Family systems associations with obesogenic behaviors among rural Latino and White families

by

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A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Human Development and Family Studies

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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2018

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I would like to thank my committee co-chairs, Dr. Megan Gilligan and Dr. Kimberly Greder, and my committee members, Dr. Tera Jordan, Dr. Janet Melby, and Dr. Loreto Prieto, for their guidance and support throughout the course of this research. Thanks to Dr. Amelia Karraker for serving on my committee through the proposal process as well. Additionally, thank you to Dr. Doris Cancel-Tirado for her sharing her time and expertise throughout this dissertation process. With their guidance, I was able think more deeply about my process, findings, and implications. I also want to express my appreciation to the mothers who were willing to participate in these surveys, without whom, this dissertation would not have been possible.

Many thanks to my friends and family, always willing to listen and provide encouragement. Thank you to my parents, Mary and Rodger Routh, for always supporting my educational aspirations. In addition, I would also like to thank my friends, colleagues, the department faculty and staff for making my time at Iowa State University a wonderful experience. A special thanks to Marti Palermo and Angelica Jasper for their expertise in grammar, citation styles, and Word formatting to ensure the success of this dissertation. Finally, I would like to thank my partner, Jay Lindsey, and our dog Fred for their daily support, encouragement, and willingness to go the extra mile so that I could focus on achieving my goals.
ABSTRACT

Although obesity rates in the United States have stabilized at the national level, disparities continue to exist among rural, low-income, and Latino children. Research has identified obesogenic behaviors in the home as leading contributors to child obesity, and these behaviors are potentially influenced by individual, family, and contextual factors. This dissertation examined data collected as part of the multi-state Rural Families Speak about Health Project and the associated Iowa Latino Family Project. Through regression and moderation analyses, Chapter 3 explored how family relationships influence children’s obesogenic behaviors in the home among Latino immigrant and White families living in rural communities with low household incomes. Family profiles were constructed in Chapter 4 with mixed methods data to explore food parenting agency in relation to household obesogenic behaviors among Latina immigrant mothers who had low household incomes and who lived in rural U.S. communities.

Together, these studies provide rich complementary insights into family and contextual factors related to children’s obesogenic behaviors. Exploratory findings from Chapter 3 indicated identification as a Latina immigrant, co-parent respect, and number of children in the home were significantly associated with Family Nutrition and Physical Activity (FNPA) scores, while number of adults in the home and household food security approached significance. The identification as a Latina immigrant also moderated the association between number of adults in the home and FNPA scores. Findings from Chapter 4 family profiles indicated a food parenting agency continuum. Mothers with higher food parenting agency tended to report fewer obesogenic food parenting behaviors, take more behavior change actions, and perceive fewer contextual challenges. Across studies, findings suggest childhood obesity risk is associated with
both family (e.g., parents and larger family networks) and context (e.g., rurality and identification as Latina immigrant mothers).

Future research should build on these exploratory studies to understand more fully the complexity of factors related to child obesogenic behaviors among under-represented families. Specifically, research should include those facing significant health disparities, such as rural low-income families and Latino immigrant families. Findings from this dissertation suggest that practitioners should attempt to implement broader family systems approaches and family-based obesity prevention programs when addressing obesogenic behaviors in the home.
CHAPTER 1. INTRODUCTION

General Introduction

Obesity is prevalent among children in the United States, with many United States (U.S.) children identified as overweight or obese (16.9% and 14.9%, respectively) (Fryar, Carroll, & Ogden, 2017). Although obesity rates have stabilized at the national level, disparities continue to exist among rural, low-income, and Latino children (Fryar et al., 2017). As obesity can have lifelong health implications (e.g., heart disease, diabetes, cancer), it is imperative to understand factors that influence the development of early obesogenic or obesity risk related behaviors (Ihmels, Welk, Eisenmann, & Nusser, 2009). While multiple factors have led to epidemic rates of child obesity in the U.S., obesogenic behaviors in the home have been identified as leading contributors to child obesity (Ihmels et al., 2009).

Previous studies have focused largely on outcomes of risky obesogenic behaviors that lead to obesity or related chronic disease (Iannotti & Wang, 2013; Peyer, 2016; Yee, Eisenmann, Carlson, & Pfeiffer, 2011). While the causes of obesity are complex in nature, an individual’s obesogenic behaviors are strongly linked to increased risk for developing or escalating obesity (Ihmels et al., 2009; Peyer, 2016). By understanding factors associated with children’s household obesogenic behaviors, we can better identify potential points of intervention to support fewer obesogenic behaviors for children, thereby decreasing their obesity risk.

The Ecological Systems Theory posits that, to understand individual behaviors, researchers must also consider the reciprocal influences of factors at multiple systems levels (Bronfenbrenner, 1992). For the purpose of this dissertation, the individual level includes individual behaviors and characteristics (Bronfenbrenner, 1992; Davison & Birch, 2001). Family factors such as relationships, characteristics, and interactions are extrapolations of the
traditional ecological micro system (Bronfenbrenner, 1992; Davison, Jurkowski, & Lawson, 2013). Similarly, contextual factors including community characteristics and cultural values align with the ecological exo and macro systems (Bronfenbrenner, 1992; Davison et al., 2013). Connections between individual, family, and contextual factors may uniquely shape children’s obesogenic behaviors and, ultimately, a child’s weight status (Davison & Birch, 2001).

Many researchers have explored factors associated with individual obesogenic behaviors (Davison & Birch, 2001; Davison et al., 2013; Ihmels et al., 2009). Individual factors are interconnected influencing behaviors throughout life, ranging from predetermined evolutionary and biological factors to preferences, knowledge, and skills (Patrick & Nicklas, 2005; Savage, Fisher, & Birch, 2007). Individual factors cannot be considered in isolation, however, because they interconnect with external familial and contextual factors to influence behaviors (Davison & Birch, 2001).

The Food Agency Paradigm suggests that food agency is the navigation of these system influences, determining whether an individual ultimately takes action to enact desired behaviors (Trubek, Carabello, Morgan, & Lahne, 2017). Specifically, food agency is an individual’s perceived power to achieve desired behaviors within their given circumstances (Trubek et al., 2017). Few studies have explored how individual perceptions of these influences and progress towards behavior change might be associated with a parent’s agency to enact their desired behaviors with children.

Family members in the home are often considered key gatekeepers to early obesogenic behaviors (Maher, Fraser, & Wright, 2010; Savage et al., 2007). The Family Systems Theory goes beyond the Ecological Systems Theory to specifically suggest that all family members may be influential on behaviors (Kerr, 2002). While research and theory support the influence of
family on children’s obesogenic behaviors, most studies have focused on the primary-caregiver and child dyad (Bornstein & Sawyer, 2006; Savage et al., 2007). Few studies have specifically explored the influence of broader family relationships (e.g., non-primary-caregivers, siblings) in association with children’s obesogenic behaviors.

Additionally, overweight and obesity status are disproportionately evident among those in rural communities with low household incomes who identify as minority racial or ethnic group (Fryar et al., 2017; Liu, Bennett, Harun, & Probst, 2008; Sparks, 2012). Specifically, children ages 10–17 years old experience higher prevalence of overweight if they are rural (16.5%) compared to those living in urban areas (14.3%) (Liu et al., 2008). Of those children in rural communities, Latino and low-income based on the federal poverty level (FPL) experience higher prevalence of overweight (23.2% Latino vs. 14.5% non-Latino, white; 21.4% < 100% FPL vs. 10.3% > 400% FPL, respectively) (Liu et al., 2008). Among Latino children, obesity rates have been associated with the number of years of residency and their generational status in the U.S. (Bates, Acevedo-Garcia, Alegría, & Krieger, 2008; Fryar et al., 2017; Liu et al., 2008). These factors may influence individual and family behaviors through access to resources as well as cultural values; thus, contextual factors should be considered in association with children’s obesogenic behaviors.

**Purpose of Dissertation**

This dissertation aims to further understand factors that contribute to obesogenic behaviors, as well as potential points for health promotion among rural, low-income Latino immigrant and White families. For the purpose of this dissertation, Latino refers to individuals who identify origins in a Latin American country, while White refers to individuals who both identify as White and non-Latino. Comparing experiences Latino immigrant families and White families living with low household income in rural communities will add a depth of
understanding to research and practice. This dissertation explores associations between family systems relationships, contextual factors, and children’s obesogenic behaviors in the home environment.

Specifically, the following research aims were explored:

1. What are the associations between family systems relationships and mothers’ reports of children’s obesogenic behaviors within the home among Latino and White rural low-income families?
   a. How do influences of family subsystem relationships (e.g., relations among co-parents, other children, and other adults in the household) and contextual factors (e.g., household food security and identification as Latina immigrant or White mothers) vary for low-income families in rural communities?
   b. Are these associations between family subsystem relationships and children’s obesogenic behaviors moderated by identification as a Latino immigrant family?

2. What are patterns in food parenting agency among low-income Latina immigrant mothers from rural Iowa communities? Specifically, what are patterns of mothers’ stages of behavior change, perceptions of influence, and childhood experiences with current obesogenic food parenting behaviors?

   **Rural Families Speak About Health Project**

   In order to more fully understand the role of family and contextual factors in the development of obesogenic behaviors among children, this dissertation included analyses of data that were collected as part of two associated projects. The first project, Rural Families Speak about Health (RFSH), is a USDA Hatch funded multi-state project (http://ruralfamiesspeak.org/) that includes data from rural, low-income mothers across 13
states. The second project, the Iowa Latino Family Project (Greder, Bao, & Routh, 2017), grew out of RFSH. It includes data collected in Iowa as part of RFSH as well as ongoing data collection with first-generation Latina immigrant mothers in rural Iowa communities. The overall purpose of both projects was to examine reported health behaviors, potential contributing factors, and outcomes for family members. In the Iowa Latino Family Project, data captured additional family interactions around food in the past as well as present day. This dissertation used quantitative data collected during 2010–2012 as part of the RFSH project; qualitative data collected in 2011 and 2016 as part of the Iowa Latino Family Project.

**Participants**

Participant recruitment targeted counties with Urban Influence Codes (UIC) of 5 or higher to sample those with rural community experiences. The county UIC classifications range from 1 (*the most urban*) to 12 (*the most rural*), distinguishing rurality based on the size and proximity to large towns or metropolitan areas. For example, a UIC of 6 indicates a county “noncore adjacent to small metro area and containing a town of at least 2,500 residents” and 12 indicates a county “noncore adjacent to metro or micro area and does not contain a town of at least 2,500 residents” (Parker, 2011). Among the 1,976 identified in 2013 as non-metropolitan counties in the U.S., 37.9% (753) counties were classified in the 5 to 7 range (Parker, 2011).

Participants in both projects were rural mothers who had at least one child age 12 years or younger, and a household income at or below 185% of the federal poverty level. In RFSH, participating states could identify a specific population subgroup to recruit in their state. In Iowa, first-generation Latina immigrant mothers who spoke Spanish as their primary language, and who met the previously mentioned criteria, were purposively recruited to participate in the study (Greder, Bao, & Routh, 2017).
**Recruitment**

Mothers were recruited through mixed purposive sampling, a nonprobability sampling technique used to reach individuals who may be difficult to access (Mammen & Sano, 2012). Mixed purposive sampling is a hybrid recruitment method utilizing both purposive sampling and chain-referral sampling (Mammen & Sano, 2012). In line with purposive sampling, flyers were posted at locations serving low-income families in the area (e.g., food pantries, Women, Infants, and Children (WIC) clinics, housing authority, and welfare-to-work programs) (Mammen & Sano, 2012). Some states, including Iowa, used chain-referral sampling in which screened mothers referred others in their friendship networks who may be interested in participating (Greder, Bao, & Routh, 2017).

Mothers who indicated interest in participating in the project completed an in-person or phone screening interview to determine if they met the participant eligibility criteria. Mothers who were deemed eligible to participate in the study were invited to a two-hour in-person interview. Mothers provided informed consent before participating in the project, and the study was approved by the Institutional Review Boards at each participating university.

**Interviews**

**Initial RFSH interviews.** Between 2010–2012, 444 mothers across 13 states participated in an initial in-person two-hour interview that included questions pertaining to their mental and physical health and well-being, as well as the health and well-being of their children. Interviews were conducted in mothers’ homes, Extension offices, or at locations in the community that were convenient for mothers and that ensured privacy (e.g., a private conference room in a library) (Mammen & Sano, 2013). Mothers were offered compensation ($30-$50 gift card) for the time and expertise they provided to the study. The amount and type of compensation varied based on the resources and requirements of each participating university.
Faculty, graduate students, University Cooperative Extension staff, and community members from the study population were trained by the research team in each state to conduct the interviews (Mammen & Sano, 2013). In Iowa, bilingual, bicultural Latinas who resided in the study communities were hired and trained to conduct the interviews (Greder, Bao, & Routh, 2017). Interviewers read each survey question aloud and then entered mothers’ responses into a computer template on a laptop (Mammen & Sano, 2013).

Open-ended questions were included in the RFSH initial interview protocol when the interviews were conducted in Iowa in 2011, in order to gain information and insights pertaining to family food practices. Eighty-three of the 98 Latina mothers in Iowa who participated in the initial RFSH interview responded to the open-ended questions. The interviewer handwrote participants’ responses on paper. Responses were later translated to English by native Spanish speaking undergraduate and graduate students.

**Follow-up interviews.** In 2016, 34 of the 98 Latina mothers in Iowa who participated in the initial RFSH interview were contacted by phone by the interviewer and invited to participate in a 1-hour in-person interview that included questions pertaining to family food practices during their childhood. The interviews were audio-recorded. Responses were later transcribed verbatim and translated to English by native Spanish speaking undergraduate and graduate students. Mothers were offered a $50 gift card to compensate them for the time and expertise they provided to the study (Greder, Bao, & Routh, 2017). As the primary researcher for studies included in this dissertation and a conversational Spanish speaker, I listened to the audio recordings and read the transcriptions in Spanish to maximize my familiarity and understanding of the data.
Organization of Dissertation

This dissertation includes five chapters: (a) Chapter 1: General Introduction, (b) Chapter 2: Literature Review, (c) Chapter 3: Family Systems’ Influences on Children’s Obesogenic Behaviors, (d) Chapter 4: Food Parenting Behaviors: Rural Latino Immigrant Families, and (e) Chapter 5: Discussion and General Conclusions.

Chapter 1 provides the rationale for these studies and the data set used within this dissertation. Chapter 1 includes an introduction, a statement of purpose for this dissertation, a description of the RFSH Project and associated data, and an outline of the dissertation organization.

Chapter 2 provides a review of the literature framing family systems’ influences on obesogenic behaviors. This includes a theoretical framework incorporating the Ecological Systems Theory as well as the Family Systems Theory. This chapter provides an overview of current knowledge on individual, family, and contextual influences as they relate to children’s obesogenic behaviors.

The two subsequent manuscripts provide insight into how experiences within family system relationships influence children’s obesogenic behaviors. In the first manuscript, Chapter 3, I examined how family relationships influence obesogenic behaviors in the home by comparing Latino immigrant and White households that have similar contextual influences (e.g., low household income, rural communities). These associations are examined through linear regression and moderation analyses. In the second manuscript, Chapter 4, I explored the phenomena of food parenting agency among Latina immigrant mothers. Family profiles were developed from mixed methods data on food parenting behaviors, perceived influences, and stages of behavior change. These profiles were explored for patterns illuminating variations in food parenting agency in connection with obesogenic behaviors.
In Chapter 5, I synthesized findings from Chapters 3 and 4 and situated findings from these chapters in the existing theoretical and empirical literature. Common findings are explored related to parent influence, broader family systems influence, and contextual influence. I also examined strengths and limitations of this dissertation and future directions indicated for research and practice related to obesogenic behaviors.
CHAPTER 2. LITERATURE REVIEW

Theoretical Framework

Obesogenic behaviors are theoretically shaped by a complex, interconnected set of factors across multiple permeable systems. The Family Ecological Model, adapted from Bronfenbrenner’s Ecological Systems Theory (Bronfenbrenner, 1992), provides a framework of individual, family, and contextual levels to understand the development of obesogenic behavior development among children (Davison, Jurkowski, & Lawson, 2013). Individual factors include caloric balance, demographics, and genetic influences (Davison et al., 2013). Parents and siblings are theorized to be key in shaping children’s behaviors through family factors (Davison et al., 2013). Contextual factors shape behaviors through community resources, social disparities, cultural values, and more (Davison et al., 2013). Factors at each level may promote or reduce children’s obesogenic behaviors (Davison et al., 2013).

