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EDUCATION

PhD   Candidate, University of Maryland, Baltimore
           Dissertation: Food environment and family food insecurity: Store type and
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MSSW   2006, University of Tennessee, Knoxville, TN
           Management and Community Practice Curriculum
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BSW   2001, Shippensburg University, Shippensburg, PA

RESEARCH INTERESTS

My primary area of research interest is the health and nutrition of families, specifically: food
access, food assistance, the food environment, food insecurity, healthy food availability,
adult and child weight status, maternal and child health, how poverty affects these areas, and
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RESEARCH EXPEREINCE

Graduate Research Assistant
University of Maryland, Baltimore
School of Medicine
2014 - Current
Research:
        Physical Activity Mapping
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        Health Related Behaviors and Outcomes
        Challenge! in Middle Schools

Graduate Research and Teaching Assistant
University of Maryland, Baltimore
School of Social Work
2013 - 2013
Research:
        Involuntary Mental Health Treatment Procedures in Maryland

Graduate Research Assistant
University of Maryland, Baltimore
Ruth H. Young Center, Urban Child Welfare Project
2010
Research:
  Title IV-E Child Welfare Training Efficacy

TEACHING EXPERIENCE

Adjunct Faculty
Shippensburg University, Shippensburg PA
2010 - Current
Courses Taught:
  Research Techniques for Social Work – BSW foundation course
  Assessing Organizations and Communities – BSW foundation course
  Social Welfare Policies and Services – BSW foundation course

Graduate Research and Teaching Assistant
University of Maryland, Baltimore
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2013 - 2013
Courses Taught:
  Maternal and Child Health Research Practicum – MSW advanced research course
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Pre-Doctoral Teaching Fellow
University of Maryland, Baltimore
Maternal and Child Health Leadership Development Program
2011 –2013
Courses Taught:
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Temporary Full-Time Faculty
Shippensburg University, Shippensburg PA
2009 – 2010
Courses Taught:
  Research Techniques for Social Work – BSW foundation course
  Social Work Skills for Working with Families – BSW practice course
  Assessing Organizations and Communities – BSW foundation course
  Foundation Macro Social Work Practice – MSW foundation course

PRACTICE EXPERIENCE

Mobile Therapist/Behavioral Specialist Consultant (Part-Time)
Youth Advocate Program, Inc., Lancaster PA
2009 –2010

Neurofeedback Specialist and Program Administrator (Full-Time)
Institute for Children and Families, Lancaster, PA
2008

Senior Research Analyst (Full-Time)
Holleran, Mountville, PA
2006 –2008

Research Assistant (Part-Time)
University of Tennessee, College of Social Work, Knoxville, TN
2005 –2006

Victim Assistance Officer and Consultant (Full-Time)
Cumberland County District Attorney and Juvenile Probation Office, Carlisle, PA
2002 –2005

PUBLICATIONS

Harrington, D., & O'Reilly, N. (2012). What about me? The sibling effect. [Review of the book *The sibling effect: What the bonds among brothers and sisters reveal about us*, by J. Kluger. *PsycCRITIQUES, 57*(18), article 3. doi: 10.1037/a0027966

PUBLICATIONS UNDER REVIEW

Fairchild, C., O'Reilly, N., & Howes, S. (Submitted to *Pediatrics*) A Systematic review of homeless youth and nutritional weight status.

PAPERS IN PROGRESS

O'Reilly, N., Quigg, A., Hurley, K., Hager, E., Hodge, C., Black, M., Gittlesohn, J., & Anliker, J. (Draft Prepared - Intend to submit to *Public Health Nutrition*) Food insecurity and shopping patterns among low-income families.

Pecukonis, E., O'Reilly, N., & DeForge, B. (Draft Prepared – Intend to submit to *Journal of Social Work Education*) Evaluating a social worker training program in maternal and child health.

GRANTS RECEIVED

O'Reilly, N. (2014) *PhD Program Dissertation Grant*, University of Maryland, Baltimore, School of Social Work.

O'Reilly, N. & Hughes, T. (2006). *Improving the Administration of Justice*, Interest on Lawyers' Tax Accounts, Tennessee Bar Foundation.

O'Reilly, N. & Ebert, M. (2003). *Youth Values Initiative,* Pennsylvania Commission on Crime and Delinquency.

REFEREED PRESENTATIONS

O'Reilly, N., Vanidestine, T., & Pecukonis, E. (2013). *Problem-Based Learning and Social Work Leadership: A Maternal and Child Health Perspective.* Curriculum presented at the Council on Social Work Education Annual Program Meeting, Dallas, Tx.

Park, H., O'Reilly, N., & Pecukonis, E. (2013). *Incorporating interprofessional education in social work health curriculum.* Curriculum presented at the Council on Social Work Education Annual Program Meeting, Dallas, Tx.

Vanidestine, T., Aparicio, E., & O'Reilly, N. (2012). *Social work education and infusing racial justice content: Qualitative research curriculum development.* Curriculum presented at the Council on Social Work Education Annual Program Meeting, Washington, D.C.

Chiarelli-Helminiak, C. & O'Reilly, N. (2011). *Preparing BSW and MSW students for courtroom testimony.* Roundtable discussion at the Council on Social Work Education Annual Program Meeting, Atlanta, GA

OTHER PRESENTATIONS

O'Reilly, N. L., Parker, S., & Waters, E. (2006). *Emergency contraception access in hospitals.* Poster presentation at National Association of Social Workers - Tennessee Chapter, Social Work Day on the Hill Policy Poster Presentation, Nashville, TN

MENTORSHIP EXPERIENCE

2014 – Current
Project Point Person, University of Maryland, School of Medicine Research Residency

2011 – 2013
Mentor, University of Maryland Center for Maternal and Child Health Social Work Education Leadership Development Program

TRAININGS CONDUCTED

2012	Maternal and Child Health Leadership Development Program - Annual Retreat, Port Deposit, MD
2011	Maternal and Child Health Leadership Development Program - Annual Retreat, Port Deposit, MD
2005	Youth Aid Panel Volunteer Training, Carlisle, PA
2004	Youth Aid Panel Volunteer Training, Carlisle, PA
2003	Youth Aid Panel Volunteer Training, Carlisle, PA

