenced human subjects research project has been certified as exempt (category # 2) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*). This determination is based on protocol and consent (received 3/27/13).

Please also note the following:

- If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
- Conduct the study as described in the approved protocol. If you wish to make changes, obtain approval from the IRB prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Report any significant new findings that may affect the risks and benefits to the participants and the IRB.
- Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.
Sincerely,

Kristy Shirley

Kristy Shirley, CIP, Research Compliance Administrator

INSTITUTIONAL REVIEW BOARD
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.8995 | Fax 701.231.8098 | ndsu.edu/irb
Shipping address: Research 1, 1735 NDSU Research Park Drive, Fargo, ND 58102

APPENDIX B. ACTIVE WHERE? SURVEY

Parent Survey

State Community Interviewer Month Year ID#

We need your help to make our study a success. Your honest answers to the items in this survey are very important to us.

Remember….

- we want to know what you think,
- there are no right or wrong answers,
- everything you tell us will be kept strictly confidential (secret).

Many of the questions are about your child's activities. Please answer these questions for your child with the most recent birthday who is between the ages of 3 and 5 years (closest to 4 years old) and who lives in this house most of the time.

Please tell us your: 1. Child's Age: _____ 2. Child's Gender: Male Female

1. How many days a week does your child live at this address?

0 1 2 3 4 5 6 7

2. Do you consider the neighborhood you live in a town, small village, or rural?

Town Small Village Rural

Authors:

Jacqueline Kerr, Ph.D., James Sallis, Ph.D., Dori E. Rosenberg, M.P.H., Gregory Norman, Ph.D., Brian Saelens, Ph.D., & Nefertiti Durant, Ph.D.

A. Recreation places and sports facilities where your child plays

For the following questions please answer both parts.
-Please tell us how often your child is active in the following places
-If your child goes there, does he/she usually walks or bikes there? (Alone or with someone)
Even if your child is not active in the place (but might go there for other reasons) please indicate whether he/she walks or bikes there. Please circle the answer that best applies to your child.

		a. My child is active here:				b. My child usually walks or bikes to or from here	
		Never	Once a month or less	Once every other week	Once a week or more		
1	indoor recreation or exercise facility (public or private)	0	1	2	3	Yes	No
2	beach, lake, river, or creek	0	1	2	3	Yes	No
3	bike/hiking/walking trails, paths	0	1	2	3	Yes	No
4	basketball court	0	1	2	3	Yes	No
5	other playing fields/courts (e.g., football, softball, tennis)	0	1	2	3	Yes	No
6	YMCA	0	1	2	3	Yes	No
7	boys and girls club	0	1	2	3	Yes	No
8	swimming pool	0	1	2	3	Yes	No
9	walking / running track	0	1	2	3	Yes	No
10	school with recreation facilities open to the public	0	1	2	3	Yes	No
11	small public park	0	1	2	3	Yes	No
12	large public park	0	1	2	3	Yes	No
13	public playground with equipment	0	1	2	3	Yes	No
14	public open space (grass or sand/dirt) that is not a park	0	1	2	3	Yes	No
15	shopping mall, plaza	0	1	2	3	Yes	No
16	friend/relative's house	0	1	2	3	Yes	No

B. Barriers to activity in the local neighborhood

Please circle the answer that best applies to your child.

Do you agree or disagree with the following statements:

It is difficult for my child to be active in the local park nearest to our home because…

	1 strongly disagree	2 somewhat disagree	3 somewhat agree	4 strongly agree
1. There is not enough space to be active in	1	2	3	4
2. There is no choice of activities	1	2	3	4
3. There is no equipment	1	2	3	4
4. There is no adult supervision	1	2	3	4
5. There are no other children there	1	2	3	4
6. It is not safe because of crime (strangers, gangs, drugs)	1	2	3	4
7. My child gets bullied, teased, harassed	1	2	3	4
8. It is not safe because it is close to a road/river/body of water	1	2	3	4
9. There are too many people there	1	2	3	4
10. It does not have good lighting	1	2	3	4
11. It is difficult to get to	1	2	3	4

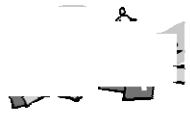
It is difficult for my child to be active in the streets/roads in my neighborhood because…

	1 strongly disagree	2 somewhat disagree	3 somewhat agree	4 strongly agree
12. There is not enough space to be active in	1	2	3	4
13. There is no choice of activities	1	2	3	4
14. There is no equipment	1	2	3	4
15. There is no adult supervision	1	2	3	4
16. There are no other children there	1	2	3	4
17. It is not safe because of crime (strangers, gangs, drugs)	1	2	3	4
18. My child gets bullied, teased, harassed	1	2	3	4
19. It is not safe because of traffic	1	2	3	4
20. There are too many people there	1	2	3	4
21. There is no good lighting	1	2	3	4
22. It is not safe because of wild animals	1	2	3	4

Parent Survey

State Community Interviewer Month Year

ID#



C. Access to services

Please circle the answer that best applies to the neighborhood where you and your child live. Both local and within walking distance mean within a 10-15 minute walk from your home.