Bowen’s Family Systems Theory further explains potential Family Ecological Model family factors, positing that all family member relationships may be influential (Kerr, 2002). According to the Family Systems Theory, the family system is an interconnected and influential network of all family members (Cox & Paley, 2003). Each family system potentially consists of multiple subsystems when two or more family members interact together (Cox & Paley, 2003). The transactional interactions or observations between individual members in family subsystems can influence mental and emotional perceptions including values, beliefs, and self-regulatory skills (Dix & Branca, 2003; Fingerman & Bermann, 2000). While the family level does not account for all potential interpersonal factors throughout the life course, family may be particularly influential for young children. Specifically, family members may shape young
children’s obesogenic behaviors within the home environment (Bornstein & Sawyer, 2006; Savage, Fisher, & Birch, 2007).

**Latino Immigrants**

Despite historic racial and ethnic homogeneity, many rural communities have experienced recent increases in diversity as immigrants increasingly move to these non-metropolitan communities since the 1990s (Crowley, Lichter, & Turner, 2015; Lichter & Johnson, 2006). With over half of all foreign-born persons coming from Latin America, rural Midwestern communities saw a 113% increase in Latino immigrants between 1990 and 2000 (Lichter & Johnson, 2006; Parrado & Kandel, 2010). Immigrants have increasingly moved to these communities for employment opportunities in meat processing or nondurable manufacturing (Crowley et al., 2015). With increasing poverty rates, Latino immigrants in these new rural communities have faced deteriorating economic factors since the 2000s (Crowley et al., 2015). For first-generation immigrants, lack of English proficiency, legal residence status, health insurance status, and community acceptance are associated with challenges enacting desired health behaviors (Bennett, Olatosi, & Probst, 2008; Cristancho, Garces, Peters, & Mueller, 2008; Tai-Seale & Chandler, 2010). The challenges facing first-generation immigrant families may be compounded when they reside within rural communities facing additional resource limitations.

**New Food Environment**

Both immigrants living in new food communities and rural communities experiencing growing diversity are grappling with navigating new influences. In any new food environments, immigrants experience accessibility challenges from unfamiliar languages, food options, or customs. As rural grocers have a smaller purchasing market, stocking culturally-specific food items or out-of-season produce can be difficult (Bailey, 2010). Alternatively, recent immigrant
families may find some food options become more accessible or desirable in their new food environments. For example, immigrants more frequently consume low-cost, calorie-dense fast foods in their new communities, citing time demands, child preference, and increased financial ability (Ayala, Baquero, & Klinger, 2008; Greder, Slowin, & Doudna, 2012). These bidirectional influences between Latino families, communities, and food resources shape obesogenic behaviors over time.

**Dietary Acculturation**

Similarly, many immigrant parents face the challenge of dietary acculturation, the process of adjusting to a new diet, as they balance traditional food practices with those common in their new communities (Buscemi, Beech, & Relyea, 2011; Greder et al., 2012). For Latino immigrants, dietary acculturation is associated with decreases in rice and fiber consumption and increases in breakfast cereal and fat intake (Gordon-Larsen, Harris, Ward, & Popkin, 2003; Lin, Bermudez, & Tucker, 2003). The amount of time immigrants and subsequent generations have lived in the U.S. has a positive association with dietary acculturation as well as obesity risk (Bates, Acevedo-Garcia, Alegría, & Krieger, 2008; Coll & Marks, 2012). Although the association between food acculturation and weight status is strong, the causal findings are mixed; thus, many researchers suggest we must look beyond acculturation as a blanket explanation for increasing obesity risk (Bowen & Devine, 2011; Buscemi et al., 2011; Creighton, Goldman, Pebley, & Chung, 2012). Limited research has explored the development of obesogenic behaviors among first-generation Latino immigrants.

**Cultural Patterns**

Cultural understanding and immigration may influence both family and obesogenic behaviors, particularly among first-generation Latino immigrants. *Familismo*, a common and strongly held value among many Latino families, is associated with loyalty, unity, and respect
within a family, as well as promotion of family needs over individual needs (Caprio et al., 2008). *Familismo* promotes behavioral cohesion or importance of deferential power within family systems, potentially influencing family systems interactions with the food environment (Caprio et al., 2008). These familial bonds can provide support extending across generations and countries. In particular, many Latino immigrant families reside with extended family members to reduce resource challenges associated with international immigration (Bowen & Devine, 2011; Van Hook & Glick, 2007). Additionally, traditional gender roles of *marianismo* and *machismo*, associated with specific masculine or feminine characteristics, may shape obesogenic behaviors between mother and child in the home (Caprio et al., 2008). Limited research explores how Latino immigrant family relationships may shape obesogenic behaviors in their new food environment.

**Obesogenic Behavior Development**

**Individual Level**

The individual level from the Family Ecological Model shape obesogenic behaviors through a variety of internal and external influences (Davison et al., 2013). Food preferences are shaped by timing, frequency, or sensory experiences of food exposures early in life (Savage et al., 2007). Additionally, children acquire knowledge, skills, and beliefs that shape their food agency, or ability to enact desired nutrition behaviors, throughout life (Trubek, Carabello, Morgan, & Lahne, 2017). Individual factors bidirectionally shape other systems levels over time to influence child’s obesogenic behaviors (Patrick & Nicklas, 2005; Savage et al., 2007).

**Family Level**

Family systems provide an important source of economic, social, and emotional support to their members (Carr & Springer, 2010; Davison & Birch, 2001; Story, Neumark-Sztainer, & French, 2002). Household family systems may influence children’s home food environment,
particularly for young children who may have fewer external influences (Anzman, Rollins, & Birch, 2010). The U.S. has seen an increasing prevalence of dual-career or single parent families, providing increasingly diverse systems of family support (Anderson & Butcher, 2006). Household structures have also shifted to include increases in cohabitation, extended family members, and non-family member adults in homes (Jacobsen, Mather, & Dupuis, 2012). Children’s behaviors may be influenced by multiple family subsystems including parent-child, co-parents-child, sibling-sibling, and non-parent-child potential interactions.

**Parent-child.** As important members of a family system and early food gatekeepers for children, parents play a key role in children’s development of obesogenic behaviors (Bornstein & Sawyer, 2006; Savage et al., 2007). The parent-child dyad works through food-related decisions together on a daily basis through food parenting interactions (Gevers, Kremers, de Vries, & van Assema, 2014; Larsen et al., 2015; Savage et al., 2007). Food parenting behaviors are influenced by family and contextual factors over their lifetime (Davison et al., 2013; Mushier-Eizenman & Kiefner, 2013). Additionally, children of obese parents were found to be at higher risk for becoming obese themselves (Haire-Joshu & Tabak, 2016).

Some food parenting behaviors promote fewer obesogenic behaviors. For example, repeated food exposures and positive facial expressions have been shown to increase fruit and vegetable or novel food consumption among children (Addessi, Galloway, Visalberghi, & Birch, 2005; Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Barhomeuf, Droit-Volet, & Rousset, 2012). Additionally, food parenting behaviors of modeling behaviors, encouraging healthful food consumption, and the division of mealtime responsibilities have been identified as promoting healthy behaviors (Braet et al., 2007; Faith, Scanlon, Birch, Francis, & Sherry, 2004; Gevers et al., 2014; Satter, 1986). Experts have also suggested that understudied food parenting
behaviors such as education and promoting self-awareness may promote development of healthful food behaviors (Larsen et al., 2015).

Although parents generally intend to promote healthy behaviors, some food parenting behaviors have been associated with mixed or higher obesity risk for children. For example, research suggests restricting foods or using food as a reward are potentially obesogenic behaviors (Faith et al., 2004; Johnson, Welk, Saint-Maurice, & Ihmels, 2012). Strategies where parents determine how much food a child eats—such as the “clean plate club”—have also been associated with larger portion sizes, suggesting potential obesity risk (Savage et al., 2007; Wansink, Payne, & Werle, 2008). However, permissive food parenting styles with fewer restrictions as well as limited guidance or consistency, are also linked to more obesogenic behaviors in the home (Johnson et al., 2012).

Food parenting agency. The Food Agency Paradigm suggests food agency is the combination of an individual’s desired behavior, whether they feel they have the power to achieve that desired behavior within their given circumstances, and whether they ultimately take action to enact that behavior (Trubek et al., 2017). Expanding on the Food Agency Paradigm, food parenting agency is a parent’s food and obesogenic behaviors that include provision, preparation, guidance, and bidirectional interactions potentially influencing their children’s behaviors (Anzman et al., 2010; Trubek et al., 2017). Due to the bidirectional nature of food parenting, a parent’s perceived agency also has implications for children’s development of obesogenic behaviors within the family environment (Anzman et al., 2010).

Co-parents. Though much research has focused on a two-party dyadic subsystem interaction between parent (often the mother) and child, food parenting behaviors may also be influenced by other family members (Faith et al., 2004; Gruber & Haldeman, 2009).
Specifically, food parenting behaviors may be shaped by interactions with a co-parent or an additional invested adult with whom parents must come to a consensus on parenting strategies (Bruss et al., 2005). Hence, the negotiation between co-parents may influence food parenting and children’s obesogenic behaviors (Gordon & Feldman, 2008).

To examine co-parent navigation of food parenting, we must consider that food parenting in some families often involves complex triadic family subsystems (i.e., interactions that involve both co-parents and a child). Bowen suggests that triadic relationships provide opportunities for conflict resolution beyond those available in a disagreeing dyad (Kerr, 2002). As co-parents navigate food parenting behaviors with their children, they may employ different strategies to reduce or avoid tension such as teamwork, open communication, or mutual respect of the other partner’s decisions (Feinberg, 2003).

Though limited research has explored triadic family subsystems specifically in relation to children’s obesogenic behaviors, researchers have explored how these relationships could more broadly impact children’s weight status and health outcomes. For example, marital distress between co-parents has been shown to impact parent-child interactions (Cox & Paley, 2003). Another intervention found targeting co-parent relationships could also influence the parent-child relationship and child well-being outcomes. More specifically, Hernandez, Pressler, Dorius, and Mitchell (2014) found that family instability, including formations and dissolutions of parental partnerships in the home, put young girls at greater risk of being overweight or obese as young adults. These stressors to the family system may place these girls at higher risk of developing obesogenic food behaviors (Hernandez, Pressler, Dorius, & Mitchell, 2014).

**Larger family network.** Beyond parents, a broad range of family members in the home may influence children’s obesogenic behaviors. Households have seen shifting composition
across the U.S. (Jacobsen et al., 2012). Increasing prevalence of dual-career or single parent families provide increasingly diverse systems of family support (Anderson & Butcher, 2006). Household structures are also shifting to include increases in cohabitation, extended family members, and non-family member adults in homes (Jacobsen et al., 2012). Many different family members can reside within a household (e.g., children, parents, grandparents, adult children, extended family members), as well as non-related family members. Specifically, first-generation Latino immigrant families are experiencing larger average household sizes and increased frequency of extended family members in the home (Landale, Oropesa, & Bradatan, 2006). This diversity in family structure also indicates potential complex family subsystems that influence behaviors in the home.

The study of family influences often examines child behaviors in association with measures of the parent-child dyad or the family unit at specified time points. Beyond the specific parent-child dyad, a substantial body of research supports the strong influence of primary caregivers (including parents, grandparents, and primary guardians) in association with children’s obesogenic behaviors (Anzman et al., 2010; Davison et al., 2013). However, fewer studies have explored the specific influences of other adults or children in the home associated with children’s obesogenic behaviors. Although these family subsystem relationships may not serve as primary gatekeepers for children’s behaviors, Family Systems Theory suggests that all of these individuals in the home potentially contribute to one another’s behaviors and outcomes (Kerr, 2002).

**Other adults.** Research suggests that, similar to parents, non-parental primary caregivers can influence children’s behaviors. Specifically, researchers found children in the care of extended-family adult relatives had earlier introduction of solid foods and were associated with
higher weight status compared to those under parental primary care (Kim & Peterson, 2008). In Mexican migrant households, researchers found children’s weight was significantly associated with the presence of a grandparent in the home, even when controlling for individual, household, and community characteristics (Creighton, Goldman, Teruel, & Rubalcava, 2011). Little research has specifically explored the association between children’s obesogenic behaviors and other non-parental, non-primary caregiving adults in the home.

Though the influences of non-primary and non-parental adults in the home has not been specifically studied, broader family influences have been explored as at mealtimes. Family mealtime interactions have both cross-sectional and longitudinal associations with diet quality and child weight status (Boutelle, Birnbaum, Lytle, Murray, & Story, 2003; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003). Family cohesion and role modeling experienced during family mealtime have also been associated with children’s obesogenic behaviors (Welsh, French, & Wall, 2011). Family subsystem interactions around food likely occur beyond family mealtimes, though, necessitating broader exploration of family influences.

**Siblings.** The Family Ecological Model theorizes the importance of whether siblings influence each other’s obesogenic behaviors and research highlights these potential associations. Though multiple researchers have found strong similarities in food preferences between siblings (Pliner & Pelchat, 1986; Skinner et al., 1998), additional research suggests siblings may have different obesogenic behaviors. Specifically, parents may interact differently with each of their children depending on a child’s weight status, resulting in potentially different parent-child food interactions (Berge, Tate, Trofholz, Conger, & Neumark-Sztainer, 2016). However, limited
research has explored the nature of direct or indirect influences between siblings on obesogenic behaviors (McHale, Updegraff, & Whiteman, 2012).

**Early origins.** Nutrition behaviors in early childhood have been linked to lifelong health behaviors and outcomes (Savage et al., 2007). Experiences early in life, such as memories of parental dietary restraint and overeating, have been associated with adult obesity risk and binge eating behaviors across time (Brunstrom, Mitchell, & Baguley, 2005; Puhl & Schwartz, 2003). Additionally, generational status in the U.S. (i.e., first-, second-, third-generation) has been associated with the trajectory of food behaviors over the life course (Bates et al., 2008; Gordon-Larsen et al., 2003; Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005). One study found this among Puerto Rican migrants girls who reported multiple trajectories for incorporating traditional food practices, based on both migration experience and maternal or grand-maternal relationships (Bowen & Devine, 2011). Limited research has explored how childhood experiences with families of origin prior to immigration on current food parenting obesogenic behaviors.

**Contextual Factors**

The Family Ecological Model suggests that contextual factors (e.g., socioeconomic status, access to resources and services, cultural values) may play a critical role in shaping individual and family obesogenic behaviors (Davison et al., 2013). Limitations in accessibility and affordability of health resources and services can contribute to obesogenic behaviors and elevated risk of obesity (Bailey, 2010; Sparks, 2012). Family relationships may serve as a buffer or support in navigating these contextual challenges (Gruber & Haldeman, 2009; McLean, Griffin, Toney, & Hardeman, 2003).

**Rural.** Families living in rural communities experience many variations in contextual influences. The Urban Influence Code (UIC) classifies rural communities based on population
size and proximity to metropolitan population centers. The county classifications range from 1 (the most urban) to 12 (the most rural). For example, a UIC of 1 indicates a county with high urban influence “in a metro area with at least 1 million residents or more.” A UIC of 6 indicates a county “noncore adjacent to small metro area and containing a town of at least 2,500 residents” and 12 indicates a county “noncore adjacent to metro or micro area and does not contain a town of at least 2,500 residents” (Parker, 2011). Among the 1,985 identified in 2013 as non-metropolitan counties in the U.S., 37.9% (753) of these counties classified in the 5 to 7 range (Parker, 2011).

Rural families face lower average household incomes and higher rates of poverty than their urban counterparts (Sparks, 2012). Rural families who have incomes at or below the federal poverty level (FPL) experience limited access to resources due to distance and also a lack of affordable options (Cristancho et al., 2008; Crowley et al., 2015; Sebelius, 2011). At the time data for this dissertation were initially collected in 2011, the FPL for a household family of four was approximately $22,350 annually (Sebelius, 2011). Rural families who face low incomes and few options may find it more convenient and affordable to buy calorie-dense and pre-packaged foods options associated with increased risk for obesity (Drewnowski & Darmon, 2005).