UNIVERSITY/DEPARTMENT SERVICE

2013 – Present	Member, GIS Users' Group Steering Committee University of Maryland, Baltimore
2010 – 2011	Student Representative, PhD Program Committee University of Maryland, Baltimore
2009 – 2010	Member, BSW Curriculum Committee Shippensburg University

SERVICE CONTRIBUTIONS: COMMUNITY

2013 – Current	Member, Food Policy Advisory Committee, Baltimore City
2009 – 2012	Volunteer, Domestic Violence Services of Lancaster County Lancaster, PA
2007 – 2008	Chair, Holleran Social Accountability Committee, Mountville, PA
2008	Coordinator, Holleran Trail Clean-Up Day, Pequea, PA
2007	Co-Coordinator, Holleran Christmas Toy Collection, Mountville, PA
2007	Coordinator, Holleran Humane League Donation Collection, Mountville, PA

AWARDS

2006   National Association of Social Workers – Tennessee Chapter, Social Work Day on the Hill Master's Level Policy Poster Presentation Winner, Nashville, TN

SKILLS

Computer
- Proficient – Microsoft, SPSS
- Intermediate – ArcGIS, Mplus, NVivo

Statistical Analysis
- Proficient – ANOVA Analyses, Multiple Regression Analyses
- Intermediate - Multilevel Modeling, Structural Equation Modeling
- Basic – Survival Analysis

Abstract

<u>Title of Dissertation</u>: High Risk, the Community Nutrition Environment, and Food Insecurity: The Role of Cumulative Risk, and Food Store Accessibility and Availability in Predicting the Likelihood of Family Food Insecurity in Baltimore City

Nicole L. O'Reilly, Doctor of Philosophy, 2015

Dissertation Directed by: Donna Harrington, Professor and Associate Dean for Doctoral and Post-Doctoral Education, School of Social Work

<u>Background</u>: Food insecurity has short and long-term health, social, behavioral, educational, and developmental outcomes for children and adults. Many families experience multiple risks for being food insecure. Families at highest risk for food insecurity often live in communities with low supermarket access and high corner and convenience store access, where food is more costly. It is important to consider how greater access to corner and convenience stores and lower access to supermarkets relate to food security.

<u>Purpose</u>: To determine if cumulative risk, community nutrition environment accessibility and availability, and food insecurity are related among a high risk population in an urban setting.

<u>Method</u>: Secondary caregiver data from the baseline evaluation of *Challenge!* Study was connected by home address to food store data (location and type) using ArcMap GIS. Logistic regression analysis was used to examine if cumulative risk and accessibility (distance to the nearest store) and availability (presence within a quarter mile of the family home) of stores were associated with food insecurity.

<u>Results</u>: Higher cumulative risk was related to higher odds of being food insecure. Neither accessibility nor availability of food stores was associated with higher odds of

food insecurity; however, cumulative risk moderated the relationship between accessibility of food stores and likelihood of food insecurity. Families who had higher risk and lived farther from corner stores had higher odds of being food insecure. Those who were low risk and living farther from the nearest corner store had lower odds of food insecurity.

Conclusion: Cumulative risk is associated with likelihood of food insecurity. At first glance, the community nutrition environment is not associated with the likelihood of food insecurity in this setting. However, cumulative risk moderates this relationship. High risk families may experience greater reliance on corner stores to protect them from food insecurity due to barriers in accessing other stores, such as transportation. Corner stores may be protective for high risk families. Low risk families may have access to greater resources that take them outside of their community, providing greater selection of stores. Efforts to reduce food insecurity should focus on those who experience the greatest risk.

High Risk, the Community Nutrition Environment, and Food Insecurity: The Role of
Cumulative Risk, and Food Store Accessibility and Availability in Predicting the
Likelihood of Family Food Insecurity in Baltimore City

Nicole L. O'Reilly

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, Baltimore in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2015

Acknowledgements

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List of Abbreviations

Beck Depression Inventory II ……………….   BDI-II
Cumulative Risk Index ………………………   CRI
Food Insecure …………………………………..   FI
Food Secure …………………………………….   FS
Geographic Information System ……………   GIS
Johns Hopkins Center for a Livable Future …   JHCLF
Logistic Regression …………………………..   LR
National Association of Social Workers ……   NASW
Temporary Aid to Needy Families ………….   TANF
Temporary Cash Assistance …………………   TCA
Thrifty Food Plan ……………………………   TFP
Perceived Stress Scale ………………………   PSS
Supplemental Nutrition Assistance Program ..   SNAP
United States Department of Agriculture ……   USDA

I: INTRODUCTION, THEORY, AND LITERATURE REVIEW

Food insecurity occurs when individuals or families lack adequate access to sufficient food for maintaining a healthy and active lifestyle. In the United States one in seven (14.3%) households are food insecure (FI), with even higher rates among households with children under the age of 18, where the rate is one in five (19.5%) (Coleman-Jensen, Nord, Andrews, & Carlson, 2014). These rates sharply increased in 2008, attributed to the economic recession that began that year (Feeding America, 2010), and have shown only slight declines since then (Coleman-Jensen, 2014). Certain demographic groups experience higher rates of food insecurity, including more than one-third of female-headed households with children (34.4%), those living at or below 185% of the federal poverty threshold (34.5%), and approximately one-quarter of Black and Hispanic households (26.1% and 23.7%, respectively) (Coleman-Jensen et al., 2014). There are also regional differences in the experience of food insecurity. Households in the Southern or Western regions of the U.S. are more likely to experience food insecurity (15.7% and 14.1%) in comparison to households in the Midwest and Northeast (13.6% and 12.4%), and families living in urban settings are more likely to be FI (16.7%) when compared to rural (15.1%) and suburban (12.1%) settings (Coleman-Jensen et al., 2014). Finally, Chilton et al. (2009) reported that immigrant families are 2.5 times more likely to experience food insecurity than non-immigrant families.