1. Stores are within easy walking distance of our home.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. Parking is difficult in local shopping areas.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are many places for my child to go (alone or with someone) within easy walking distance of our home.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. From our home, it is easy for my child to walk (alone or with someone) to a bus stop.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5. The streets/roads in my neighborhood are unpaved or hilly, making our neighborhood difficult for me and my child to walk in.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

6. There are major barriers to walking in our local area that make it hard for my child to get from place to place (for example, busy roads, railway lines, rivers).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

D. Streets in my neighborhood

Please circle the answer that best applies to the neighborhood where you and your child live.

1. The streets in our neighborhood do not have many cul-de-sacs (dead-end streets).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. The distance between intersections (where streets cross) in our neighborhood is usually short. (100 yards or less; the length of a football field or less).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are many different routes for getting from place to place in our neighborhood. (My child doesn't have to go the same way every time.)

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

E. Places for walking/biking?

Please circle the answer that best applies to the neighborhood where you and your child live.

1. There are sidewalks on most of the streets/roads in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. There are wide shoulders on most of the streets/roads in our neighborhood

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. Sidewalks are separated from the road/traffic in our neighborhood by parked cars.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5

4. There is grass/dirt between the streets and the sidewalks in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

F. Neighborhood surroundings

Please circle the answer that best applies to the neighborhood where you and your child live.

1. There are trees along the streets in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. There are many interesting things for my child to look at while walking in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are many beautiful natural things for my child to look at in my neighborhood (e.g., gardens, views).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. There are other buildings/homes in my neighborhood that are nice to look at for my child

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

G. Neighborhood safety

Please circle the answer that best applies to the neighborhood where you and your preschooler (or 4 year old) child live.

1. There is so much traffic along nearby streets that it makes it difficult or unpleasant for my child to walk (alone or with someone) in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. The speed of traffic on most nearby streets is usually slow (30 mph or less).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. Most drivers go faster than the posted speed limits in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. Our neighborhood streets have good lighting at night.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5. Walkers and bikers on the streets in our neighborhood can be easily seen by people in their homes.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

6. There are crosswalks and signals to help walkers cross busy streets in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

7. When walking in our neighborhood there are a lot of exhaust fumes.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

8. There is a high crime rate in our neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

9. The crime rate in our neighborhood makes it unsafe for my child to go on walks (alone or with someone) at night.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

10. I am worried about letting my child play outside alone around my home (e.g., yard, driveway, apartment common area) because I am afraid of them being taken or hurt by a stranger.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

11. I am worried about letting my child be outside <u>with a friend</u> around my home because I am afraid my child will be taken or hurt by a stranger.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

12. I am worried about letting my child play or walk alone or with friends in my neighborhood and local streets because I am afraid my child will be taken or hurt by a stranger.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

13. I am worried about letting my child be alone or with friends in a local or nearby park because I am afraid my child will be taken or hurt by a stranger.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

H. Local environment

How often is <u>your child</u> active in the following places? Please circle the answer that best applies to <u>your child</u>.

		Never	Once a month or less	Once every other week	Once a week or more	
1.	Inside our home	0	1	2	3	
2.	In our yard	0	1	2	3	No yard
3.	In our driveway	0	1	2	3	No driveway
4.	At a neighbor's house, yard or driveway	0	1	2	3	
5.	In a local street, cul de sac (dead end street), vacant lot	0	1	2	3	

I. Physical activity

Physical Activity is any activity that increases your child's heart rate and makes <u>your child</u> get out of breath some of the time.

Physical Activity can be done in sports, playing with friends, or walking to school.

Some examples of physical activity are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing.

Add up the time <u>your child</u> spends in physical activity each day (do not include school physical education or gym class). Circle the answer that best applies to <u>your child</u>.

1. For the past <u>seven days</u>, how many days was <u>your child</u> physically active for a total of at <u>least 60 minutes</u> per day?