The community resources and organizations shape the food environment influencing individual and family behaviors. Rural families often experience lower educational attainment levels, older housing structures, and fewer high-paying, professional job options compared to their urban or suburban counterparts (Sparks, 2012). Lower rates of health insurance as well as insufficient healthcare systems infrastructure and personnel in rural communities have also been associated with health disparities (Sparks, 2012). Rural food environment face contextual challenges of poverty and limited education potentially contributing to obesogenic behaviors.
Compared to urban counties, rural counties are also more likely to have food deserts, defined as locations where all county residences live 10 or more miles from a full-service grocery store (Bailey, 2010). Though children may often be sheltered from inadequate calories in food insecure homes, research provides mixed associations between food insecurity and weight status (Larson & Story, 2011; Sharkey, Nalty, Johnson, & Dean, 2012). These food environment resource challenges can contribute to family member behaviors, with a growing body of evidence indicating that economic and accessibility issues are associated with obesity risk (Singh, Siahpush, & Kogan, 2010). While disparities and many contextual factors have been identified for rural, low-income, and Latino immigrant families, more research is needed to understand the role of families in promoting or preventing obesogenic behaviors for children.
CHAPTER 3. FAMILY SYSTEMS INFLUENCE ON CHILDREN’S OBESOGENIC BEHAVIORS

Modified from a research article to be submitted to Journal of Nutrition Education and Behavior

Brianna Routh, Megan Gilligan, & Kimberly Greder

Abstract

Objective
Examine the associations between family relationships and children’s obesogenic behaviors among Latino and White rural, low-income families.

Design
Cross-sectional from the Rural Families Speak about Health (RFSH) project

Participants
147 RFSH mothers living in counties with Rural Urban Influence Codes from 5 to 7, with limited annual household incomes, and at least one co-resident child under 13 years old. The subsample included only mothers identifying as White or Latina immigrant (n = 77 and n = 70, respectively).

Main Outcome Measures
Obesogenic behaviors (dependent variable) were measured with FNPA Scale, co-parent relationship and family structure (independent variables) were measured through the PAI and frequency of adults and children in the home respectively, and control variables included household food security and identification as a Latina immigrant.

Analysis
Linear regression and moderation, significance p < 0.05 or less

Results
Identification as a Latina immigrant (B = -3.534), co-parent respect (B = 0.662), and number of children in the home (B = 1.273) were significantly associated with FNPA scores, while number of adults in the home (B = -0.709) and household food security (B = 1.634) were approaching significance. The identification as a Latina immigrant moderated the association between number of adults in the home and FNPA scores (B = -1.682).

Conclusions and Implications
Further research should broadly consider family relationship influences on obesity-related behaviors for rural, low-income families. Family-based obesity prevention programs should consider all household members.

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Introduction

Although childhood obesity rates seem to be stabilizing nationally, obesity disparities continue to exist for youth in rural and low-income communities. Additionally, Latino children in the United States (U.S.) experience higher prevalence of obesity, although rates also seem to be associated with years or generations in the U.S. Obesity risk has been attributed to many potential factors including risky individual behaviors, interpersonal influences, and broader external contextual influences. Individual behaviors associated with obesity risk such as excess calorie and nutrient intake, sedentary activities, excess screen time, and inadequate sleep are identified as obesogenic behaviors.

As obesogenic behaviors can begin early in life, family household experiences and interactions theoretically play a significant role in behavior development and obesity risk. Associations between obesity risk and behaviors within the family are being widely studied but often focus on primary caregiver and child relationships. As the structure of family households continues to diversify and the prevalence of dual-career or single parent homes increases, more family members within the home may provide increased influence. This study aims to examine family relationships within rural, low-income homes to understand their association with children’s obesogenic behaviors.

Theoretical Framework

Family, one of the most influential social determinants of health, provides an important source of economic, social, and emotional support to its members. Family Systems Theory posits that all family members are interconnected, interdependent, and potentially bidirectionally impactful on one another. For this study, families will refer to individuals residing within the same household. Family systems are made up of subsystems, or relationships between two or more family members, including co-parent and child relationships, sibling relationships, and
children’s relationships with other adults in the home.\textsuperscript{13} Similar to parents, other household family members may influence children’s home food environment,\textsuperscript{14,15} particularly for young children who may have fewer external influences. Along with individual and contextual factors, all family subsystems potentially support or inhibit a child’s obesogenic behaviors in the home.

**Literature Review**

**Co-parent Influences**

Parent-child interactions, particularly mother-child interactions, are related to household obesogenic behaviors and child obesity outcomes, as shown in Figure 1.\textsuperscript{16,17} Parents are often the primary gatekeeper to early childhood nutrition behaviors.\textsuperscript{8,18} Parental gatekeeping practices are shaped by parents’ own development, bidirectional interactions with children, and contextual influences as well as potential interactions with another adult caregiver or co-parent.\textsuperscript{19,20} Co-parent relationship navigation affects the larger family subsystem and children’s behaviors or obesity outcomes. For example, stability between co-parent relationships has been associated with children’s behaviors.\textsuperscript{21} Specifically, co-parent relationship instability has been associated with increased obesity risk among young girls.\textsuperscript{22} Thus, if a mother perceives misalignment with her co-parent in parenting decisions, this challenge in the co-parent relationship may also be associated with more frequent obesogenic behaviors in the home.

**Household Family Structure**

In addition to parents, siblings and other relatives may contribute to obesogenic behaviors. Past cross-sectional studies found similarities in sibling and peer food preferences.\textsuperscript{23,24} However, other studies found siblings may experience differential parental treatment depending on their weight status.\textsuperscript{14,25} Further, younger children may be more susceptible to peer influences, particularly in the form of negative attitudes towards foods,\textsuperscript{26,27} in predicting their dietary behavior.\textsuperscript{28} Additionally, studies have found associations between non-
parental primary caregivers with children’s elevated weight status and food-related behaviors. Specifically, children in the care of extended-family adult relatives had earlier introduction of solid foods and were associated with higher weight status compared to those under parental primary care. In Mexican migrant households, researchers found children’s weight was significantly associated with the presence of a grandparent in the home, even when controlling for individual, household, and community characteristics.

Family Systems Theory posits that all family subsystems are interconnected. As shown in Figure 1, all members may potentially influence a child’s behaviors. Researchers have found mealtimes as a family system unit are associated with both diet quality and weight status of youth. For example, as with parenting behaviors, specific mealtime behaviors have been identified as supporting or inhibiting obesogenic behaviors, including meaningful conversation, minimal distraction, and a positive atmosphere. Family interactions around food can occur outside of mealtimes and between any household members; therefore, family subsystem influences on children’s behaviors may extend beyond current research.

**Community Food Environment**

The food environment, defined as household or community-level organizations and food resources, also influences individual and family behaviors. In a rural food environment, contextual challenges of poverty and limited education may compound in contributing to obesity health disparities. Compared to urban and suburban counterparts, rural communities experience fewer high-paying, professional job options, lower educational attainment, and insufficient health infrastructure on top of increased distance between resources. Rural counties are also more likely to have food deserts compared to urban counties. A food desert is defined as a location where all county residences live 10 or more miles from a full-service grocery store. Rural families who have limited incomes commonly experience challenges in
accessing food resources due not only to distance but also a lack of affordable options.\textsuperscript{41,42} These food environment resource challenges can contribute to family member behaviors, with a growing body of evidence indicating that economic and accessibility issues are associated with obesity risk.\textsuperscript{14,43,44}

**Culture and Immigration**

In addition to food environment resources, social constructs of race and ethnicity have strong associations with obesity risk.\textsuperscript{45} For this study, Latino refers to individuals who identify origins in a Latin American country, while White refers to individuals who both identify as White and non-Latino. Although mechanisms are not fully understood, researchers suggest variations in obesity risk may be linked to biological mechanisms like stress or gene-environment interactions as well as cultural mechanisms through which shared understandings shape individual’s obesogenic behaviors.\textsuperscript{45} Despite historic racial and ethnic homogeneity, population growth in many rural communities since the 1980s can largely be attributed to increasing minority inhabitants.\textsuperscript{46} Despite disproportionate economic disparities compared to White and African-American counterparts, immigrant families from Latin American countries have increasingly moved to rural Midwestern communities.\textsuperscript{42,46} Though both White and Latino families may share rural food environments, cultural understanding and immigration may influence obesogenic behaviors.

Particularly among first-generation immigrants, where cultural patterns may remain more prominent, these shared understandings may shape how family subsystems interact.\textsuperscript{45} *Familismo*, a common and strongly held value among many Latino families, is associated with loyalty, unity, and respect within a family, as well as promotion of family needs over individual needs.\textsuperscript{47} *Familismo* promotes behavioral cohesion or importance of deferential power within family systems, potentially influencing family systems interactions with the food.
These familial bonds can provide support extending across generations and countries, as many Latino immigrant families reside with extended family members to reduce resource challenges associated with international immigration. Additionally, traditional gender roles of marianismo and machismo, associated with specific masculine or feminine characteristics, may shape food-related interactions in the home as mothers tend to assume primary childcare responsibilities. These cultural and immigration patterns may shape the obesogenic behaviors children are exposed to in the home.

In addition to cultural influences on familial interactions, immigration may influence obesogenic behaviors, as first-generation Latino immigrants must navigate a new rural community food environment. Lack of English proficiency, legal residence status, health insurance status, and community acceptance may contribute to obesogenic behaviors for many immigrants. Additionally, the length of time residing in the U.S. is positively associated with dietary acculturation, defined as adjustment to the majority culture’s dietary trends, and to risk for obesity. However, many researchers suggest looking beyond acculturation as a blanket explanation for increasing obesity risk, with one study specifically citing both migration experiences and familial relationships influence on behaviors. Family, culture, and community provide complex influences on obesogenic behaviors; therefore, Latino immigrants may have different experiences than their White counterparts.

**Purpose of This Study**

This study examined the associations between family systems relationships and mothers’ reports of children’s obesogenic behaviors within the home among Latino and White rural, low-income families. Two main research questions examined in this study included:

1. How do influences of family subsystem relationships (e.g., relations among co-parents, other children, and other adults in the household) and contextual factors (e.g.,
household food security and identification as Latina immigrant or White mothers) vary for low-income families in rural communities?

2. Are these associations between family subsystem relationships and children’s obesogenic behaviors moderated by identification as a Latino immigrant family?

**Methods**

**Sample**

This study was completed using data from the multi-state USDA Hatch funded project, Rural Families Speak about Health (RFSH) (https://www.nimss.org/projects/view/mrp/outline/16076), and was approved by the Institutional Research Board at the associated university. Between 2011 and 2012, RFSH mothers across 13 states responded to a series of questions related to health and family relationships behaviors and outcomes. Of the 444 mothers interviewed within the RFSH project, 148 mothers met study inclusion criteria of specific rurality and identified as Latina immigrant or White. One case was excluded due to missingness, leaving a final subsample of 147 mothers. Mothers were screened for overall RFSH inclusion criteria for the initial interview, and a subsample meeting additional criteria were included in this study analysis. Mothers included lived in rural counties (Rural Urban Influence Codes 5 to 7), had limited annual household incomes (at or below 185 percent of the federal poverty level), had at least one co-resident child under the age of 13 years, and identified as either White or first-generation Latina. Latina immigrant mothers (n = 70) in this study resided in multiple Iowa communities, and the White mothers (n = 78) resided in Tennessee, Massachusetts, California, and Texas. As shown in Table 1, Demographic Characteristics of Mothers, the number of years that the Latina mothers in the study had lived in the U.S. varied greatly, ranging from 1 to 31 years. Table 1 includes additional characteristics of the mothers. Mothers were approximately 31 years old on average (30.9) and annual household
income measured in categorical ranges had a median category of $15,000 to $19,999. Consistent with demographic trends, more Latina mothers reported not completing high school (24.3%) and higher employment rates (47.1%) compared to White mothers (13.0% and 27.3% respectively).

**Procedure**

Mothers were recruited through mixed purposive sampling, which has been used to reach individuals who may be difficult to access. Mixed purposive sampling is a hybrid of purposive sampling and chain-referral sampling, using flyers at local organizations serving low-income families in the area or through screened mothers referring others in their friendship networks, respectively. After consent, trained interviewers (e.g., faculty, graduate students, University Cooperative Extension staff, community partners) conducted two-hour in-person interviews using a structured survey with rural low-income mothers. Interviews were conducted in either English or Spanish based on the preference of each mother. Additionally, to avoid mothers’ potential literacy challenges and reduce data entry errors, interviewers entered mothers’ responses into a computer-assisted form. Mothers were offered an honorarium between $30-50 for participating in the interview based on the resources available in each participating state.

**Measures**

**Children’s obesogenic behaviors (dependent variable).** The Family Nutrition and Physical Activity (FNPA) screening tool was used to assess frequency of children’s obesogenic behaviors within the home. The 21-item measure included questions related to the type and frequency of food consumption, physical activity, sleep, media use, and family routines. Previous factor analyses indicated that all items loaded onto a single factor and had internal consistency with reported reliability of $\alpha = 0.72$. For this subsample, the alpha reliability was similar ($\alpha = 0.70$) and items loaded onto a single factor with internal consistency and reliability.
Sample questions examined relative frequency of child, parent, or family behaviors through multiple question and response types. For example, questions included “How often does your family eat at least one meal together each day?” with response options “almost never, sometimes, often, or almost always” and “In a typical week, do you monitor the amount of television your child watches?” with response options “yes or no.” Lower item sum scores indicate a child is participating in a greater frequency of obesogenic behaviors within the home. Data were treated as continuous to maximize potential to identify variation in the sample.\(^7,16,61\)

**Co-parent relationship (independent variables).** As co-parents navigate the food parenting relationship with their children, they may employ different strategies to reduce or avoid tension such as teamwork, open communication, or mutual respect of the other partner’s decisions.\(^62\) In this study, the Parent Alliance Inventory (PAI), assessed mothers’ perceptions of their co-parent relationship with regards to teamwork, effective communication, and mutual respect for the partner’s decisions.\(^63\) Co-parents were defined as individuals such as spouses, partners, grandparents, or other adult figures who mothers viewed as their partners in parenting decisions. The PAI demonstrated high internal consistency (\(\alpha = 0.97\)),\(^52\) with similar internal consistency in this sample (\(\alpha = 0.96\)). The 20-item measure loaded onto two factors resulting in two subscales and accounted for 66.3% of the variance in the mothers’ scores.\(^52\)

The two subscales assess perceived success of co-parent teamwork and communication and perceived co-parent respect, referred to as PAI Teamwork and PAI Respect respectively for this study. PAI Respect subscale consists of 3 items including questions such as, “The other primary caregiver believes I am a good parent.” PAI Teamwork consists of 17 items including questions such as, “When there is a problem with the child, we work out a good solution together.” All questions have Likert scale response options “strongly agree, agree, not sure how
I feel, disagree, and strongly disagree.” Responses were recoded so lower values equate to less co-parent alliance and all scales and subscales were then calculated using sum scores. Higher sum scores indicated greater perceived alliance between the co-parents on that particular scale or subscale. Sum scores were treated as continuous variables for analysis.

**Household family structure (independent variables).** Both frequency and relationship type variables were used to understand the membership structure within the household. Specifically, the number of adults in addition to the mother (including a partner, extended family relatives, adult children, or non-related adult residents) and the total number of children under the age of 13 (including siblings, cousins, or other resident children) who resided in the home were used in analysis. Frequency of children and adults were used as continuous variables in the analysis.

Whether or not families reported having different types of familial relationships between adults and children in the home was explored to understand potential structural influence on children’s behaviors. As sample size was limited across some categories, the original 16 familial classifications were collapsed into six dichotomous variables for analysis. Additional classifications for adults-child relationships in the home include: 1) co-parent (legally married or cohabiting partner of either gender), 2) grandparent (from either co-parent's side), 3) adult child (child or grandchild of primary caregiver), 4) other extended family (extended family members including but not limited to aunts, uncles, and cousins), and 5) non-related adults (household adult residents who were not identified as family relations). All homes included a female primary caregiver, for the purposes of this study referred to as the mother, therefore this classification was not included in the analysis. These classifications were coded to indicate if this type of adult-child relationship was present in the home, with not present as the reference.
**Latina immigrant (independent variables).** Mothers self-identified as White or Latina immigrants. Latina immigrant mothers were dichotomously compared with White mothers (reference group). Due to relatively small sample sizes and homogenous demographics, additional mother characteristics are provided in Table 1, but will not be included in further analyses.