Several risk factors are associated with food insecurity: race, poverty (Coleman-Jensen et al., 2013), unemployment (Sharkey, Dean, & Johnson, 2011), being single (Coleman-Jensen et al., 2013), lower education (Laraia Siega-Riz, Gundersen, & Dole, 2006; Sharkey et al., 2011; Yu, Lombe & Nebbit, 2010), female head of household (Coleman et al., 2014; Laraia, Borja, & Bentley, 2009), smoking (Armour, Pitts, & Lee,

2008; Kirkpatrick & Tarasuk, 2008), high levels of stress (Gucciardi, Vogt, DeMelo, & Stewart, 2009; Jilcott, Wall-Bassett, Burke, & Moore, 2011), and depression (Melchior et al., 2009; Whitaker, Phillips, & Orzol, 2006). Although each of these can be examined individually, research on child outcomes and risk indicates that using a cumulative risk model may be a better predictor of outcomes (Burchinal, Roberts, Hooper, & Ziesel, 2000). Cumulative risk models examine the summative effect of multiple risk factors, regardless of which factors are present. Prior research on child wellbeing, child health, and child obesity suggests that this model of assessing risk is a good predictor of outcomes: a greater number of risk factors is associated with a higher likelihood of negative outcomes (Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Bauman, Silver, & Stein, 2006; Frank et al., 2010; Suglia, Duarte, Chambers, & Boynton-Jarrett, 2012; Trentacosta et al., 2008).

What is currently not understood is the relationship between cumulative risk and risk of family food insecurity. Also not known is how family food insecurity relates to the availability and accessibility of food stores in a community. This dissertation explored the relationship between cumulative risk and family food insecurity among families with early adolescent girls. It also examined how availability and accessibility of supermarkets, corner stores, and convenience stores relate to family food insecurity. Lastly, this dissertation tested whether or not cumulative risk moderates the relationship between accessibility and availability of food stores and family food insecurity.

This chapter defines and describes food security and food insecurity in the United States, and reviews the health, social, educational, and developmental outcomes of food insecurity among adults and children. The chapter also includes a review the model of

community nutrition environments developed by Glanz, Sallis, Saelens, and Frank (2005), to expand understanding of how communities are related to individual experiences with food, as well as a review of the cumulative risk model. The literature regarding food insecurity, the food environment, and cumulative risk is reviewed and used to build an adapted version of the model of community nutrition environments. This chapter concludes with research aims and hypotheses developed utilizing the adapted model of community nutrition environments, as well as gaps and inconsistencies in the literature.

A. Defining Food Security and Food Insecurity

The United States Department of Agriculture (USDA) (2009) defines food security as dependable access to food that is able to adequately sustain an active and healthy lifestyle. The USDA (2012) addresses four distinct categories related to food security: high food security, marginal food security, low food security, and very low food security (see Appendix A for greater details on definition and measurement). High and marginal food security are considered food secure. Households with high food security have no indication of limited access to food or any experiences of anxiety around food access. Homes with marginal food security may show one or two indicators of food insecurity, often anxiety, but do not experience any shift in diet or caloric intake (USDA, 2012). The USDA (2012) categorizes food insecure homes into low and very low food secure homes. Homes with low food security experience a decrease in quality or desirability of food, but no decrease in overall calories consumed. Homes that experience very low food security see not only a shift in the quality and desirability of dietary intake, but also a change in actual eating patterns, including reduced caloric

intake (USDA, 2012). Families who experience low and very low food security report both an increased number of food insecurity indicators and more severe indicators of food insecurity, such as skipping meals. Longitudinal research indicates that among families who are food insecure, it is typically a transient rather than chronic experience, with only 1.2% of families with children experiencing chronic food insecurity versus nearly one-fifth of families experiencing transient food insecurity over a four year time span (Ryu & Bartfield, 2012).

1. **Measurement of food security.**

Measurement of food security in U.S. households began in 1995 as a supplement to the Current Population Survey (Bickel, Nord, Price, Hamilton, & Cook, 2000). The U.S. Household Food Security Scale has been used since the initial data collection with minimal change. Previous classifications of household food security status included food insecure with severe hunger, food insecure with moderate hunger, food insecure without hunger, and food secure (Bickel et al., 2000). The current USDA definitions represent a shift that occurred in 2006 from the old terminology that included hunger. The Committee on National Statistics stressed the need to differentiate between food insecurity (an experience) and hunger (a potential consequence of food insecurity), (USDA, 2012). Being food insecure does not necessarily mean a person experiences hunger, but it is a possible outcome of the experience of food insecurity. Although the terminology changed, measurement remained the same, allowing for continued comparison across time in food insecurity research (USDA, 2012).

2. Adult outcomes associated with food insecurity.

Generally, FI adults are more likely to perceive their health as fair or poor in comparison to their food secure (FS) counterparts (Sharkey, Johnson, & Dean, 2011; Stuff et al., 2004; Sullivan, Clark, Pallin, & Camargo, 2010; Walker, Holben, Kropf, Holcomb, & Anderson, 2007). FI adults are also more likely to have diabetes (Holben & Pheley, 2006), hypertension (Seligman, Laraia, & Kushel, 2009), and metabolic syndrome (Parker, Widome, Nettleton, & Pereria, 2010). In addition, the rate of HIV transmission is higher among FI adults and adherence to antiretroviral therapy is lower (Anema, Vogenthaler, Frongillo, Kadiyala, & Weiser, 2009). Although some of these health consequences may be related to nutrition issues, such as an increased intake of fats and fruit juices (Mello et al., 2010), it is also possible that these are the results of postponing needed medical care in exchange for food (Kushel, Gupta, Gee, & Haag, 2006; Sullivan et al., 2010). FI adults are more likely to be overweight or obese (Franklin et al., 2012), particularly women (Larson & Story, 2010) and are more likely to report poor mental health in comparison to their FS counterparts (Sharkey et al., 2011; Sullivan et al., 2010). For example, Whitaker et al. (2006) reported that food insecurity is associated with maternal depression and anxiety. Although these relationships also relate to income and living in poverty, their association with food insecurity remains after controlling for income and poverty.

3. Child outcomes associated with food insecurity.

Food insecurity is related to the general health of children (Casey et al., 2005; Cook & Frank, 2008). Chilton and colleagues (2009) reported that poor health is especially high among FI immigrant families, particularly among recent immigrants. FI

children are also more likely to be hospitalized (Cook et al., 2004), to have iron deficiencies (Cook & Frank, 2008), and to have lower bone mass (Eicher-Miller, Mason, Weaver, McCabe, & Bonshey, 2011) than their FS peers.