0 days 1 2 3 4 5 6 7

2. Over a <u>typical or usual week</u> on how many days is <u>your child</u> physically active for a total of at least <u>60 minutes</u> per day?

0 days 1 2 3 4 5 6 7

3. Outside of pre-school, how many days per week does <u>your child</u> play or practice team sports (e.g., neighborhood tee-ball, basketball, soccer, pee-wee/little league)?

0 days 1 2 3 4 5 or more

4. Outside of pre-school, how many days per week does <u>your child</u> have activity training or instruction not in a team sport (e.g., martial arts, dance, tennis)

0 days 1 2 3 4 5 or more

5. How many days per week does <u>your child</u> have gym or Phys Ed class <u>at (pre)school</u>?

0 days 1 2 3 4 5 or more

6. On average, how long is each PE period? ___ minutes per class don't know

7. Do you have a dog at home? Yes No

7a. If you answered yes, how much time did <u>your child</u> spend walking your dog last week?

_____ hours _____ minutes

8. Do you have a family membership to a health club or gym? Yes No

9. Do you have a family membership to a public, private, or community pool? Yes No

J. Rules

Rules for playing outside

Do you or another parent/guardian have the following rules for your child, regardless of how often the child is told the rule? Please circle an answer for each rule.

1	Stay close to or within sight of the house/parent	Yes	No	Sometimes
2	Do not go into the street	Yes	No	Sometimes
3	Come in before dark	Yes	No	Sometimes
4	Do not fight or play rough games	Yes	No	Sometimes
5	Do not climb walls, trees or fences	Yes	No	Sometimes
6	Do not go places alone	Yes	No	Sometimes
7	Stay within the neighborhood	Yes	No	Sometimes
8	Do not ride bike on the street	Yes	No	Sometimes
9	Wear a bike helmet	Yes	No	Sometimes
10	Wear protective clothing (e.g. knee pads)	Yes	No	Sometimes
11	Carry a cell phone	Yes	No	Sometimes
12	Avoid strangers	Yes	No	Sometimes
13	Watch out for cars	Yes	No	Sometimes
14	Check in frequently	Yes	No	Sometimes
15	Stay on paths, trails or sidewalk	Yes	No	Sometimes
16	Do not cross busy streets	Yes	No	Sometimes
17	Wear hat and/or sunscreen in summer	Yes	No	Sometimes

Rules for Eating

How often do you or another parent/guardian have the following rules about your child's eating, regardless of how often the child is told the rule? Please circle an answer for each rule.

18	No second helpings at meals	Yes	No	Sometimes
19	Limited portion sizes at meals	Yes	No	Sometimes

10

20	No dessert until plate is cleaned	Yes	No	Sometimes
21	No desserts except fruit	Yes	No	Sometimes
22	No meals while watching TV/DVDs	Yes	No	Sometimes
23	No snacking while watching TV/DVDs	Yes	No	Sometimes
24	No sweet snacks	Yes	No	Sometimes
25	No fried snacks at home (such as potato chips)	Yes	No	Sometimes
26	Must help with meal preparation at home	Yes	No	Sometimes
27	Must help with clean-up after meals at home	Yes	No	Sometimes
28	Must eat dinner with family	Yes	No	Sometimes
29	Limited fast food	Yes	No	Sometimes

K. FOOD

1. In a typical day, how many servings of fruit does **your child** eat? A serving is equal to:

   - 1 medium piece of fresh fruit
   - 1/2 cup of fruit salad
   - 1/4 cup of raisins, apricots or other dried fruit
   - 6 oz. of 100% orange, apple, or grapefruit juice

   (Do not count fruit punch, lemonade, Gatorade, Sunny Delight or fruit drink)

   None (0) 1 2 3 4 or more

2. In a typical day, how many servings of vegetables does **your child** eat? A serving is equal to:

   - 1 medium carrot or other fresh vegetable
   - 1 small bowl of green salad
   - 1/2 cup of fresh or cooked vegetables
   - 3/4 cup of vegetable soup

   (Do not count French fries, onion rings, potato chips, or fried okra)

   None (0) 1 2 3 4 or more

How often are the following food items available in your home? (Please circle one answer for each food.)