**Food security (control).** The six-item U.S. Household Core Food Security Module was used to categorize each family’s household food security. The six-item short form references the past 12 months and identifies reduction in diet quality, access, and potential disrupted food intake patterns. The Food Security Module has high reported internal consistency (α = 0.74 to 0.93). In comparison to the 18-item core module, the 6-item short form has 92.0% sensitivity and 99.4% specificity in determination of overall food insecurity. Sample questions based on conditions in the home over the preceding 12-month period included: “The food that I bought just didn't last and I didn't have money to get more” with response options of “often true, sometimes true, or never true” and “Did you ever eat less than you felt you should because there wasn’t enough money for food?” with response options of “yes or no.” Responses were recoded so that 1 indicated an affirmative response indicating food insecurity. Food security sum scores were recoded to dichotomous groups of high or marginal food security compared to low or very low food security (reference group) in accordance with previous studies.

**Data Analysis**

SPSS Version 22 and Excel were used to analyze the data. Descriptive statistics were used to describe sample characteristics. Means and standard deviations or frequency and percentages were employed to describe study measures including, food security, obesogenic behaviors, co-parent relationship scores, household structure, and household member frequency,
as seen in Table 2. All continuous independent variables were centered for analysis. Preliminary analyses compared means for all model variables between Latino and White families using independent samples T-tests and multivariate analysis of variance (MANOVA) tests.

Prior to analysis, all variables were reviewed for missingness. No family was missing more than two item responses on the full FNPA scale. Thus, item-specific mean substitution, calculated separately for Latina and White mothers, were included in sum scores in place of missing responses. Subsequently, no family was missing FNPA sum scores regarding children’s obesogenic behaviors in their home. All of the mothers indicated the number of adults in their home in addition to themselves. All subsample mothers also identified a co-parent and responded to PAI items, hence, this measure did not have missingness. Eleven percent (13 of 148 families) were missing responses to the survey item indicating the number of children under 13 years old in the home, but responses were extrapolated from additional data points to fill in missing responses for all but one case, leaving a final subsample of 147 mothers.

As this is an exploratory study of potential family systems associations, the importance of family subsystem relationship variables was determined using the Relative Importance Excel Macro. Initially, overall model $R^2$, standardized least-squares regression weights, incremental $R^2$, general dominance weights, and relative importance weights calculations were used to identify which set of family subsystem relationship predictors had the most model parsimony with least substantial loss in variance explained. This analysis indicated the most parsimonious model would be four family subsystem relationship variables: co-parent perceived respect, number of children under the age of 13, number of adults beyond the mother, and extended relative adults in the home. To initially understand the relationship between these variables, bivariate correlations were run.
Forced entry linear regression was used to analyze the association between FNPA scores and family subsystem relationship variables, while controlling for household food security and mother identification as a Latina immigrant. To address the second research question, identification as a Latina immigrant was tested as a potential moderator. Four separate moderation analyses were tested to determine if this identification significantly moderated any of the family subsystem relationship variable associations with FNPA scores. Assumptions were also tested to support these regression analyses. Normality was confirmed through P-P plot and homoscedasticity was confirmed through scatterplot output in the SPSS analysis, with no outliers identified. Additionally, the variance inflation factor (VIF) for all variables between 1 and 2 indicating low likelihood that multicollinearity is a concern.

**Findings**

Analysis of specific study measures indicated statistically significant variations in mean scores between Latina immigrant mothers and White mothers, as seen in Table 2 *Descriptive Characteristics of Study Variables*. Namely, the two groups of mothers had significantly different FNPA scores: White mothers reported fewer children’s obesogenic behaviors than Latina immigrant mothers. Significant differences between the two groups were also found in measures of household food security and co-parent teamwork, a PAI subscale. The groups were also approaching statistically significant variation in the number of adults in the home. Specifically, Latina immigrant mothers reported higher levels of co-parent teamwork and household food security, as well as more adults in the home, than did White mothers. The majority of all mothers in the study reported that they lived with their partners (n = 120, 82%), and 7% to 15% of mothers reported each other type of adult-child subsystem in the home (n = 10 to n = 22). Latino families had more adults identified as extended family members, not including
grandparents or adult children, and fewer adults identified as non-family members compared to White families.

Table 3, *Family Subsystems Association with Children’s Obesogenic Behaviors*, shows associations between family subsystems relationships (four indicated from exploratory relative importance tests) and FNPA scores. Overall, the analysis confirms bivariate results where identification of Latina, co-parent respect, and number of children in the home were significantly associated with FNPA scores. Additionally, β weights indicated that identification as a Latina immigrant was associated with lower FNPA scores and was the strongest predictor of children’s obesogenic behaviors. Alternatively, higher co-parent respect and more children under the age of 13 were associated with higher FNPA scores and fewer obesogenic behaviors. Additional variables of food security, number of adults in the home, and presence of other family relatives in the home were approaching statistically significance. Although this model does not account for all possible contributors to children’s obesogenic behaviors, the model is able to predict 26.9% of the adjusted variance in FNPA scores among the families in this study.

Table 4, *Identification as a Latina Immigrant Moderating Association between Family Subsystem Relationships and Children’s Obesogenic Behaviors*, presents the results of four separate moderation analyses that tested the interactions between identification as a Latina and family subsystem relationship variables in association with FNPA scores. Model 3 was the only model that indicated a statistically significant interaction between identification as a Latina and number of adults in the home. The addition of this interaction term increased the model’s ability by 2.3% to predict the variance in children’s obesogenic behaviors in the home. Notably, the number of adults in the home and presence of other extended family relationships in the home no longer approached statistical significance in Model 3. Identification as a Latina immigrant did
not significantly moderate the associations with FNPA and other family subsystem relationship variables in Models 1, 2, or 4.

**Discussion**

Family Systems Theory posits that families consist of interconnected subsystem relationships, which all potentially influence a child’s obesogenic behaviors. While research has examined the association between familial primary caregivers and children’s obesogenic behaviors, limited research has explored how non-primary caregiving household family members’ influence children’s behaviors. Additionally, few studies have explored the associations between household family relationships and obesogenic behaviors among rural, low-income families, including Latino immigrant families. The findings of this exploratory study contribute to current literature by underscoring the potential influences of all family members, regardless of mealtime role or caregiving behaviors, when understanding children’s obesogenic behaviors in the home. Additionally, these findings highlight the role of family relationships in shaping obesogenic behaviors specifically among rural, low-income Latino immigrant and White families.

**Co-parent Influences**

Consistent with previous literature, co-parent relationships were also associated with children’s obesogenic behaviors in this study. The statistical significance of a mother’s perception of respect from her co-parent indicates the potential importance of triadic family subsystems, such as two co-parents and a child. Notably, only 10 mothers indicated that they were the only adult living in the home; thus, the other co-parent did not live in the home. Among family subsystem relationship variables, the presence of a partner in the home had a lower relative importance, hence was not included in the final model. In contrast to other
literature which has focused on dyadic relationships, these findings support the further exploration of triadic subsystem relationships as influencing children’s behaviors.\textsuperscript{13,31}

These findings may suggest that co-parents navigation of their relationship and general parenting roles may carry over to directly or indirectly influence children’s obesogenic behaviors in the home. Further research should aim to understand the mechanisms in which co-parent relationships shape children’s obesogenic behaviors. Family Systems Theory posits a triad may be more stable than a dyad, as a third member is able to provide resolution to conflicts that arise.\textsuperscript{13} In line with this theory, children’s obesogenic behaviors may be shaped by triadic relationships between both co-parents and a child. One study identified stable co-parent relationships associated with children’s less obese weight status, but additional literature has not yet explored potential mechanism influencing this stability and weight status association.\textsuperscript{22}

Although teamwork between co-parents is associated with positive parent-child outcomes, findings from this study suggest that respect between co-parents had more relative importance in this model.\textsuperscript{71} The importance of co-parent respect over co-parent teamwork may be due to gender roles and division of parenting responsibilities among families in the study. The absence of statistically significant moderation on co-parent respect suggests that this triadic relationship matters for both Latina immigrant and White families. Future research should explore whether co-parent respect directly influences children’s behaviors through parent-child interactions or indirectly influences behaviors in the home through co-parent relationship stability.

**Household Family Structure**

Limited previous research has explored household structure in relation to children’s obesogenic behaviors. However, Family System Theory suggests that all family relationships are interconnected and potentially influential on one another’s behaviors.\textsuperscript{13} Previous research found consistency in dietary behaviors for both siblings and youth peer relationships, while
identifying that these associated behaviors are more predictive of negative dietary behaviors.\textsuperscript{26-28} Findings from this study support the association between youth relationships and children’s obesogenic behaviors. These findings also expand on current literature, suggesting that more youth under 13 years old in the home are positively associated with fewer obesogenic behaviors in the home. Additional children may provide peer supports of fewer obesogenic behaviors, as well as family subsystems may be more consistent and supportive of efforts to reduce obesogenic behaviors. Future research should explore if more children in the home directly support one another’s behaviors. Alternatively, youth may indirectly have behavioral associations shaped by similar home food environment patterns.

Prior studies found statistically significant positive associations between the presence of non-parental adult family caregivers in the home with both children’s obesogenic behaviors and child health outcomes.\textsuperscript{29,30} This study expanded on these associations by including all adults in the home regardless of caregiving status. Consistent with prior studies, findings of this study indicated that more adults present in the home was associated with more obesogenic behaviors among children, therefore supporting the potentially unique role of adult-child family subsystems with children’s obesogenic behaviors. Despite limited sample sizes, the specific presence of other extended family members in the home was also associated with more obesogenic behaviors. As more respect between co-parents suggests consistent or aligning food parenting strategies support fewer obesogenic behaviors, more adults in the home may contribute to less alignment in adult-child food related interactions. These additional adults may constitute “too many cooks in the kitchen” in modeling or supporting consistent children’s behaviors. Further research should explore whether additional household adult provide direct or indirect influence on children’s behaviors.
Identification as a Latina Immigrants

In alignment with previous research, Latino immigrant families in this study had significantly more obesogenic behaviors on average compared to White families. Mothers’ identification as Latina or White remained a prominent predictor of children’s obesogenic behaviors, further supporting variations in family and community influences between these families. Specifically, identification moderated relationships between household adults and children’s behaviors. Findings revealed that the presence of multiple adults in the homes of Latino immigrant families was more strongly associated with children’s obesogenic behaviors than among White families. Although the dichotomization of families in the current study cannot identify specific mechanism of influence, previous research provides indication as to why these two groups may have different obesogenic behaviors. In general, immigrant families may approach their new food environment differently, contributing to variations in food behaviors from their White counterparts.\textsuperscript{72} Additionally, cultural patterns of *familismo* (loyalty), *marianismo*, and *machismo* might shape family member interactions and levels of influence on children’s behaviors.\textsuperscript{51,73} The intersection of cultural influences, specifically related to adult roles in the home, and navigation of a new food environment may contribute to moderation effects seen in obesogenic behaviors for immigrant Latino families. Future research should explore if these findings are replicated among other families at high obesity risk to further understand the impact of rurality, limited income, cultural patterns, or immigration on the prevalence and nature of associations between family subsystem relationships and children’s obesogenic behaviors.

Limitations

There are multiple limitations to this study. First, the generalizability of the findings is limited in scope due to the cross-sectional nature of the data; thus, directionality of the
relationships in the models can only be theoretical assumed. Second, the secondary nature of the analysis and the small sample size restricted the number of variables that could be included in the analysis, potentially missing other important family systems or community specific variables. However, for an exploratory study of rural, low-income, White and Latino immigrant families, findings suggest family subsystem relationships are an important area for further exploration to address childhood obesogenic behaviors.

Implications

These study findings suggest that the role of all household family subsystems should be considered in future childhood obesogenic behavior research, as these relationships provide insight into almost a third of the variance in children’s behaviors. This will potentially require innovative multiple family member analysis to capture influences of all family subsystem relationships. Similar to suggestions made by a panel of experts reflecting on food parenting measures, to more deeply understand parent influence on children’s obesogenic behaviors, future research on family subsystems influences may benefit from diverse methodologies including observational, qualitative longitudinal, and community-based participatory research designs. Understanding the complexities of family systems influences on children’s household obesogenic behaviors can help to identify strengths and barriers for more effective intervention and health promotion.

Based on these findings, obesity prevention and intervention programs focused on rural families with limited household incomes, particularly for Latino immigrant families, should take into consideration influences of co-parent and household family relationships on children’s behaviors. Family-based obesity interventions have been attempted, but often the focus still remains on the individual or the parent-child dyad. While family-based approaches can be more costly and time intensive, and there is a lack of substantial evidence of greater effectiveness
in preventing or reducing child obesity, findings from this study suggest that multiple relationships within families are associated with obesogenic behaviors among children.

Although mechanisms of influence are not completely clear, practitioners can solicit information directly from families or individuals to help them explore how household members potentially influence children’s behaviors. Situationally-informed strategies to incorporate into behavioral interventions can be tailored to food environment, cultural patterns, and dynamics of the particular family system. Family members can serve as sources of social support, provide behavioral reinforcement, and engage in family-based goal setting. Additionally, by understanding specific family subsystems interactions, practitioners may be able to promote awareness and utilize perceptions towards motivational interviewing in promoting behavior change. Ultimately, the family subsystems should be considered in both research and intervention as a part of the complex supports and inhibitors contributing to children’s obesogenic behaviors and obesity risk.

References


68. Raaijmakers QA. Effectiveness of different missing data treatments in surveys with Likert-type data: introducing the relative mean substitution approach. Educ Psychol Meas. 1999;59(5):725-748.


Family subsystems within the home environment, including mother (primary caregiver and study participant), other primary caregiver (the individual identified by the mother as a co-parent), other children (potentially including siblings, cousins, or non-related youth), and other adults (including non-primary caregiver adults such as grandparents, extended relatives, and non-related adults) in bidirectional relationships with a focal child, potentially influencing the focal child’s obesogenic behaviors.
Table 1.
Demographic Characteristics of Mothers

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Full Sample</th>
<th>White</th>
<th>Latina Immigrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD) (N = 147)</td>
<td>30.9 (8.3)</td>
<td>32.0 (7.5)</td>
<td>29.7 (9.0)</td>
</tr>
<tr>
<td>Annual Household income, mean range (N = 147)</td>
<td>15,000-19,999</td>
<td>15,000-19,999</td>
<td>15,000-19,999</td>
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<tr>
<td>Educational Attainment, n (%) (N = 145)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>27 (18.4)</td>
<td>10 (13.0)</td>
<td>17 (24.3)</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>64 (43.5)</td>
<td>35 (45.5)</td>
<td>29 (41.4)</td>
</tr>
<tr>
<td>Post High School</td>
<td>54 (36.7)</td>
<td>31 (40.3)</td>
<td>23 (32.9)</td>
</tr>
<tr>
<td>Employed, n (%) (N = 145)</td>
<td>54 (36.7)</td>
<td>21 (27.3)</td>
<td>33 (47.1)</td>
</tr>
</tbody>
</table>
Table 2.
Descriptive Characteristics of Study Variables ($N = 147$)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Full Sample</th>
<th>White ($n = 77$)</th>
<th>Latino Immigrant ($n = 70$)</th>
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<tr>
<td><strong>Control Variable</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Food Secure, $n$ (%)</td>
<td>94 (64)</td>
<td>39 (51)</td>
<td>55 (79)</td>
</tr>
<tr>
<td><strong>Dependent Variable</strong></td>
<td>54.6 (5.9)</td>
<td>56.2 (5.4)</td>
<td>52.9 (6.0)</td>
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<td>FNPA, $M$ (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
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<td></td>
</tr>
<tr>
<td>PAI Respect, $M$ (SD)</td>
<td>13.7 (2.2)</td>
<td>13.5 (2.392)</td>
<td>14.0 (2.0)</td>
</tr>
<tr>
<td>PAI Teamwork, $M$ (SD)</td>
<td>76.3 (11.1)</td>
<td>73.6 (13)</td>
<td>79.2 (8.4)</td>
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<td># Children under 13, $M$ (SD)</td>
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<td>2.0 (1.1)</td>
<td>1.9 (0.9)</td>
</tr>
<tr>
<td># Other Adult, $M$ (SD)</td>
<td>1.6 (1.2)</td>
<td>1.4 (1.1)</td>
<td>1.7 (1.2)</td>
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<tr>
<td>Partner, $n$ (%)</td>
<td>120 (82)</td>
<td>57 (74)</td>
<td>63 (90)</td>
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<td>Grandparent, $n$ (%)</td>
<td>22 (15)</td>
<td>11 (14)</td>
<td>11 (16)</td>
</tr>
<tr>
<td>Adult Child, $n$ (%)</td>
<td>18 (12)</td>
<td>9 (12)</td>
<td>9 (13)</td>
</tr>
<tr>
<td>Other Extended Family, $n$ (%)</td>
<td>19 (13)</td>
<td>6 (8)</td>
<td>13 (19)</td>
</tr>
<tr>
<td>Non-Family Member, $n$ (%)</td>
<td>10 (7)</td>
<td>7 (9)</td>
<td>3 (4)</td>
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</table>
Table 3.
*Family Subsystems Association with Children’s Obesogenic Behaviors (N = 147)*