FI children have lower fruit intake (Grutzmacher & Gross, 2011) and lower calcium intake (Eicher-Miller et al., 2011) than FS children. Among FI Latino families in the United States, children are likely to have lower intake of meat, decreased caloric intake (Matheson, Varady, Varady, & Killen, 2002), and higher consumption of unhealthy foods (Rosas et al., 2009; Sharkey, Nalty, Johnson, & Dean, 2012) when compared to their FS counterparts.

Findings regarding the weight status of FI children are mixed, with a recent review of the literature indicating that the two are not related (Kursmark & Weitzman, 2009). An exception is the interaction between high family stress and food insecurity, which is linked to higher rates of elevated weight among children, such that children from high stress, FS homes were more likely to be overweight, but children from high stress FI homes were less likely to be overweight (Gundersen, Lohman, Garasky, Stewart, & Eisenmann, 2008). As children age, the relationship between food insecurity and weight status shifts and FI adolescents are more likely to be at an elevated, unhealthy weight than their FS peers (Casey et al., 2006). These findings suggest that it is possible that the effects of food insecurity on elevated weight status are delayed among children, not surfacing until adolescent and adult years.

Educational and developmental outcomes of food insecurity. Food insecurity is related to lower reading and math skills (Alaimo et al., 2001; Jyoti, Frongillo, & Jones, 2005), higher risk of developmental problems (Rose-Jacobs et al., 2008), and a higher

likelihood of repeating a grade (Alaimo et al., 2001). Hernandez and Jacknowitz (2009) reported that small developmental risks for toddlers were increased for children from homes that experienced transient rather than chronic food insecurity, suggesting that chronically FI families are able to buffer toddlers from the full impact of food insecurity. However, food insecurity is typically a transient experience (Ryu & Bartfield, 2012), indicating cause for concern regarding developmental outcomes among FI children.

      Behavioral and social outcomes of food insecurity. Research regarding the social and behavioral impact of food insecurity is mixed. Parents from FI homes are less likely to use positive parenting practices (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007). Belsky, Moffitt, Arsenault, Melchior, and Caspi (2010) noted that food insecurity is associated with emotional problems among children, but not cognitive and behavioral problems. Conversely, Melchior and colleagues (2009) reported that children from FI homes are more likely to exhibit problem behaviors. Although both studies used the same secondary data collected between the ages of 5 to 12 years old, Belsky and colleagues (2010) used behavioral data from children and their teachers and averaged the results for a composite score on behavioral scales. Melchior and colleagues (2009) used data collected from mothers and their children's teachers, each reported independently. The differences between the two studies suggest that children were less likely to recognize their behavior as problematic in comparison to their teachers and mothers. In addition, Whitaker et al. (2006) reported increased likelihood of behavior problems (aggression, anxiety/depression, and inattention/hyperactivity) among young children from marginally FS and FI homes, supporting Melchior et al.'s (2009) findings. Food insecurity is also negatively related to a child's formation of self-control,

interpersonal skills (Howard, 2011), and social skills (Alaimo et al., 2001; Jyoti et al.,

2005). Overall, the majority of the research indicates that after controlling for poverty

and income, children from FI homes experience increased difficulties emotionally,

behaviorally, and cognitively (Alaimo et al., 2001; Howard, 2011; Jyoti et al., 2005;

Melchior et al. 2009).

B. Theory

The theoretical framework for the current dissertation was developed using two

models. The model of community nutrition environments (Glanz et al., 2005)

conceptualizes the possible ways that community factors influence an individual's eating

behaviors. Although the model of community nutrition environments provides a

foundation for understanding how individuals' food access is related to the community

environment, parts of the model are not yet fully developed and these limitations will be

discussed below. Following a description of the model, a detailed critique of the model

of community nutrition environments will be presented, followed by a description of the

cumulative risk model and a comprehensive review of the literature. At the conclusion of

this chapter, an adapted version of the model of community nutrition environments that

addresses some of the current limitations and incorporates cumulative risk will be

presented.

1. Model of community nutrition environments.

According to Glanz and colleagues (2005), focusing on individual level factors

inadequately accounts for individuals' health. They stress the role of the physical

environment and individual level experiences on eating habits. The model is based on a

review of the literature available at the time of its development. The Glanz et al. (2005)

model includes *Policy Variables*, *Environmental Variables*, *Individual Variables*, and *Behavior*. *Policy Variables* include "governmental" and "industrial policy", but Glanz and colleagues (2005) do not provide definitions or examples of these policies. *Environmental Variables* include the "information environment", "community nutrition environment", "organizational nutrition environment", and the "consumer nutrition environment". The "information environment" represents media and advertisements related to food and nutrition. Although the information nutrition environment impacts attitudes and behaviors, it is different from other environmental constructs in that it operates at all levels of a person's environment – national, state, and local, and is also influenced by government and industry policy (Glanz et al., 2005). The model does not address what attitudes and behaviors are affected by the information nutrition environment.

The "community nutrition environment" encompasses the type, location, and accessibility of food outlets. Glanz and colleagues (2005) conceptualize store accessibility as the hours of operation and the presence of drive-through windows. However, they do not provide a definition or examples of store type and location. The "organizational nutrition environment" construct of the model includes the home (including family), school, work, and other organizations such as places of worship and healthcare facilities, and is specific to locations available to a defined group of people (Glanz et al., 2005). Additionally, they describe the home food environment as very complex, and influenced by factors such as food availability outside of the home, as well as the role of culture.

The "consumer nutrition environment" focuses on what shoppers experience when entering the food environment, including the overall quality of food in terms of range of choices, freshness, nutritional content, provision of nutritional information, and promotion of certain items through sales and placement (Glanz et al., 2005). This portion of the model addresses price, which is one of the most important factors in peoples' food choices (Glanz et al., 1998). In the consumer nutrition environment, in-store availability of healthy food options includes low-fat options, fruits and vegetables, and unsweetened fruit juices (Glanz et al., 2005). The consumer nutrition environment also includes four indicators of healthy food availability in restaurants: healthy main dish choices, availability of fruit, availability of non-fried vegetables, and servings that support portion control.