1	chocolate candy	Never	Rarely	Sometimes	Frequently	Always
2	other candy	Never	Rarely	Sometimes	Frequently	Always
3	raw fruit (e.g., apples, oranges)	Never	Rarely	Sometimes	Frequently	Always
4	cakes, brownies, muffins or cookies	Never	Rarely	Sometimes	Frequently	Always
5	regular chips	Never	Rarely	Sometimes	Frequently	Always

6	baked chips	Never	Rarely	Sometimes	Frequently	Always
7	raw vegetables (e.g., carrots)	Never	Rarely	Sometimes	Frequently	Always
8	100% fruit juice	Never	Rarely	Sometimes	Frequently	Always
9	juice drinks (e.g., Snapple, Sunny delight)	Never	Rarely	Sometimes	Frequently	Always
10	regular sodas with sugar	Never	Rarely	Sometimes	Frequently	Always
11	diet or sugar free sodas	Never	Rarely	Sometimes	Frequently	Always
12	sports drinks (e.g., Gatorade)	Never	Rarely	Sometimes	Frequently	Always
13	fruit roll-ups or other dried fruit	Never	Rarely	Sometimes	Frequently	Always
14	regular or 2% milk	Never	Rarely	Sometimes	Frequently	Always
15	1% or fat-free milk	Never	Rarely	Sometimes	Frequently	Always
16	sweetened breakfast cereal	Never	Rarely	Sometimes	Frequently	Always
17	unsweetened breakfast cereal	Never	Rarely	Sometimes	Frequently	Always

1. What is your gender?
   Male (1)
   Female (2)

2. What is your age? _____ (years)

3. What is the highest level of education you received?
   Less than high school (1)
   High school diploma or GED (2)
   Some college or technical school (3)
   Associate's degree (4)
   Bachelor's degree or more (5)

4. Do you consider yourself to be Hispanic or Latino?
   No (1)
   Yes (2)

5. What race do you consider yourself to be?
   White (1)
   Black or African American (2)
   American Indian or Alaska Native (3)
   Native Hawaiian or other Pacific Islander (4)
   Asian (5)
   Other (please explain) (6): _____

6. What is your marital status?
   Single, never married (1)
   Married (2)
   Widowed, divorced or separated (3)
   Living with Partner (4)
   Other (please explain) (5):_____

7. How many people (including yourself) live in your household? _____

8. How many children do you have? _____

9. How many children under 18 live in your household? _____

10. What are the ages of the children living in your household?
a) _____ b) _____ c) _____ d) _____ e) _____ f) _____

13

11. What type of residence do you live in?

Single family house (1)
Multi-family house (2)
Apartment (3)
Condominium/townhouse (4)
Other (5) _____

12. Do you rent or own your home?

Own/buying (1)
Rent (2)

13. How many drivable motor vehicles (cars, trucks, motorcycles) are there at your household?
_____

Thank you for your time!

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APPENDIX C. INTERVIEW QUESTIONS

1. What do you believe a healthy lifestyle consists of for your child/children?
2. Where do you purchase food?
    a. Why do you choose to shop at those establishments?
3. How would you describe the quality and variety of the food available in these establishments?
4. How do you decide what food to buy for you and your family?
5. Could you give me examples of what you consider nutritious, or healthy, food?
6. What kinds of activities do you and your family do together?
7. What activities does your child engage in on his/her own, with or without your supervision?
8. Do you have access to physical activity equipment?
9. Where do you purchase physical activity equipment?
10. Is there anything you would change about your community that you believe could help improve the health of your family?
11. What are ways you believe your community can provide more opportunities for recreational activities or physical activity for your family?

APPENDIX D. INTERVIEW RECRUITMENT FLYER

North Dakota State University

is welcoming volunteers to participate in a study about

HOW PARENTS OF PRE-SCHOOLERS VIEW THEIR COMMUNITY

We want to learn how parents of preschool-aged children describe their community and understand whether they believe it is a place that supports a healthy lifestyle for their family.

Who can volunteer?

Participants must be:
1) A parent of a child 3-5 years old
2) Resident of a rural community

What is involved?

If you decide to participate, you will take part in a 45-minute face-to-face interview. Interview questions will be about what you believe a healthy lifestyle is, where you purchase food, where your children are active, and what your community could do to improve the health of your family. The interview will be audio-recorded, but your name will not be included.

- **Low risk**
- **$25 gift card**
- **Confidential**

Where and When will the interview take place?

You will choose a time and place convenient for you to take part in an interview. We recommend a quiet, undisturbed space within your home, or a public space, such as a church, community center, or library that allows for privacy and audio recording.

How can I volunteer?

If you're interested in participating, or would like more information about the study, contact

Brandy Buro
701-710-0901
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NDSU EXTENSION SERVICE

Dr. Abby Gold
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This study was reviewed by the NDSU Human Research Protection Program (701.231.8908, 1-855-800-6717, ndsu.irb@ndsu.edu).