<table>
<thead>
<tr>
<th></th>
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<th>SE(β)</th>
<th>β</th>
<th>t</th>
<th>p</th>
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<td>Constant</td>
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<td>15.992</td>
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<tr>
<td>Food Security</td>
<td>1.634</td>
<td>.929</td>
<td>.133</td>
<td>1.759</td>
<td>.081</td>
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<td>Latino Immigrant</td>
<td>-3.534</td>
<td>.892</td>
<td>-.300</td>
<td>-3.963</td>
<td>.000</td>
</tr>
<tr>
<td><strong>Family Subsystem Relationships</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAI Respect</td>
<td>.662</td>
<td>.191</td>
<td>.250</td>
<td>3.474</td>
<td>.001</td>
</tr>
<tr>
<td># children under 13 years of age</td>
<td>1.273</td>
<td>.435</td>
<td>.213</td>
<td>2.926</td>
<td>.004</td>
</tr>
<tr>
<td># other adults in the home</td>
<td>-.709</td>
<td>.419</td>
<td>-.144</td>
<td>-1.691</td>
<td>.093</td>
</tr>
<tr>
<td>Other Adult Extended Family  (excluding grandparents or adult children)</td>
<td>-2.750</td>
<td>1.465</td>
<td>-.157</td>
<td>-1.877</td>
<td>.063</td>
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<td><strong>Model Variance</strong></td>
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<tr>
<td>R</td>
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<tr>
<td>R²</td>
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<td>0.299</td>
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<td>Adjusted R²</td>
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<td>0.269</td>
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</table>

* P < 0.10, * P < 0.05, ** P < 0.01, *** P < 0.001
Table 4.
Identification as a Latina Immigrant Moderating Association between Family Subsystem Relationships and Children's Obesogenic Behaviors (N = 147)

<table>
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<tr>
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<td></td>
<td>B</td>
<td>SE(β)</td>
<td>B</td>
<td>SE(β)</td>
</tr>
<tr>
<td>Constant</td>
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<td>3.497</td>
<td>45.590***</td>
<td>2.954</td>
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<td>Food Security</td>
<td>1.740*</td>
<td>.933</td>
<td>1.623*</td>
<td>.931</td>
</tr>
<tr>
<td><strong>Family Subsystem Relationships</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PAI Respect</td>
<td>.487*</td>
<td>.245</td>
<td>.658**</td>
<td>.191</td>
</tr>
<tr>
<td># children under 13 years of age</td>
<td>1.254**</td>
<td>.435</td>
<td>1.077*</td>
<td>.567</td>
</tr>
<tr>
<td># other adults in the home</td>
<td>-.707*</td>
<td>.419</td>
<td>-.722*</td>
<td>.421</td>
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<tr>
<td>Other Adult Extended Family (excluding grandparents or adult children)</td>
<td>-2.822*</td>
<td>1.465</td>
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<td>1.470</td>
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<tr>
<td><strong>Interaction Variables</strong></td>
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</tr>
<tr>
<td>1. Latino Immigrant by PAI Respect</td>
<td>.443</td>
<td>.389</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Latino Immigrant by # children</td>
<td>-</td>
<td>-</td>
<td>.466</td>
<td>.861</td>
</tr>
<tr>
<td>3. Latino Immigrant by # other adults</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>4. Latino Immigrant by Presence of Other Extended Family</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R</td>
<td>0.552</td>
<td>0.548</td>
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<tr>
<td>Adj R²</td>
<td>0.270</td>
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+ P <0.10, * P <0.05, ** P <0.01, *** P <0.001
CHAPTER 4. FOOD PARENTING AGENCY: RURAL LATINO IMMIGRANT FAMILIES

Modified from a research article to be submitted to Hispanic Journal of Behavioral Sciences

Brianna Routh¹, Doris Cancel-Tirado², Megan Gilligan¹, and Kimberly Greder¹

Abstract

Although obesity rates in the United States seem to be stabilizing on the national level, obesity risk continues to grow, especially among rural, low-income Latino youth. Parents play an important role in shaping children’s early food behaviors. While risky and effective obesogenic parenting behaviors are well documented, less research has explored variations and perceptions in food parenting among diverse populations. This study explores perceptions and behaviors across 21 Latina immigrant mothers with low incomes living in two rural communities. Family profile analysis was used to identify patterns of food parenting agency within mixed methods data. Mothers with high food parenting agency tended to report fewer obesogenic food parenting behaviors, take more behavior change action, report adaptive behaviors from childhood, and have better views of their current food environment. Mothers with lower food parenting agency had more obesogenic behaviors and described more contextual challenges. Hence, diversity in food parenting agency should be considered in future research and obesity prevention.

Key words: mixed methods, Latina, immigrant, food parenting agency

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Introduction

Interactions around food between young children and family members regularly occur in the home, potentially contributing to children’s development of lifelong food behaviors (Bornstein & Sawyer, 2006; Davison, Jurkowski, & Lawson, 2013). Obesogenic behaviors, defined as behaviors associated with obesity risk, often begin in childhood. Obesogenic behaviors include excess calorie and nutrient intake, sedentary activity, excess screen time, and inadequate sleep (Ihmels, Welk, Eisenmann, & Nusser, 2009). Family health and nutrition behaviors, including food and well-being practices of household members, have been associated with obesity risk, particularly for younger children (Peyer, 2016). Although obesity rates in the United States (U.S.) seem to be stabilizing on the national level, obesity risk continues to grow, especially among rural, low-income youth (Fryar, Carroll, & Ogden, 2017; Liu, Bennett, Harun, & Probst, 2008). In addition, immigrant families with low household incomes in rural communities are navigating obesity risk with potentially unfamiliar food resources. The long-term health risks associated with childhood obesity necessitate understanding of food parenting perceptions and practices influencing children’s obesogenic behaviors (Ihmels, Welk, Eisenmann, & Nusser, 2009).

Despite historic racial and ethnic homogeneity, since the 1990s many Midwestern rural communities have experienced growth due to Latin American immigrants (Crowley, Lichter, & Turner, 2015). These immigrants tend to be younger on average and—despite higher rates of employment—they tend to have higher rates of poverty compared to other minorities in rural communities (Chapa & De La Rosa, 2004; Crowley et al., 2015). Although obesity risk at the point of immigration to the U.S. is initially lower for Latino youth, rates increase higher than the national average with length of time or generation in the U.S. (Bates, Acevedo-Garcia, Alegria, & Krieger, 2008; Coll & Marks, 2012; Fryar et al., 2017; Liu et al., 2008). Latino immigrant
parents and youth who live in rural communities and have low incomes face compounding contextual risk factors that contribute to elevated risk for developing obesity (Fryar et al., 2017; Liu et al., 2008).

Parents, particularly mothers, are often primary gatekeepers in the home of young children’s food experiences (Maher, Fraser, & Wright, 2010; Savage, Fisher, & Birch, 2007; Schmalzbauer, 2011). Food parenting behaviors, defined in this paper as interactions around food, and specifically, obesogenic behaviors between parent and child, can influence children’s nutrition behaviors and weight status (Gevers, Kremers, de Vries, & van Assema, 2014; Larsen et al., 2015). This study aims to explore patterns in variations and perceptions in food parenting among Latina immigrant mothers with low incomes in rural U.S. communities.

**Theoretical Framework**

Although researchers have identified food parenting behaviors that are associated with less obesity risk for children, more research is needed to understand factors that influence food parenting behaviors. Research suggests that individual behavior change may require more than traditional knowledge and skill-based education (Contento, 2008; Gerards & Kremers, 2015; Larson, Nelson, Neumark-Sztainer, Story, & Hannan, 2009; Larson, Perry, Story, & Neumark-Sztainer, 2006). Specifically, behavior change counseling is most effectively achieved when motivation, behaviors, and environment are addressed (Contento, 2008).

The Transtheoretical Model of behavior change is frequently utilized in nutrition research and counseling (Prochaska, 2013; Spahn et al., 2010). The Transtheoretical Model suggests that parents may go through behavior change stages in a cyclical pattern of pre-contemplation, contemplation, preparation, action, and maintenance of behaviors over time (Prochaska, 2013; Prochaska & Velicer, 1997). In addition to these behavior changes or maintenance stages, Prochaska suggests individual perceptions of internal and external influences (Prochaska, 2013).
Perceptions include self-efficacy and raising consciousness related to desired behaviors (Bandura, 1982; Prochaska, 2013). Additionally, supportive relationships such as family members and continual evaluation of both personal and environmental influences can shape behavior change (Prochaska, 2013). Although the Transtheoretical Model has identified behavior change stages among diverse adult populations, the use of this model in nutrition counseling has shown mixed results with long-term significant changes (Prochaska, 2013; Spahn et al., 2010).

To promote healthy lifelong behaviors, additional influences must be explored to understand the complexities of food parenting behaviors. Trubek and co-authors recently proposed the Food Agency Paradigm as a framework for understanding the complexities of individual setting and enacting food parenting goals (Trubek, Carabello, Morgan, & Lahne, 2017). As defined by Trubek et al., food agency specifically considers complex individual, cultural, and social contexts that influence whether an individual changes or maintains desired food parenting behaviors (Trubek et al., 2017). Building on this definition of food agency, food parenting agency is a parent’s food and obesogenic behaviors that include provision, preparation, guidance, and bidirectional interactions potentially influencing their children’s behaviors (Anzman, Rollins, & Birch, 2010; Trubek et al., 2017).

Opportunities for promoting healthy food parenting behaviors can be better understood by considering current perceptions and behaviors through food parenting agency and potential for behavior change through the Transtheoretical Model. Given that the Food Agency Paradigm has only recently been introduced, and primarily in relation to cooking behaviors, exploration is needed to determine its applicability to other behaviors such as food parenting (Trubek et al., 2017). Additionally, both food parenting agency and the Transtheoretical Model stages of
behavior change are influenced by individual understanding of interpersonal interactions and contextual factors (Prochaska, 2013; Trubek et al., 2017). Mothers’ past childhood experiences of food parenting behaviors may influence their present day action and understanding. Similarly, perceptions of contextual influences may shape an individual’s willingness and ability to enact desired food parenting behaviors.

**Literature Review**

**Food Parenting**

Food parenting behaviors are complex and multidimensional (Musher-Eizenman & Kiefner, 2013). Food parenting strategies such as repeated food exposures and positive facial expressions have been shown to increase fruit and vegetable or novel food consumption among children (Addessi, Galloway, Visalberghi, & Birch, 2005; Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Barthomeuf, Droit-Volet, & Rousset, 2012). Alternatively, strategies that restrict some foods, use food as a reward, or provide too little structure are associated with higher obesity risk for children (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Johnson, Welk, Saint-Maurice, & Ihmels, 2012). Despite extensive research regarding specific food parenting behaviors, more research is needed to understand variations in the behaviors that may inhibit the promotion of children’s obesogenic behaviors (Musher-Eizenman & Kiefner, 2013). Food parenting behaviors may influence not just children’s behaviors but also food behaviors of all household members.

**Food Parenting for Latino Immigrants**

Both the Transtheoretical Model and the Food Agency Paradigm provide frameworks that consider family member influences as well as contextual influences to understand desired and enacted food parenting behaviors. In rural communities, low household income can limit accessibility and affordability of food and health resources, contributing to an elevated risk of
obesity (Bailey, 2010; Sparks, 2012). First-generation Latina immigrant mothers face compounding challenges (e.g., lack of English proficiency, legal residence status, health insurance status, community acceptance) to enact desired food parenting behaviors (Bennett, Olatosi, & Probst, 2008; Cristancho, Garces, Peters, & Mueller, 2008; Tai-Seale & Chandler, 2010).

Immigrant parents are often attempting to balance traditional food practices with dietary patterns common in their new communities (Buscemi, Beech, & Relyea, 2011; Greder, Slowing, & Doudna, 2012). The process of adopting eating patterns of a new majority environment, known as dietary acculturation, may precipitate more food parenting behavior changes (Buscemi et al., 2011; Greder et al., 2012). Although acculturation has been associated with obesity risk, many researchers suggest looking beyond acculturation as a blanket explanation for increased risk (Bowen & Devine, 2011; Buscemi et al., 2011; Creighton, Goldman, Pebley, & Chung, 2012). In addition to acculturation, past and present family interactions may also influence changes in diet and food parenting behaviors (Bowen & Devine, 2011; Hooper, Ivory, & Fougere, 2015; Puhl & Schwartz, 2003). One study of migrant Latino youth found that dietary acculturation trajectory was linked to food experiences with mothers and grandmothers prior to migration (Bowen & Devine, 2011). To date, limited research has explored how childhood family and food experiences relate to present day food parenting, particularly among immigrant parents. Familial and contextual immigration potentially shape food parenting perceptions and actions, particularly for Latino immigrant families in rural U.S. communities.

**Purpose of This Study**

Because mothers are a potentially prominent influence on children’s obesogenic behaviors, this study explored food parenting agency patterns among low-income Latina immigrant mothers from two rural Iowa communities through family profile analyses.
Specifically, this study explored patterns of mothers’ stages of behavior change, perceptions of influence, and childhood experiences with current obesogenic food parenting behaviors.

**Methods**

This study used data from the Iowa Rural Latino Family Project (Greder, Bao, & Routh, 2017), an outgrowth of the multi-state Rural Families Speak about Health study (http://ruralfamiesspeak.org/). A subsample of 21 Latina immigrant mothers from low-income households in two rural Iowa communities participated in two in-person interviews where they responded to a series of open and closed-ended questions related to health perceptions, behaviors, and outcomes. The mixed methods family profile approach was used to explore patterns in quantitative and qualitative data that could explain how mothers understand and practice food parenting behaviors (Kuckartz, 2014).

**Sample**

To be eligible to participate in the initial interview, mothers had a) household incomes equal to or below 185% of the federal poverty level, b) at least one co-resident child under 13 years old at the time of first interview, and c) identify as first-generation Latina immigrants. Of the 98 mothers who participated in the first interview in Iowa, 78 were also asked open-ended questions related to food parenting. Follow-up interviews were conducted with a convenience sample of 30 of the original 98 mothers to further understand current and past family influences on their health. Quantitative and qualitative data were available for 21 mothers and were used for mixed methods analyses in this study to provide a deeper understanding of food parenting and family nutrition behaviors.

Of the 21 mother subsample, the majority of the mothers were born in Mexico (85.7%; $n = 18$); three were born in Guatemala, El Salvador, and Argentina (4.8%). At the time of the first interview, mothers were on average 34.1 years old (range: 21-45 years old) and had lived in the
U.S. on average 9 years (range: 4–22 years). Mothers had consistently low levels of acculturation to the majority culture. The large majority of mothers (95.2%; \( n = 20 \)) were either married or lived with a partner. Over half of the mothers (52.4%; \( n = 11 \)) had not earned a high school diploma or GED. At the time of the first interview, mothers reported that their household incomes ranged from $880 to $3,100 per month. Additionally, each household averaged 2.9 adults and 1.8 children under 13 years of old (range: 1-7 adults and 1-4 children, respectively). Although not consistent, mothers reporting the fewest obesogenic behaviors had the highest numbers of children in the home, ranging from one to five youth compared to one to three for those with more obesogenic behaviors. The FNPA scores indicating obesogenic food parenting practices ranged from 35 to 63 with an average score of 51. Across most food agency profiles, quantitative measures included in this study had no patterns emerged.

**Procedures**

First interviewed in 2011 and again in 2016, this subsample of mothers participated in two structured surveys including both open-ended and closed-ended questions. Questions were developed or adapted from existing tools by an interdisciplinary research team to address broad questions of rural family health. For both time points, survey protocols were translated into Spanish by bilingual translation professionals.