Individual Variables include "sociodemographics", "psychosocial factors", and the "perceived nutrition environment", but these are not defined nor do Glanz et al. (2005) provide examples. Last in the model is "eating behaviors", but no definition or examples are provided for this variable either.

The *Policy, Environmental,* and *Individual Variables* work together to impact eating behaviors. *Policy Variables* directly relate to *Environmental Variables*, including the community, organizational, consumer, and information nutrition environments. The information nutrition environment acts on eating behaviors through the other *Environmental Variables* and the *Individual Variables*. The community, organizational, and consumer nutrition environments also affect *Individual Variables*. Specifically, the *Environmental* and *Individual Variables* both directly impact eating behavior. According to Glanz et al. (2005), the *Individual Variables* (demographic, psychosocial, or perceived

environment variables) moderate or mediate the effects of the *Environmental Variables*. However, they do not specify whether it is moderation or mediation.

2. Critique of the model of community nutrition environments.

Although the model of community nutrition environments provides an initial framework for understanding how national, community, and individual variables potentially interact to influence individual eating behaviors, there are some areas that deserve further consideration. First, several components of the model are not clearly defined. Greater detail regarding the policy variables, both governmental and industrial, would provide a clearer understanding of how these constructs potentially impact individual choices. Glanz et al. (2005) also note that attitudes and behaviors are affected by the information environment, but they do not clearly delineate what these attitudes and behaviors are. The community nutrition environment is defined as including both stores and restaurants, but no definition of the different types of stores and restaurants is provided. In addition, there is a need for clearer operationalization of the individual variables, which include demographics, psychosocial factors, and the perceived nutrition environment. Although Glanz and colleagues (2005) refer to obesity and other chronic diseases and conditions as potential long-term outcomes, they do not define eating behaviors. Further, the narrow definition of accessibility, a construct within the community nutrition environment variable, is also limited because Glanz and colleagues (2005) conceptualize store accessibility as the hours of operation and the presence of drive-through windows. Store accessibility may be broader than this, and drive-through windows do not necessarily increase accessibility, particularly in neighborhoods with low vehicle ownership.

Glanz et al. (2005) also indicate that the individual variables potentially mediate or moderate the influence of the environmental variables on eating behaviors. However, they do not establish if it is mediation, moderation, or possibly both, and give no clear explanation of how this relationship occurs. Additionally, the model does not account for interactions between three of the four constructs included in the environmental variable (community, organizational, and consumer nutrition environment). Glanz and colleagues (2005) briefly mention in the description of the model that the home (part of the organizational nutrition environment) is affected by the availability of stores, but provide no further detail or explanation.

Lastly, the inclusion of the home food environment in the organizational nutrition environment is a puzzling fit. Although it fits the model's definition in that there is limited access to the home food environment based on group membership (i.e., family), it exists at the micro level of a person's environment, whereas work, church, and other organizations exist at a mezzo level (Kuminyaka, 2007). The model may provide a better framework for understanding how different elements of the community influence individual eating behaviors if the relationships between the variables are better understood, as well as more clearly defined in a manner that makes sense for low income families. Separating the home nutrition environment from the community level organizational nutrition environments may provide a better understanding of how individuals make their food choices. Although the model of community nutrition environments has some shortcomings, it provides a connection between community level nutrition constructs and individual experiences with food.

3. Cumulative risk model.

Early work by Rutter (1979) focused on how stress factors, both acute and chronic, interacted to magnify long-term outcomes for children with parents with severe mental illness, suggesting that the accumulation of stress factors heightened potential negative outcomes. This work lead to the use of a cumulative risk model in outcomes related to child development, health, and well-being. Evans (2003) suggests that a model of cumulative risk accounts for the complex interplay and natural covariation of many social risk factors. Cumulative risk is important as the impact of any one individual variable may have a small effect on the outcome of interest. However, when viewed within the context of multiple experiences of risk, the results of these individual factors are magnified (Corapci, 2008; Nair, Schuler, Black, Kettinger, & Harrington, 2003; Sameroff, Gutman, Peck, 2003). For example, poverty alone will likely create difficulty around accessing food. However, the addition of other risk factors related to food insecurity may intensify the experience. A low income caregiver may be able to procure the food necessary to maintain food security in the household. However, if a caregiver also experiences high levels of stress and depression, these psychosocial factors may interfere with the ability to attain the food necessary to preserve food security. Similarly, a caregiver who is unemployed may struggle with food security, but also being single would intensify the experience. The use of cumulative risk also allows for the innate covariance of common risk factors that disproportionally occur in certain populations, particularly as they relate to race and poverty (Evans, 2003). The complex patterns between these variables and poverty may affect the relationship between cumulative risk and food insecurity, such that poverty magnifies the effects of all other

variables. In addition, experience of multiple risk factors is more likely than the experience of just one risk factor (Evans, Kim, Ting, Tesher, & Shannis, 2007). What is not known is how the experience of multiple risk factors accumulates in such a way that heightens the likelihood of food insecurity.

Risk factors known to have a relationship with an outcome of interest can be combined to create a composite variable that addresses the multiplicative effect of risk. This is considered a cumulative risk index (CRI). In addition to the conceptual benefits of this model, there are statistical advantages to the use of a CRI in comparison to entering multiple individual risk factors into a regression model. The use of multiple individual risk factors is problematic due to multicollinearity and sample size, resulting in models that are significant, with no variable as a significant predictor of the outcome (Burchinal et al., 2000). Using a CRI addresses this issue and allows for data reduction that is based in prior literature and theory. The use of one cumulative risk score versus multiple factors also results in a more parsimonious statistical model.