Mothers meeting inclusion criteria were recruited through respondent driven sampling in order to recruit hard-to-reach populations through friendship networks of previous study participants (Greder et al., 2012). To reduce language barriers and increase participant comfort, trained interviewers administered instruments aloud for mothers in their preferred language, in their home or at a local Cooperative Extension office (George, Duran, & Norris, 2014; Kaiser, Townsend, Melgar- Quiñonez, Fujii, & Crawford, 2004; Ojeda, Flores, Meza, & Morales, 2011). Interviewers entered mothers’ responses to closed-ended questions into an electronic
questionnaire on an iPad and audio-recorded mothers’ responses to open-ended questions. Mothers received $50 gift cards for participating at each interview time point. This study was approved by the Iowa State University Institutional Review Board, and written informed consent was secured from all mothers at each time point of data collection.

A family profile analysis approach was used to analyze mixed methods data for food parenting patterns across and within families (Kuckartz, 2014; Miles, Huberman, & Saldana, 2013). The audio recordings of mothers’ qualitative responses were transcribed verbatim in Spanish and then translated into English by native Spanish speaking graduate and undergraduate students. Transcripts were uploaded into MAXQDA, a qualitative data management and analysis software program. ID numbers were assigned to participating mothers to ensure data was de-identified. Responses to quantitative survey items that were recorded on paper were entered into SPSS and Excel for data analysis.

**Measures**

**Qualitative.** Although the mothers were not specifically asked during the interviews about food parenting agency or influences on their food parenting behaviors, mothers did discuss these concepts multiple times while responding to other questions. The first survey included open-ended questions regarding current household food practices, such as “What is most important to you in feeding your family?” and “Are you feeding your family the way you want to feed your family? Please explain.” The second survey encouraged participants to reflect on the influences of their family members of origin in open-ended questions including “Tell me about things that your mother/father/siblings currently or previously have done to make you healthier?” From this, several mothers reflected on their own childhood food experiences.

**Quantitative.** Questions used in this analysis specifically explored food parenting behaviors as measured by the Family Nutrition and Physical Activity scale (FNPA) (Ihmels et
This 21-item measure assesses prevalence of children’s obesogenic behaviors within the home. This scale provides an indicator of food parenting behaviors occurring between parents and children. It includes questions about the type and frequency of food consumption, physical activity, sleep, media use, and family routines. Although not all questions directly refer to food practices, all wellness behaviors have been associated with obesity risk. A lower sum score indicates a greater prevalence of obesogenic behaviors among children within the home. Factor analyses during the development of the measure indicated that all items loaded onto a single factor and had internal consistency with reported reliability α = 0.72 (Ihmels et al., 2009).

Additional quantitative responses were explored to identify potential patterns helpful in understanding food parenting behaviors. Family level characteristics such as co-parent relationships (Abidin & Brunner, 1995), reported monthly household income, and number of household members were explored to contextualize food parenting agency patterns. Mother level characteristics were explored as well, including education, number of years in the U.S., acculturation (Isasi et al., 2015), experiences as Latina immigrants (Cavazos-Rehg, Zayas, Walker, & Fisher, 2006), personal financial well-being (Prawitz et al., 2006), and mental health (Ball, Burton, & Brown, 2009). These measures were included as potential descriptive factors in mixed methods analyses.

**Data Analysis**

**Qualitative.** The qualitative data were analyzed using the following procedures. First, the lead researcher reviewed transcripts and wrote analytic memos to track initial and continuing observations (Kuckartz, 2014). After thorough review, “lumping” style coding was used for all food parenting related situations (Saldaña, 2015). Following the “lumping” coding, two more specific codes were assigned to each food parenting related situations: one for stages of behavior change and one for perceived influences, as seen in Table 1, *Food Parenting Agency Codes*. 
‘Stages of behavior change’ codes included satisfaction with status quo, identify, plan, action, or satisfaction with change theoretically aligning with the Transtheoretical Model stages of pre-contemplation, contemplation, preparation, action, and maintenance, respectively. All situations received one ‘stage of behavior change’ code, assigned based on the closest stage described to long-term food parenting behavior change (Prochaska, 2013). ‘Perceived influences’ codes captured mothers’ perceptions of factors influencing their food parenting behaviors. Codes for ‘perceived influences’ initially aimed to capture parent, child, bidirectional, and contextual influences, but emergent codes were used to clarify influences (Kuckartz, 2014). Ultimately, ‘perceived influence’ codes included mother, child, bidirectional, father, or other family member, and context to capture all non-familial and community resources perceived to influence food parenting behaviors. As a behavior may have many distinct influences, each situation had potential for multiple coded perceived influences. Research team members reviewed transcripts, providing secondary coding for reliability comparison across five of the 21 mothers. Specific codes were defined and modified by the research team to clarify understanding (Kuckartz, 2014).

**Mixed methods.** Family profiles were then created for each mother based on the brief review of present day food parenting qualitative descriptions, frequency of qualitative codes for ‘stages of behavior change’ and ‘perceived influences’, and FNPA scores (Kuckartz, 2014; Miles et al., 2013). Similar techniques have been effective in identifying risk factors associated with obesity (Martinson et al., 2011). The research team explored similarities and differences between family profiles to reach consensus on emerging food parenting agency patterns (Kuckartz, 2014; Ojeda et al., 2011; Wolcott, 1994).

Finally, the initial family profile patterns were compared with additional mixed methods data to further contextualize findings. Specifically, family profile patterns were compared to
descriptions of mothers’ childhood food parenting experiences as well as family level and mother level quantitative variables. Coded simultaneously with present day food parenting descriptions, brief descriptions of mothers’ own childhood food parenting experiences were compared for similarities and differences with family profile patterns. Additionally, quantitative family and mother level variables were compared to family profiles to further contextualize food parenting patterns. Through peer debriefing, the research team refined characteristics and understanding of food parenting agency patterns emerging from the family profile analysis (Creswell, Plano Clark, Gutmann, & Hanson, 2003; Lietz, Langer, & Furman, 2006).

**Researcher Reflexivity**

As the lead researcher, my expertise is in family systems and public health nutrition. As a registered dietitian, I have first-hand experience with individual nutrition counseling as well as community nutrition programming. Specifically, I have experience developing and facilitating family-based obesity interventions for rural and Latino immigrant families. My conversational Spanish allowed me to review transcripts in both Spanish and English for clarity.

Additional research team members were consulted, with two serving as Principal Investigators for data collection efforts cited in this study. These researchers had content expertise in Latino public health, Latino immigrant families, and multi-generational family influences. Their methodological backgrounds in qualitative and mixed methods research also helped inform analysis. A constructivist lens would suggest that truth is a complex combination of subjective understanding of past and present objective experiences (McCaughtry, Fahlman, Martin, & Shen, 2011). This lens along with these professional backgrounds led us to explore how individuals acquire, understand, and practice food parenting behaviors with their children to better understand avenues for intervention.
Findings

The mixed-methods data revealed variations in mothers’ food parenting agency. Mothers described a range of familial and contextual influences as well as variety in stages of behavior change in food parenting behaviors. Despite many similar life circumstances of these rural, limited-income Latina immigrant mothers, patterns emerged through family profile analysis from food parenting perceptions, behaviors, stages of behavior change, and mothers’ own childhood experiences.

Stages of Behavior Change

Mothers described multiple stages of behavior change when discussing food parenting. While some mothers reported satisfaction with current food parenting behaviors, these situations were differentiated based on additional description of the food parenting situation. Descriptions varied, as some mothers described satisfaction with a behavior change they were maintaining or while others described satisfaction without identifying a change, suggesting satisfaction with the status quo. At least once in their descriptions of food parenting situations, all mothers identified desired food parenting behavior changes. Often, mothers continued on to describe additional stages of behavior change associated with that desired behavior change, such as a plan or action taken. Infrequently, mothers explicitly shared plans they had to make these food parenting changes. One mother described how “[she] would like to reduce the salt amount in [her] meals” and she plans to “use the least salt [she] can.” Mothers also described examples of food parenting behaviors they were currently taking action to address an identified concern. Another mother identified that she wanted her children to like the foods she cooked, so she took action:

“I have been attending some classes of nutrition and I’ve learned ways to cook vegetables in a way that they like to eat. For example, I make shapes like happy faces with the veggies and they think it is fun.”
**Perceived Influences**

Mothers discussed a range of perceived familial and contextual influences on their food parenting behaviors. When discussing present day food parenting related situations, they often described their own and their children’s perceived influences on behaviors. All except for two mothers perceived their own influence on food parenting situations and explicitly acknowledged their own action or lack of action in the home. One mother described seeing herself as the food parenting influencer: “I would like to not give them meat everyday.” Fewer mothers reported perceiving their children as influencing the food parenting behaviors. Another mother described her children as the influencers by stating, “They like frozen and junk foods and they eat them for snacks.” When describing food parenting, mothers also discussed bidirectional influences, using “we” or describing roles of multiple family members for that food parenting situation. Occasionally—when discussing the present day or childhood experiences—mothers described influences of additional family members’ needs, preferences, and behaviors including those of fathers, siblings, and grandparents.

When mothers were asked about their own parents’ influences on their current health, all described childhood food parenting interactions. Similar to their present day descriptions, mothers described perceptions of various family members’ influences on their own childhood food parenting experiences, including their own mothers, fathers, siblings, and grandparents. Multiple mothers recalled advice they had received from family members regarding how and when to eat foods. Other family members were described in more prominent roles when parents’ involvement was limited due to work or economic limitations. Bidirectional influences were described through interactions around food, from childhood experiences helping parents with food preparation to helping at the store or in the fields.
In addition to familial influences, all mothers perceived contextual influences on their past and present food parenting behaviors, such as community organizations as well as tangible and intangible resources. These influences included limited income, time, and limited access to affordable food options. Mothers often described reducing cost by eating in-season fruits and reducing meat intake. They also described childhood food parenting experiences with limited access to “junk” food options as well as experiences relying on neighbor-grown produce or homemade options. Many mothers spoke about present day desires to decrease oils or fats, reducing meat intake, and increasing fruit and vegetable intake. Some noted present day food parenting desires to reduce salt or “junk” foods, and many preferred fresh produce from their childhood vs. frozen food products available in their current food environment. Additionally, mothers discussed desired changes in meal preparation strategies and consistency in family rituals around mealtimes.

**Family Profiles: Food Parenting Agency Continuum**

Four subgroups were identified through family profile analysis to understand patterns in food parenting agency based on stages of behavior change, perceived influences, and frequency of obesogenic food parenting behaviors. The FNPA scores ranged from 35 to 63 with a mean score of 52.6 across the 21 participating mothers. These subgroups reflect a continuum of low, low moderate, high moderate, and high food parenting agency subgroups, as seen in Figure 1, *Food parenting agency continuum*. Mothers with the highest food parenting agency had efficacy to take or maintain desired actions, positive perceptions of their current food context, and the fewest reported obesogenic behaviors. Mothers with the lowest food parenting agency had few current actions and less perceived ability to overcome their contextual challenges.

**Low food parenting agency: “We eat according to the money we have.”** The mother quoted here had lived in the U.S. for 13 years with less than a high school education. She shared
that she feeds her children the best she can, but described that her family’s behaviors are limited by financial cost. Three mothers reported no current actions towards food parenting behavior change, but frequently identified desired food parenting behaviors or challenges. A variety of familial influences were described, but mothers with low food parenting agency most frequently reported contextual influences on their food parenting agency. Specifically, these mothers were most likely to discuss financial concerns as influencing their food parenting situations. Similarly, these mothers all described parental involvement limitations as barriers in their own childhood food parenting experiences. These mothers also had two of the lowest FNPA scores in the subsample, ranging from 35 to 50, indicating more obesity-related food parenting and children’s behaviors.

Two subgroups of mothers fell along the middle of the food parenting agency continuum with a variety of perceived familial and contextual influences. These mothers identified many desired behavior changes with few descriptions of actions. All of these mothers occasionally mentioned affordability challenges, but also mentioned challenges in food availability. The types of contextual availability challenges differed between subgroups.

**Low moderate food parenting agency: “I don’t like the lunch or breakfast they get in the school.”** This mother had immigrated to the U.S. 8 years prior and had technical training beyond her high school degree. Similar to other mothers in this subgroup, she discussed contextual challenges specific to available food options. The eight mothers in this group described frustration with readily available, inexpensive, high-calorie and low-nutrient foods including fast food, school meals, or “junk” foods. In addition, multiple mothers discussed a desire for food parenting knowledge and resources, identifying potential community sources of support, including nutrition educators, medical doctors, Women, Infants, and Children (WIC),
and Supplemental Nutrition Assistance Programs (SNAP). These mothers frequently identified desired food parenting behaviors or challenges, but also reported additional behavior change stages. These mothers less frequently described an action than those with high food parenting agency, but often identified at least one action towards or maintenance of food parenting behavioral goals. While a variety of familial influences were identified with limited frequency, mothers consistently reported themselves as influences in at least two to three food parenting situations. The FNPA scores of these mothers had a wider range of reported obesogenic behaviors for the subsample, from 45.65 to 58.

**High moderate food parenting agency:** “We had a hard time trying to find Mexican stores and the ingredients for the food I know how to cook.” This mother had immigrated to the U.S. over 15 years prior with three adults and three children in the home, and she described challenges both affording and locating desired food ingredients for traditional meals. Three mothers, with midrange FNPA scores for this subsample ranging from 49 to 50, more frequently reported actions or maintenance of actions towards food parenting healthy behavior change. Additionally, they had fewer food parenting situations classified as only in the identification stage compared to other mothers below the average FNPA score. While these mothers still described contextual challenges, they were in reference to availability of desired foods within their community. Mothers in this group specifically identified general desires for healthy food selection and preparation, but coupled this with challenges related to child food preferences.

**High food parenting agency:** “In this country I have the resources to eat better, we can buy more vegetables.” This mother had been living in the U.S. for 12 years without completing high school, three other adults and three children lived in her home, and she had the highest reported FNPA score of 63. She also shared how she had changed her diet based on
information from local community nutrition classes, stating, “We eat more vegetables than meat, we used to eat more meat when we were in Mexico.” Seven mothers were classified as having high food parenting agency. Though these mothers identified desired food parenting behaviors, they also described taking action or satisfaction with previous behavior changes. Three mothers identified specific sources where they could or had sought food parenting knowledge and skills. All mothers in this group described their food parenting situations in the U.S. as at least the same or improved food experiences in the US than they had prior to immigration. These mothers had the highest FNPA score range for this subsample, with scores ranging from 55 to 63, therefore reporting fewer obesogenic food parenting behaviors in the home.

Contrary to those with low food parenting agency, only one mother described limited maternal involvement from her childhood, which was a result of her mother’s mental health challenges. Additionally, though all of the mothers in the sample described financial contextual limitations in their childhood, the mothers with high food parenting agency also described their childhood families’ actions to adapt. One mother who had been in the U.S. for 10 years described her parents’ behaviors and advice when interacting with her around food during her childhood in Mexico. She described parental adaptations to promote healthy behaviors despite contextual limitations:

“[Our mother] would cook for us and make us homemade tortillas. We never ate meat because we never had it, but we did have beans, fish, rice, and salsa. Those were the only things we ate to be well. [Our father] would always say that it was best to eat what he would make over eating other things off the streets.”

**Discussion and Implications**

A food parenting agency paradigm and the Transtheoretical Model suggest that food parenting behaviors are influenced by internal, interpersonal, and contextual factors. This study
focused specifically on Latina immigrant mothers with low incomes currently living in rural U.S. communities, as these unique life experiences have often been underrepresented in research (George et al., 2014). Because mothers often play a prominent role in nutrition gatekeeping and food parenting with young children in the home, these mothers were well positioned to reflect on their current and past experiences (Maher et al., 2010; Savage et al., 2007; Schmalzbauer, 2011). Through family profile analysis, four patterns emerged from low to high food parenting agency. Findings suggest future research and practice needs related to mother’s variations in stages of behavior change and perceived influences. While few trends emerged in family and mother level characteristics in connection to food parenting agency, findings indicate that childhood experiences of parents may continue to shape present day profiles and should also be considered in future research and practice.

**Stages of Behavior Change**

As the Transtheoretical Model suggests, behavior change is a complex process (Prochaska, 2013). Although these findings do not explore the process of change, patterns suggest connections between parental behavior and stages of behavior changes along the food parenting agency continuum. Specifically, patterns emerged between mothers reported obesogenic behaviors through FNPA scores and coded stages of behavior change across the continuum. The connection between behaviors and stages of behavior change may indicate mothers with lower food parenting agency may benefit from professional facilitation through the behavior change processes.

Along the continuum, patterns indicate mothers had varied perceptions of how this new food environment influences their behaviors. These patterns progressed from mothers’ perceived difficulty meeting basic food and financial needs, to challenges with available resources, to perceptions of successfully meeting food parenting needs. Supporting previous expert
suggestions for longitudinal or observational study of food parenting (Hughes et al., 2013), these findings suggest future research should confirm directionality of influence between perceptions, behavior change, and ultimately behaviors.