C. Literature Review

Utilizing the model of community nutrition environments and the cumulative risk model, this dissertation explored the relationship between family food insecurity, cumulative risk, and the food environment. Using a systematic approach, current literature regarding the relationship between food access, food insecurity, and risk of food insecurity was identified. Search terms related to the food environment included "food environment", "food desert*, and "food access". Search terms related to food insecurity included both "food insecurity" and "food security". Several databases were included to address the complexity of the issue across health, social, economic, geographic, and

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psychological components. Among the EBSCO databases, the search strategy included

Academic Search Premier, CINAHL, SocINDEX with Full Text, Family Studies

Abstracts, Health Source: Consumer, Health Source: Nursing, Psychology and

Behavioral Science, Social Work Abstracts, and Urban Studies Abstracts. In addition,

the Ovid databases searched included PsycINFO and MEDLINE. The search strategy

also targeted PubMed and the Social Science Index – Web of Science. This search

strategy yielded over 1,000 articles about food insecurity and the food environment, but

only 2 articles that directly explore the relationship between the two constructs. Using

the models as a guide, the key literature as it relates to the community nutrition

environment and the organizational nutrition environment is summarized below.

1. **Community nutrition environment.**

As previously reviewed, the community nutrition environment is comprised of

type and location of stores (Glanz et al., 2005). There are three major types of stores:

supermarkets, grocery stores, and convenience stores. *Supermarkets* are typically larger

food retailers with more than four cash registers (Galvez et al., 2008), chain affiliation

(Franco et al., 2008; Lee et al., 2010; Richardson et al., 2012), and more than 50

employees (Franco et al., 2008). *Grocery stores* are typically smaller food retailers with

two to three cash registers (Galvez et al., 2008) that are independently operated (Franco

et al., 2008; Lee et al., 2010; Richardson et al., 2012), with less food selection than

supermarkets (Franco et al., 2008; Lee et al., 2010). In this dissertation, grocery stores

are referred to as *corner stores*, as this is the label used in the data source, and it is how

they are commonly known in the Baltimore community. Last, *convenience stores* are

retailers with limited focus on food (Franco et al., 2008; Lee et al., 2010), often attached

to gas stations (Franco et al., 2008; Lee et al., 2010; Richardson et al., 2012), and have just one cash register (Galvez et al., 2008) (see Appendix B for a table comparing store types).

Store type and food availability. Comparisons between convenience stores, grocery stores, and supermarkets indicate that as size of the store increases, so does the likelihood of the store carrying fruits, vegetables, and other healthy options, such as whole grains and low fat dairy (Andreyeva et al., 2008; Franco et al., 2008; Jetter & Cassady, 2006; Liese, Weis, Pluton, Smith, & Lawson, 2007; Leone et al., 2008). Overall, supermarkets and grocery stores are more likely to stock healthy versions of staple foods than convenience stores (Andreyeva et al., 2008; Connell et al., 2007; Franco et al., 2008; Liese et al., 2007). Supermarkets dedicate greater space to fruits and vegetables than convenience stores, but also dedicate greater shelf space to snack foods (Farley et al., 2009).

Leone et al. (2008) reported greater availability of fruits, vegetables, low-fat milk, and whole wheat bread in supermarkets in comparison to grocery and convenience stores. Even in grocery stores that stocked healthy food options, they were more likely to stock off-brands that have lower nutritional content, whereas supermarkets provide overall better access to high-fiber breads, whole grain items, and ground beef with less than 10% fat content (Jetter & Cassady, 2006). Horowitz and colleagues (2004) noted a decreased availability of foods that fit the dietary needs of people with diabetes in bodegas (small corner stores) when compared to supermarkets. Overall, supermarkets have a wider variety of food available to shoppers and have increased access to healthy foods, although

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there are notable exceptions to this, such as Trader Joes and Whole Foods, which are smaller stores with a large selection of healthy foods.

Store type and food cost. Focusing on the difference in availability of foods by store type is limiting, as price plays an important role as well (Miller, Bodor, & Rose, 2012). According to Krukowski and colleagues (2010), healthy food options are more expensive and healthy food cost is related to store type, with the price of food decreasing as the store size increases. Similarly, Horowitz et al. (2004) reported overall lower food prices in supermarkets in comparison to small bodegas.

Cost also varies according to type of food. Typically, produce was less expensive in supermarkets when compared to grocery and convenience stores (Azuma, Gilliland, Valliantos, & Gottleib, 2010; Leone et al., 2011; Liese et al., 2007) and less expensive in grocery stores when compared to convenience stores (Liese et al., 2007). Consumers in rural North Carolina paid significantly more for bacon, turkey, eggs, and canned salmon in convenience stores when compared to supermarkets and grocery stores (Liese et al., 2007). In addition, the price of milk is lower in supermarkets than grocery stores (Leone et al., 2008) or convenience stores (Leone et al., 2008; Liese et al., 2007), and is lower in grocery stores than convenience stores (Leone et al., 2008; Liese et al., 2007). Generally, low-fiber bread is significantly less expensive in supermarkets and grocery stores when compared to convenience stores (Liese et al., 2007) but no significant differences existed in the cost of high-fiber breads, generally considered a healthier option (Leone et al., 2008; Liese et al., 2007). Although there are some notable differences between supermarkets and convenience stores (Horowitz et al., 2004; Liese et al., 2007) and grocery stores (Leone et al., 2008; Liese et al., 2007), less is understood about the

differences between grocery stores and convenience stores. It is also important to note that these studies are all cross-sectional and do not examine shifts and changes in the community nutrition environment over time.

The relationship between the food environment and food availability and price depicts a complex picture for low income families. Families living in communities with limited access to supermarkets likely depend more heavily on more expensive options, such as small grocery and convenience stores. In addition, the difference in availability among stores appears to be consistent across studies from different regions of the United States, indicating similarities in food access despite geographic considerations such as region and population density.

2. Organizational nutrition environment – risk of food insecurity.

A review of the literature indicates that low income families face considerable struggles with budgeting, purchasing, and storing food (Fulp, McManus, & Johnson, 2009; Wiig & Smith, 2009). The overall quality of a family's diet is related to the difference in price between foods with high nutrients and low energy density and foods with low nutrients and high energy density (Monisvais, Mclain, & Drewnoski, 2010). Families with limited access to resources, such as money and transportation, must also alter shopping patterns to fit within these resources (Darko, Eggett, & Richards, 2013; Jilcott, Hurwitz, Moore, & Blake, 2010).

Food cost. According to Engel's Law, as income increases, less of the family budget is spent on food (Ziliak, 2002). Stewart and Blisard (2008) found that low income families spent $23.37 per person, per week on foods consumed at home in comparison to $27.65 among middle income families and $33.62 among high income families.

Although high and middle income families spent more in actual dollars, the cost of food represents a significantly smaller portion of their overall income in comparison to low income families. Programs such as the Supplemental Nutrition Assistance Program (SNAP), previously known as the Food Stamps Program, provide some measure of protection against food insecurity (Black, Hager, Merry, & Quigg, 2008). This relationship is complex because eligibility for assistance programs is based on income guidelines (Black et al., 2008), meaning that those who qualify have less income and assets. Lower income is associated with food insecurity (Coleman-Jensen et al., 2014). Therefore, those who are eligible to receive SNAP benefits are less likely to be FS based on the eligibly requirements of SNAP. Over a two year time period, only 43% of families receiving SNAP benefits were FS in comparison to 90% of families not receiving SNAP benefits (Wilde & Norde, 2005). Although rates of food security are lower among families receiving SNAP, it is not due to SNAP. Rather it is due to a lack of resources that would qualify an individual or family for SNAP benefits in the first place.

Despite this assistance, low income families struggle to maintain an adequate and healthy diet. A qualitative study with African American women reported that SNAP benefits are not sufficient to provide their families with a healthy diet (Fulp et al., 2009) and that environmental limitations, such as storage capacity, ability to shop in bulk, and transportation influence what foods they purchase (Wiig & Smith, 2009). The type of food is also related to the purchasing power of low income families. Although low income shoppers with limited food store availability in rural and urban Minnesota paid a similar price for fresh produce, they paid more for eggs, bread, and milk than

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recommended by the market basket price, possibly due to increased reliance on more expensive food outlets, such as convenience stores (Hendrickson, Smith, & Eikenberg, 2006). Overall, low income families experience increased financial difficulty in regard to food budgeting, purchasing, and storage.

Access to high quality food. Additionally, there is a relationship between family diet and price disparities between low and high quality foods. There is a growing difference in the cost of food: foods with the lowest energy density and highest nutrient density were the most expensive; conversely, low nutrient, energy dense foods were the least expensive (Monsivais et al., 2010). This price disparity increased between 2004 and 2008, with prices for high nutrient foods increasing 29.2% in comparison to a 16.1% increase for low nutrient foods. Over the last 30 years, the price of fruits and vegetables has risen considerably in comparison to sugar sweetened beverages and sweets (Brownell & Frieden, 2009). Jetter and Cassady (2006) noted that the difference in cost between the traditional Thrifty Food Plan (TFP) market basket and a healthier version of the market basket represented 35 to 40% of the food budget for low income families. For food insecure families trying to stretch a food budget, this can mean choosing lower nutrient foods, rather than high nutrient foods that cost more.

Golan, Stewart, Kuchler, and Dong (2008) contradict this idea, suggesting that the perception of the cost of healthy food, rather than actual cost, serves as a barrier to purchasing healthy foods among low income families. Their review of research indicated that families who shifted from purchasing snacks and other energy dense foods to fresh produce actually spent less money on food. They cite several fruits and vegetables (e.g., apples, bananas, iceberg lettuce, tomatoes [in season], and carrots) that are well within an

appropriate price range using the TFP. However, it is important to consider what Caprio and colleagues (2008) refer to as "poverty of time," the lack of time many low income families have for things such as shopping around for the best price and preparing foods from scratch (p. 2214). This is likely especially true for families that are considered to be working poor. Overall, research regarding access to a high quality and nutritious diet for low income families is mixed, with many indications that low income families struggle to access nutritious foods such as fruits and vegetables, and others indicating that many healthy foods are still a reasonable option for low income families.

   Shopping patterns among low income families. The role of shopping patterns, specifically which stores low income families most likely frequent, are also an important consideration, as families reported that being able to shop at stores with the least expensive food is an essential coping strategy to avoiding food shortages (Darko et al., 2013). Among low income families, supermarkets, supercenters (Jilcott, Wall-Bassett, Moore, & Sharkey, 2011), discount grocery stores, and big box stores (e.g., Wal-Mart or Target) (Dammann Wiig & Smith, 2010) are most commonly used. Low income families are also more likely to rely on smaller stores in between trips to larger supermarkets, which are more difficult to frequently visit due to a lack of transportation (Bodor, Ulmer, Dunaway, Farley, & Rose, 2010). Qualitative interviews with both rural and urban women found geographic differences in what influenced food store choice, with shoppers in rural communities noting greater concern with price and quality (Krukowski, McSweeney, Sparky, & Smith-West, 2012).

   Low income families indicated that use of supermarkets was also based on proximity, choosing the stores closest to their homes (Jilcott et al., 2010) and lower use of

drug stores and supercenters at greater distance from the home (Jilcott-Pitts, McGuirt, Carr, Wu, & Keyserling, 2012). Low income shoppers indicated that store availability, including transportation and proximity, influence the frequency of shopping trips (Wiig & Smith, 2009), visiting independent grocers most frequently, an average of 2.72 times weekly, versus .31 weekly trips to chain supermarkets and .29 trips to convenience stores (LeDoux & Vojnovic, 2012). However, some urban shoppers reported often skipping over convenience stores in their own neighborhoods and instead shopping outside of their neighborhoods in order to access supermarkets and grocery stores (LeDoux & Vojnovic, 2012). There is also the potential for differences between rural and urban communities, with urban shoppers more likely to report that proximity and convenience plays an important role in food store choice, and rural shoppers reporting that most stores were far from their homes, therefore they visit stores in conjunction with other errands and appointments (Krukowski et al., 2012). Again, these studies are all cross-sectional in nature, and do not examine how family shopping patterns shift and change. Additionally, the cross-sectional nature of the studies does not allow for causal inference regarding the availability of healthy food, costs, and consumer choices.

It is possible that general reliance on smaller, more expensive stores throughout the month may consume a large portion of the family food budget. This increased reliance on more expensive food outlets that are often close to home suggests a potential relationship between the community nutrition environment (stores in the community, both in terms of availability and accessibility) and the organizational food environment (family food insecurity). Most literature suggests that that if families do want to access

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more nutrient rich foods, they must spend a greater portion of their budgets to purchase them.