**Perceived Influences**

Potentially related to self-efficacy from the Transtheoretical Model and the Food Agency Paradigm integration of internal and external influences, patterns in perception aligned with behaviors (Prochaska, 2013; Trubek et al., 2017). While mothers with mixed food parenting agency were less concerned about financial subsistence compared to those with low food parenting agency, they still described contextual challenges specific to navigating their new food environment. As obesogenic behaviors were less frequently reported in the home, mothers may have more confidence in their abilities and have higher frequency of taking action or utilizing resources to navigate their food environment. Further research is needed to understand how perceptions influence or are influenced by behaviors and stages of behavior change.

**Family and Mother Level Characteristics**

Both the Transtheoretical Model and Food Agency Paradigms suggest the potential influences of external factors on food parenting behaviors. In addition to behaviors with higher obesity risk, family and mother level characteristics have also been linked to obesity, such as socioeconomic conditions, acculturation, and time spent in the U.S. (Creighton et al., 2012; Ihmels et al., 2009; Johnson et al., 2012; Lindsay, Sussner, Greaney, & Peterson, 2009). In support of this research, mothers identified many of these contextual factors in their food parenting situations such as financial resources, desire for increased knowledge, and access to desirable and undesirable resources. In contrast, no specific patterns were found in alignment with the food parenting agency continuum. Thus, perception of these individual, family, and contextual influences may be more aligned with behaviors than quantitative measures of
resources for these Latina immigrant mothers. Future research should explore if similar patterns exist across a broader population or wider ranges of family and mother level characteristics.

** Childhood Experiences **

The food parenting agency continuum may be related to unique life experiences of immigrant families living in rural communities. This agency may also be, in part, influenced by family members of origin (Bowen & Devine, 2011). Beyond suggesting experiences with mothers and grandmothers, current findings suggest food parenting agency has patterns reflecting mothers’ own childhood food parenting experiences. Specifically, mothers with current high food parenting agency reported more childhood food parenting experiences that involved action and adaptation. Alternatively, mothers with low food parenting agency reported limited parental influence in their childhood. These findings support the influence of perception as well as family relationships on behaviors across generations. Future research should continue exploring long-term family influences on food parenting patterns.

** Strengths and Limitations **

Several strengths and limitations of this study should be recognized. Specifically, the study findings provide deeper insight into food parenting agency variations within an often high-risk and underserved rural immigrant population. These findings may directly inform food parenting and obesity prevention efforts. However, population size, rates of immigration, economics, and local food environment can widely vary across U.S. communities. Thus, Latina immigrant mothers in different community environments have potentially unique supports and challenges providing external food parenting influences. Further research is needed to determine the transferability of these food parenting agency patterns for Latino immigrant families and others living with various resources associated with rurality and socioeconomic status.
Additionally, a strength of this analysis is that it provides new directions for exploration of influences on food parenting. This mixed methods study provides deeper insights into food parenting agency by identifying patterns in perceptions and practices across a spectrum of current obesogenic behaviors. These findings also suggest several areas for future research. The study of food parenting behaviors may benefit from observational, longitudinal, and multiple reporter methodologies to better understand complex influences (Hughes et al., 2013). In the current study, mothers were not asked directly about food parenting. If these questions were asked, mothers may have provided alternate insights and connections. Future researchers should consider the inclusion of direct questions regarding food parenting influences.

**Implications**

Food parenting behaviors cannot be viewed in isolation. The findings in this study indicate it is necessary to consider patterns of stages of behavior change, perceptions, and childhood experiences in policy and practice. At a time when innovative policy and public health intervention is needed to turn back the tides of the obesity epidemic, it is imperative to continue exploring the food parenting agency continuum. Local policies and organizations can support food parenting agency by reducing contextual challenges in rural communities. Specifically, in rural communities that include increasingly diverse families, local efforts may aim to assist families by providing financial supports, diversifying food selections, increasing access and public transportation to food resources, or working to make the healthy choice the easy choice. In addition, research should specifically aim to understand effective intervention strategies to promote food parenting agency within culturally diverse, rural, low-income communities. Supporting research on family or parent-centered obesity prevention, development, and modification of interventions must consider the complex nature of food parenting agency (Davison et al., 2013). Further development of family and community obesity
prevention policies and programs can move individuals, families, and communities towards fewer obesity related behaviors and improved health outcomes.

References


doi:10.1016/j.appet.2017.05.017

Table 1.  
*Food Parenting Agency Codes*

<table>
<thead>
<tr>
<th>Final Code (Previous Codes)</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td><strong>Stages of Behavior Change</strong></td>
<td></td>
</tr>
<tr>
<td>Satisfied with status quo (no concern)</td>
<td>The respondent states an absence of food parenting problem, challenge or goal, or states they are pleased with current behaviors, without identifying a food parenting problem, challenge, or goal.</td>
</tr>
<tr>
<td>Identify</td>
<td>The respondent states a problem, challenge or goal related to a food parenting situation.</td>
</tr>
<tr>
<td>Plan</td>
<td>The respondent states a strategy they might use to address the identified food parenting problem, challenge or goal.</td>
</tr>
<tr>
<td>Action</td>
<td>The respondent states what they are doing or previously did to address the identified food parenting problem, challenge or goal.</td>
</tr>
<tr>
<td>Satisfied with change (no concern)</td>
<td>The respondent states a food parenting problem, challenge or goal that they perceive to be resolved.</td>
</tr>
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<tr>
<th><strong>Perceptions of Influences</strong></th>
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<tbody>
<tr>
<td>Mother Driven (parent driven)</td>
<td>A food parenting situation where the respondent perceives they or their mother might, should, or do/did have the power to change or maintain a food behavior (grandmother coded as mother in descriptions of childhood experiences)</td>
</tr>
<tr>
<td>Child Driven</td>
<td>A food parenting situation where the respondent perceives the child might, should, or do/did have the power to change or maintain a food behavior, without also describing a parent’s power in the situation (respondent coded as child in descriptions of childhood experiences)</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>A food parenting situation where the respondent perceives both the parent and child are contributors to behaviors, includes referring to both parties or saying “we”</td>
</tr>
<tr>
<td>Context Driven</td>
<td>A food parenting situation where a mother perceives as an outside force (excluding other family members) impacting their food habits, often that they don't have the power to change or maintain a food behavior</td>
</tr>
<tr>
<td>Father or Other Family Member Driven (parent driven)</td>
<td>A food parenting situation where the respondent perceives a father or other family member might, should, or do have the power to change or maintain a food behavior</td>
</tr>
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Figure 1.  *Food parenting agency continuum.*
CHAPTER 5. GENERAL CONCLUSION

General Discussion

The overall purpose of this dissertation was to explore and further understand the associations between family relationships and children’s obesogenic behaviors among rural, low-income families, specifically Latino immigrant families. This dissertation examined data that were collected as part of the multi-state Rural Families Speak about Health Project and the associated Iowa Latino Family Project. One study in this dissertation utilized quantitative data for analysis, and the other study utilized both quantitative and qualitative data for a mixed methods research design. Together, these studies provide rich complementary insights into family and contextual factors that promote or inhibit children’s obesogenic behaviors. Two broad research questions were examined in order to enhance the understanding between family systems, contextual factors, and obesogenic behaviors within the home. The first broad research question in Chapter 3 explored how family relationships influence children’s obesogenic behaviors in the home among Latino immigrant and White families living in rural communities with low household incomes. The second broad research question in Chapter 4 explored food parenting agency in relation to household obesogenic behaviors among Latina immigrant mothers who had low household incomes and who lived in rural U.S. communities. Findings from these two studies suggest the complexity of childhood obesity risks in connection with family and context, as well as the continued need for family-based, culturally sensitive prevention efforts.
Theoretical Frameworks

Both Family Systems Theory and Bronfrenbrenner’s Ecological Systems Theory (Cox & Paley, 2003; Davison, Jurkowski, & Lawson, 2013) provide a framework for understanding family and contextual factors associated with obesogenic behaviors. The Ecological System Theory indicates the interconnection of individual, interpersonal, and contextual influences on obesogenic behaviors (Davison et al., 2013). Similarly, the Family Systems Theory posits that family subsystems bidirectionally influence one another’s behaviors. Findings from Chapters 3 and 4 support this framework. In particular, the findings highlight the importance of co-parents, broad family subsystems, context, and specifically identification as a Latina immigrant in understanding food parenting agency and children’s obesogenic behaviors.

Co-parents

Affirming findings from previous studies that demonstrated parents are key gatekeepers to children’s early obesogenic behaviors (Bornstein & Sawyer, 2006; Savage, Fisher, & Birch, 2007), findings from both of the studies in this dissertation revealed associations between parents’ and children’s obesogenic behaviors. In Chapter 4, mothers across the food parenting agency continuum described situations in which both parents and children were instrumental in shaping obesogenic behaviors. Mothers also described childhood experiences where both of their parents provided advice, resource supports, and bidirectional interactions around food. Although not frequently discussed when sharing examples of present day food parenting behaviors, mothers did occasionally mention fathers as perceived influencers of food parenting behaviors. Additionally, Chapter 3 built on previous findings, suggesting co-parent relationships were associated with these obesogenic behaviors. More specifically, the perceived respect between a mother and her co-parent was found to have more relative importance than perceived teamwork and communication in predicting these obesogenic behaviors. The perceived
influence of parents as well as associations with co-parent relationships demonstrate parents potentially shape children’s obesogenic behaviors in multiple complex ways. Further research should explore how co-parents navigation of their relationship and general parenting roles may carry over to directly or indirectly influence children’s obesogenic behaviors in the home.

**Larger Family Network**

This dissertation expands on previous research that has examined associations between family members and obesity by exploring broad family subsystems and obesogenic behaviors. Previous findings indicated that family systems influence mealtime interactions, diet quality, and youth weight status (Boutelle, Birnbaum, Lytle, Murray, & Story, 2003; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003). The multiple family subsystems relationship variables included in this analysis (e.g., co-parent respect, number of adults, number of children under 13 years old, presence of extended family), predicted 26.9% of the adjusted variation in children’s obesogenic behaviors in the home. Although Latina immigrant mothers only infrequently reported non-primary caregivers as perceived influencers of present day food parenting behaviors in Chapter 4, siblings and grandparents were regularly discussed as influencers in mothers’ own childhood experiences. Additionally, Chapter 3 findings indicated an association between additional household family members and obesogenic behaviors that occurred in low-income, rural homes. As more respect between co-parents suggests consistent or aligning food parenting strategies support fewer obesogenic behaviors, more adults in the home may contribute to less alignment in adult-child food related interactions. These additional adults may constitute “too many cooks in the kitchen” in modeling or supporting consistent children’s behaviors.
Findings from Chapter 3 indicated that as the number of siblings in a household increased, the prevalence of obesogenic behaviors among children decreased. In contrast, as the number of adults in the household increased, the prevalence of obesogenic behaviors among children increased. Similarly, mothers with high food parenting agency patterns also tended to have more children in the home. With more children in the home, family subsystems interactions may be more consistent and supportive of efforts to reduce obesogenic behaviors. These findings strongly support that broad family subsystems, including all specific family member and child subsystem relationships, should be considered potentially influential to obesogenic behaviors.

Context

Dissertation findings also confirm the importance of context in understanding obesogenic behaviors. Contextual risk factors such as low household income and geographic distance from resources have consistently been shown to contribute to obesity among rural residents (Befort, Nazir, & Perri, 2012; Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007). While household food security only approached significance in association with household obesogenic behaviors in Chapter 3, mothers described contextual factors that they perceived influenced their food parenting behaviors in Chapter 4. Specifically, mothers described financial challenges and limited access to desired food resources. While most mothers described multiple contextual challenges, mothers with high food parenting agency reported that the U.S. provided them similar or better resources than their countries of origin. Similarly, mothers who were characterized as having high food parenting agency described childhood experiences where they perceived their own parents had adaptive behaviors to address contextual challenges. Subjective perceptions of influence should be further compared to objective measures of common contextual food-related factors, such as accessibility and affordability, to further understand
mechanisms influencing food parenting agency patterns. Findings across studies indicate that real or perceived context should be considered as potential influences on obesogenic behaviors.

**Identification as a Latina Immigrant**

Both studies in this dissertation highlight the significance of mothers’ identification as Latina immigrants in connection to family relationships and obesogenic behaviors. As previous findings have revealed, Latina immigrant mothers commonly faced challenges of balancing both traditional and new community food practices (Buscemi, Beech, & Relyea, 2011; Greder, Slowing, & Doudna, 2012). In Chapter 3, whether mothers identified as Latina immigrants or White contributed significantly to the association between family systems and household behaviors. Specifically, identification as a Latina immigrant was a significant moderator in the association pertaining to the number of adults and obesogenic behaviors. Additionally in Chapter 4, mothers frequently reported desires to carry out traditional food practices that they stated were healthier for their families. Mothers also described experiences during their childhoods with family members that aligned with patterns in current food parenting behaviors. The intersection of cultural influences, specifically related to adult roles in the home, childhood experiences in a different food environment, and navigation of a new food environment may contribute to variations seen in obesogenic behaviors for immigrant Latino families. Overall, identification as a Latina immigrant strongly influenced food parenting and children’s obesogenic behaviors.
**Strengths and Limitations**

Analysis of secondary data has limitations and strengths (Cheng & Phillips, 2014). Mixed purposive sampling allowed for the exploration of family health issues among populations that can be difficult to reach and who are often under-represented in research (Mammen & Sano, 2012). Generalizability was not the primary aim of this data collection; rather, Latino immigrant families were specifically recruited to more deeply understand their experiences in rural communities. Since the data has already been collected, exploration is limited to the responses that participants provided based on the questions they were asked. Data analyzed for this dissertation is limited to the mothers’ self-reported experiences, as opposed to observational data or multiple respondents that may provide alternate representations of behaviors. Previous studies suggest that the mother is the primary gatekeeper for many household food parenting behaviors. However, data from multiple family members could be helpful to provide a more holistic picture of processes within a family related to obesogenic behaviors among children. Longitudinal patterns, connecting childhood experiences to present day food parenting agency, were limited to mothers’ recollections. Through data-driven and research-question driven analyses, this dissertation provided exploratory mixed methods understanding of obesogenic behaviors within the home (Cheng & Phillips, 2014). Future research may be strengthened through additional data collection strategies to understand how behaviors are developed and maintained over time.

**Recommendations for Future Research and Practice**

To inform practice, future research should build on this exploratory study to more fully understand the complexity of factors related to child obesogenic behaviors among under-represented families (Wang, Moss, & Hiller, 2005). Specifically, scholars should explore influences of familial and contextual factors both broadly and deeply among populations facing significant health disparities, such as rural, low-income families, and Latino immigrant families.
This exploratory dissertation points to family as a potential point of intervention for promoting healthy behaviors among young children. It may also be important to identify critical timing within the family systems interactions to effectively promote fewer obesogenic food parenting behaviors. Research should also focus on the roles of all family members, but particularly roles of non-primary caregivers, in order to identify strategies for engaging these individuals in health promotion efforts in the home. Larger sample sizes are needed to more fully capture whether specific types of family relationships (e.g., relationships with aunts or uncles, with older or younger siblings, etc.) may be more or less influential in shaping children’s behaviors. Further, longitudinal study may allow for more fully understand influences of family and contextual transitions (e.g., co-parent separation and immigration, respectively) on obesogenic behaviors over time. Future research should develop a deeper understanding of family member and child relationships in association with obesogenic behaviors to determine the most effective areas for health promotion within the family subsystem.

Family-based obesity prevention programs are widely suggested and occasionally attempted, however, they are often limited in scope to the parent-child family subsystem (Berry et al., 2004; Kitzmann & Beech, 2011; Nowicka & Flodmark, 2008). Based on findings in this dissertation, broader family systems influences on obesogenic behaviors among children should be considered in the development of programs intended to reduce or prevent obesity. This may mean incorporating the entire family unit in a program or tailoring a program to incorporate specific family members. A recent study of Latina mothers found differences between mothers’ and fathers’ food parenting preferences and practices, therefore suggesting implications for nutrition education with Latino families (Lora, Cheney, & Branscum, 2017). Family-based programming may also include working with individuals to understand the influences of family
systems through perceived roles, past family food experiences, and identifying influences of interactions between multiple subsystem members. Findings on the importance of identification as Latina immigrants and contextual resources, both studies in this dissertation suggest considering culture, lived experiences, contextual challenges, and family values when tailoring family-based obesity prevention programs as well. Future research should continue to explore the most effective family-based behavior change strategies that address familial and contextual influences on obesogenic behaviors.

Findings from this dissertation suggest that practitioners should attempt to implement broader family systems approaches when addressing obesogenic behaviors in the home. Specifically, practitioners should move beyond helping individuals gain knowledge and skills to prevent child obesity; they should also consider family and contextual factors that may influence obesogenic behaviors into programming through professional development as well as through incorporating these influences directly into programming.

Professional development may include understanding theoretical and practical familial influences. Familiarity with the Ecological System Theory as well as Family Systems Theory may be helpful to practitioners to further understand the influence of family systems on child obesogenic behaviors. Specific training for nutrition professionals may pertain to understanding bidirectional family member interactions and their potential influences on early childhood development and behaviors. Future training may also test or incorporate effective family-based obesity prevention programming strategies.

Additionally, as further evidence-based programming strategies for Latino families are developed, professionals can incorporate and engage all family members and contextual backgrounds more fully in current obesity programming. This may include inviting all family
members to attend programming to promote family level cohesion and understanding of familial roles in for nutrition behaviors. If not all family members can attend programming or it is tailored for only specific family members, professionals may consider having those individuals at least reflect on the roles that family members play in past and present nutrition behaviors. It may be particularly important in Latino immigrant families to consider the roles of all primary care giving and non-primary caregiving adults in the home to identify how they might impacting obesogenic behaviors. Through exploring family and contextual influences on children’s obesogenic behaviors, researchers and practitioners alike can better identify strategies for reducing obesity risk among children.
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doi:10.1016/j.appet.2017.05.017


doi:10.1038/oby.2008.398


doi:10.1093/heapro/dai025


doi:10.1001/archpedi.162.10.994

## APPENDIX A. FAMILY NUTRITION AND PHYSICAL ACTIVITY (FNPA) SCREENING TOOL QUESTIONS

Table A1.
*Family Nutrition and Physical Activity (FNPA) Screening Tool Questions*
*(Ihmels, Welk, Eisenmann, & Nusser, 2009)*

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now I'm going to ask you some questions about your family and community.</td>
<td>Yes</td>
</tr>
<tr>
<td>In a typical week; Do you restrict how much your child eats potato chips,</td>
<td>No</td>
</tr>
<tr>
<td>cookies, and candy?</td>
<td></td>
</tr>
<tr>
<td>In a typical week; Do you have a routine or schedule for bedtime for</td>
<td>Less than 8 hours</td>
</tr>
<tr>
<td>your child?</td>
<td>8-9 hours</td>
</tr>
<tr>
<td>How many hours of sleep does your child usually get each night?</td>
<td>9-10 hours</td>
</tr>
<tr>
<td>How many hours of television does your child usually watch?</td>
<td>More than 10</td>
</tr>
<tr>
<td>How many hours does your child spend on the computer or video games?</td>
<td></td>
</tr>
<tr>
<td>Does your family eat dinner while watching television?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does your child have a television in his or her bedroom?</td>
<td>No</td>
</tr>
<tr>
<td>Do you monitor the amount of television your child watches?</td>
<td></td>
</tr>
<tr>
<td>How often does your child eat breakfast?</td>
<td>Almost never</td>
</tr>
<tr>
<td>How often does your family eat at least one meal together each day?</td>
<td>Sometimes</td>
</tr>
<tr>
<td>How often does your family eat fast food during the week?</td>
<td>Often</td>
</tr>
<tr>
<td>How often does your family eat fruits and/or vegetables with your main</td>
<td>Almost always</td>
</tr>
<tr>
<td>meal?</td>
<td></td>
</tr>
<tr>
<td>How often do you use prepackaged foods (like frozen pizza) for your main</td>
<td></td>
</tr>
<tr>
<td>meal?</td>
<td></td>
</tr>
<tr>
<td>How often does your family freshly prepare food (like chicken, pasta) for</td>
<td></td>
</tr>
<tr>
<td>your main meal?</td>
<td></td>
</tr>
<tr>
<td>How often does your family drink soda pop or Kool-Aid at snacks and</td>
<td></td>
</tr>
<tr>
<td>meals?</td>
<td></td>
</tr>
<tr>
<td>How often does your family participate in at least 30 minutes of physical</td>
<td></td>
</tr>
<tr>
<td>activity per day?</td>
<td></td>
</tr>
<tr>
<td>How often does your family drink 100% fruit juice or low fat milk at</td>
<td></td>
</tr>
<tr>
<td>snacks and meals?</td>
<td></td>
</tr>
<tr>
<td>How often does your family play games outside, ride bikes or walk</td>
<td></td>
</tr>
<tr>
<td>together?</td>
<td></td>
</tr>
<tr>
<td>How often does your child participate in physical activity during their</td>
<td>0 to 1 sports</td>
</tr>
<tr>
<td>free time?</td>
<td>1-2 sports</td>
</tr>
<tr>
<td>In the past year; Has your child participated in organized sports with</td>
<td>3-4 sports</td>
</tr>
<tr>
<td>a coach or leader (e.g. soccer) or in organized group activities</td>
<td>5 or more sports</td>
</tr>
<tr>
<td>involving physical activity (e.g. swim lessons)?</td>
<td></td>
</tr>
<tr>
<td>In a typical week: Do you use food as a reward for good behavior?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>
Reference

APPENDIX B. CHAPTER 3 PARENTING ALLIANCE INVENTORY (PAI) QUESTIONS

Table B1.
*Chapter 3 Parenting Alliance Inventory (PAI) Questions*

*(Abdin & Brunner, 1995)*

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>The child enjoys being alone with other primary caregiver</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>During pregnancy or the adoption process, the other primary caregiver</td>
<td>Agree</td>
</tr>
<tr>
<td>expressed confidence in my ability to be a good parent.</td>
<td>Not sure how I feel</td>
</tr>
<tr>
<td>When there is a problem with the child, we work out a good solution</td>
<td>Disagree</td>
</tr>
<tr>
<td>together.</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>The other primary caregiver and I communicate well about the child.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver is willing to make personal sacrifices to</td>
<td></td>
</tr>
<tr>
<td>help take care of the child.</td>
<td></td>
</tr>
<tr>
<td>Talking to the other primary caregiver about our child is something I</td>
<td></td>
</tr>
<tr>
<td>look forward to.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver pays a great deal of attention to the child.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver and I agree on what our child should and</td>
<td></td>
</tr>
<tr>
<td>should not be permitted to do.</td>
<td></td>
</tr>
<tr>
<td>I feel close to the other primary caregiver when I see him or her play</td>
<td></td>
</tr>
<tr>
<td>with the child.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver knows how to handle children well.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver and I are a good team.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver believes I am a good parent.</td>
<td></td>
</tr>
<tr>
<td>I believe the other primary caregiver is a good parent.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver makes my job of being a parent easier.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver sees the same way I do.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver and I would basically describe the child</td>
<td></td>
</tr>
<tr>
<td>in the same way.</td>
<td></td>
</tr>
<tr>
<td>If the child needs to be punished, the other primary caregiver and I</td>
<td></td>
</tr>
<tr>
<td>usually agree on the type of punishment.</td>
<td></td>
</tr>
<tr>
<td>I feel good about the other primary caregiver’s judgement about what is</td>
<td></td>
</tr>
<tr>
<td>right for the child.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver tells me I am a good parent.</td>
<td></td>
</tr>
<tr>
<td>The other primary caregiver and I have the same goals for the child.</td>
<td></td>
</tr>
</tbody>
</table>

**Reference**

APPENDIX C. CHAPTER 3 RELIABILITY OF STUDY MEASURES

Table C1.
*Chapter 3 Reliability of Study Measures (N = 147)*

<table>
<thead>
<tr>
<th>Measures</th>
<th>Latino (n=70)</th>
<th>White (n=77)</th>
<th>Full Sample</th>
<th>Previous Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNPA (dependent variable)</td>
<td>0.66</td>
<td>0.68</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Ihmels et al., 2009)</td>
</tr>
<tr>
<td>PAI Respect (independent variable)</td>
<td>0.67</td>
<td>0.88</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>PAI Team/Communication (independent</td>
<td>0.88</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>variable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Food Security (control variable)</td>
<td>0.71</td>
<td>0.86</td>
<td>0.84</td>
<td>0.74 to 0.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Keenan, Olson, Hersey, &amp; Parmer, 2001)</td>
</tr>
</tbody>
</table>
## APPENDIX D. CHAPTER 3 COMPARISON OF MEANS FOR STUDY VARIABLES

Table D1.  
*Independent Samples Tests*

<table>
<thead>
<tr>
<th></th>
<th>Latino Immigrant (n = 70)</th>
<th>White (n = 77)</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>FNPA</td>
<td>52.9</td>
<td>6.0</td>
<td>56.2</td>
</tr>
<tr>
<td>Partner</td>
<td>0.3</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Grandparent</td>
<td>0.2</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Adult Child</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Other Extended</td>
<td>0.2</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Family Member</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

* + P < 0.10, * P < 0.05, ** P < 0.01, *** P < 0.001

Table D2.  
*Multiple Analysis of Variance Tests*

<table>
<thead>
<tr>
<th></th>
<th>Latino Immigrant (n = 70)</th>
<th>White (n = 77)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>MANOVA 1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAI Respect</td>
<td>14.0</td>
<td>2.0</td>
<td>13.5</td>
</tr>
<tr>
<td>PAI</td>
<td>79.3</td>
<td>8.4</td>
<td>73.6</td>
</tr>
<tr>
<td>MANOVA 2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of children</td>
<td>1.9</td>
<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>under 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of adults</td>
<td>1.7</td>
<td>1.2</td>
<td>1.4</td>
</tr>
</tbody>
</table>

* + P < 0.10, * P < 0.05, ** P < 0.01, *** P < 0.001
### APPENDIX E. CHAPTER 3 CORRELATIONS BETWEEN MEASURES

Table E1.  
*Chapter 3 Correlations Between Measures*

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FNPA</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Food Security</td>
<td>.063</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Latino Immigrant</td>
<td>-.289**</td>
<td>.278**</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. PAI Teamwork and Communication</td>
<td>.161</td>
<td>.120</td>
<td>.244**</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. PAI Respect</td>
<td>.257**</td>
<td>.121</td>
<td>.119</td>
<td>.753**</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. # of children under 13</td>
<td>.290**</td>
<td>-.080</td>
<td>-.054</td>
<td>.029</td>
<td>.044</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>7. # of adults</td>
<td>-.323**</td>
<td>-.048</td>
<td>.155</td>
<td>.061</td>
<td>-.026</td>
<td>-.177*</td>
<td>1</td>
</tr>
</tbody>
</table>
APPENDIX F: CHAPTER 3 ASSUMPTIONS TEST FOR REGRESSION ANALYSIS

a)

![Normal P-P Plot of Regression Standardized Residual](image1)

Dependent Variable: fullFNPA

b)

![Scatterplot](image2)

Dependent Variable: fullFNPA

Figure F1. Assumptions test for regression analyses.
1. What is most important to you in feeding your family?

2. Are you feeding your family the way you want to feed your family (yes/no)? Please tell me about this.

3. How, if at all, have the foods you and/or your children eat changed since you came to the U.S.?

4. What changes, if any, would you like to see in the kinds of foods you and/or your children eat?
APPENDIX H. CHAPTER 4 SAMPLE OPEN-ENDED QUESTIONS FROM SECOND INTERVIEW

1. Tell me about things that your mother currently or previously have done to make you healthier?

2. Tell me about things that your father currently or previously have done to make you healthier?

3. Tell me about things that your siblings currently or previously have done to make you healthier?
APPENDIX I. CHAPTER 4 SAMPLE OF ANALYTIC MEMOS

Entry A

Early thought and theory exploration
Life course theory of papers/ family system

1. Parenting Alliance Measure (PAI)/FNPA= Early life family structure influencing health behavior development
2. Family mealtime= midlife reflection on past family influence and current influence on children
3. Family health= midlife adult intergenerational structural influences (outside the home) on health behaviors currently

Family system theory
- All intergenerational structural family roles could be influencing an individual current behavior and any changes they may or may not end up making
- These are a web of family relationship that cannot be looked at as simply separate bidirectional interactions in a vacuum
- Includes parent-child relations and youth sibling relations, but goes beyond that
- Family can be broadly or narrowly defined
  - Define family of origin
  - Define immediate family
  - Define extended family- may be defined different by cultural avenues
- Similarly, on a larger scale, the family component is one variable in the larger ecological system of factors at different broad and narrow levels influence a person’s health behaviors

Entry B

Exploring methodological assumptions
- no single truth-- what is true (epistemology)
- How do I examine what is real (Methodology)-- Qual and quan working together
  - context of study is important
  - details before generalizations (can I make generalizations first and then explore the details to break it down→ when is this accurate and when is it not)
- nutrition science= positivist, but we struggle more with how to create behavior change from a positivist stance
  - bias- role of values (axiology)
  - can I limit distance between myself and participants?
    - does this simple mean listening to their stories and respecting and acknowledging different realities
    - not “solving their problems” but “understanding their situation, to best build on strengths to improve well-being in a way that is acceptable to them”
Plan for coding and analysis

1) Review key transcripts for familiarity and coming to consensus on main categories/initial sub-categories to code. Proposed categories for both T1 (present) and T4 (past) as follows:

- **Who**: Which family members are being described as providing support
- **What Support**: What type of support is that family member described as providing
- **What Food**: What type of food does the mother describe consuming or not
- **Perceived Parental Agency**: How does mother perceive her parent’s/ her own food parenting power in light of contextual barriers (poverty, access to desired foods, knowledge)- specifically perception of ability to overcoming barriers

I have ideas for sub categories/codes for all of these and some are pretty straight forward I think, but will connect with you first before adding these! The codes currently in the MAXQDA file were used at least initially for some other papers/presentations- so some will relate nicely as a starting point for us while others may not apply at all.

2) Code for main categories and initial sub-categories *(We can separate these into two steps if needed for additional review/revision of codes. I plan to code all transcripts within the ultimate sample, and have Co-Majors review for consistency.)*

3) I will create a thematic profile matrix for qualitative text analysis *(Kuckartz, 2014)*

<table>
<thead>
<tr>
<th></th>
<th>Who and what support</th>
<th>What food</th>
<th>Parent agency</th>
<th>Used for analysis of question 3</th>
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<tr>
<td><strong>Family 1</strong></td>
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<td></td>
<td></td>
<td>Present case summary family 1</td>
</tr>
<tr>
<td><strong>Family 2</strong></td>
<td></td>
<td></td>
<td></td>
<td>Present case summary family 2</td>
</tr>
<tr>
<td><strong>Family 3</strong></td>
<td></td>
<td></td>
<td></td>
<td>Present case summary family 3</td>
</tr>
</tbody>
</table>

*Used for analysis of question 2* Present category summary Present category summary Present category summary

4) I will meet with you to discuss any discrepancies or concerns as well as keep touching base with you to get your input as I write up findings and discussion for this article!
## APPENDIX J. CHAPTER 4 EXCERPT FROM FAMILY PROFILES

Table J1.  
*Excerpt from Family Profiles*

<table>
<thead>
<tr>
<th>ID</th>
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<th>Stages of Behavior Change</th>
<th>Perceived influencers</th>
<th>Food parenting Present Day</th>
<th>Food Parenting Past</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Satisfied status quo</td>
<td>Satisfied with action</td>
<td>Taking action</td>
<td>Plan</td>
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<tr>
<td>ID</td>
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<tr>
<td></td>
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</tbody>
</table>
APPENDIX K. INSTITUTIONAL REVIEW BOARD APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Date: 8/11/2015
To: Dr. Kimberly Greder
1086 LeBaron Hall

CC: Dr. Megan Gilligan
1356 Palmer

From: Office for Responsible Research

Title: Rural Families Speak About Health

IRB ID: 10-321

Approval Date: 8/7/2015

Date for Continuing Review: 8/6/2016

Submission Type: Continuing Review / Modification

Review Type: Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

Use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.

Retain signed informed consent documents for 3 years after the close of the study, when documented consent is required.

Obtain IRB approval prior to implementing any changes to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.

Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Stop all research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.

Complete a new continuing review form at least three to four weeks prior to the date for continuing review as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. Approval from other entities may also be needed. For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.