3. Cumulative risk for food insecurity.

Prior research on sociodemographic risk and child development, child wellness, child behavior, and child obesity indicates that the cumulative experience of individual risk factors has an overall association with outcomes, regardless of which risk factors are present or absent (Appleyard et al., 2005; Bauman et al, 2006; Frank et al., 2010; Suglia et al., 2012; Trentacosta et al., 2008). Although some studies include food insecurity as a part of a CRI (Frank et al., 2010; Suglia et al., 2012), no literature that included food insecurity as an outcome was located. It is not known how the accumulation of individual risk factors measured by a CRI relates to the likelihood of food insecurity. The current study addresses this gap in the literature. A CRI was used in this study to account for the role of individual risk factors in relation to risk of food insecurity. It includes both psychosocial and sociodemographic variables, originally proposed by the model of community nutrition environments (Glanz et al., 2005). In addition, it incorporates a behavioral risk factor. The purpose of including the CRI was to account for risk, while capturing the multiplicative experiences of risk. The components of the CRI used in this dissertation, and their relationship with food insecurity, are described in the following section.

Per Glanz and colleagues (2005) individual variables play an important role in eating patterns. The literature indicates that key sociodemographics such as race, income, household composition, marital status, and education level relate to food insecurity (Coleman-Jensen et al., 2014). Employment status is also associated with food

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insecurity (Sharkey et al., 2011). In addition, smoking (Armour et al., 2008; Kirkpatrick & Tarasuk, 2008), and psychosocial factors, specifically stress (Jilcott et al., 2011) and depression (Melchior et al., 2009, Whitaker et al., 2006), are also related to food insecurity. The risk factors addressed in this dissertation do not represent all possible risk factors, rather they represent risk factors for food insecurity that were accessible based on available data.

Sociodemographics. According to Coleman-Jensen et al. (2014), there is a higher rate of food insecurity among Black and Hispanic families in comparison to White families. As household poverty increases, the percentage of families experiencing food insecurity, both low and very low, increases. Food insecurity is also more common among households headed by a single female (Coleman et al., 2014; Laraia, et al., 2009) and in households where caregivers are either unemployed or working part-time in comparison to full-time. In addition, having a lower level of education is associated with food insecurity (Laraia et al., 2006; Sharkey et al., 2011; Yu, et al., 2010).

Smoking. Having a smoker present in the home is associated with higher odds of being FI (Armour et al., 2008; Kirkpatrick & Tarasuk, 2008) and increased severity of food insecurity (Cutler-Triggs, Fryer, Miyoshi, & Weitzman, 2008). Smoking also relates to poor diet quality (Duffy, Zizza, Jacoby, & Tayie, 2009). Qualitative interviews among adults using a soup kitchen indicate that addictions often compete with food for monetary resources (Wicks, Tevena, & Quine, 2006).

Psychosocial factors. A number of psychosocial factors are related to increased risk of family food insecurity, including stress and caregiver depression. Food insecurity is associated with elevated levels of stress among SNAP participants (Jilcott et al., 2011)

and individuals diagnosed with diabetes (Gucciardi et al., 2009). However, it is unclear if stress increases the probability of food insecurity or if food insecurity increases levels of family stress.

Similarly, prior research suggests an increased risk of food insecurity among mothers with depression (Whitaker et al., 2006), with FI mothers having 2.8 greater odds of being depressed than mothers from FS families (Melchior et al., 2009). After controlling for socioeconomic status and other demographics, this relationship was also true for pregnant women (Laraia, Siega-Riz, Gundersen, & Dole, 2006), pregnant Latina women (Hromi-Fielder, Bermudez-Millan, Segura-Perez, & Perez-Escamilla, 2011), and first-time African American mothers (Laraia, et al., 2009). Depression decreases the probability of a family attaining food security (Lent, Petrovic, Swanson, & Olson, 2009), and longitudinal research suggests that the relationship between food insecurity and depression is bidirectional (Huddleston-Casas, Charnigo, & Simmons, 2009).

4. **Community nutrition environment and food insecurity.**

Given some research that low income families use independent grocers more frequently than other store types (LeDoux & Vojnovic, 2012), and that independent grocers are often more expensive (Krukowski et al. 2010; Horowitz et al., 2004; Leone et al., 2008; Liese et al., 2007), there is a need to better understand how reliance on more expensive food outlets relates to food insecurity. It is important to note that for many low income families, presence of different store types and distance to the nearest stores play an important role in store choice (Krukowski et al., 2010; Wiig & Smith, 2009). One study of Mexican immigrants on the Texas/Mexico border examined the relationship between store proximity and food insecurity, finding that the further a family lived from

where they purchased the bulk of their groceries, the more likely the household was to experience adult food insecurity (Sharkey et al., 2011). They found no significant relationship between distance to the most used shopping venue and overall household food insecurity or child food insecurity. Researchers in Toronto found that distance to discount supermarkets and community food assistance programs did not play a role in household food insecurity among their low income sample (Kirkpatrick & Tarasuk, 2010). However, their definition of the food environment only included discount supermarkets and community food assistance programs, failing to consider the role of non-discount supermarkets, grocery stores, and convenience stores.

5. **Summary of the literature.**

A review of available literature related to food insecurity and nutrition environments reveals consistent findings. Supermarkets generally have greater availability of food (Andreyeva et al., 2008; Bodor et al., 2008; Bustillos et al., 2009; Connell et al., 2007; Farley et al., 2009; Franco et al., 2008; Jetter & Cassady, 2006; Liese et al, 2007; Leone et al., 2008), lower prices (Azuma et al., 2010; Block & Kouba, 2006; Horowitz et al., 2004; Krukowski et al., 2010; Leone et al., 2011; Liese et al., 2007; Miller et al., 2012), and better quality items (Andreyeva et al., 2008; Connell et al., 2007) than grocery or convenience stores. In addition, low income families spend a greater portion of income on food, compared to middle and high income families (Stewart & Blisard, 2008; Ziliak, 2002), and struggle despite protective assistance programs (Fulp et al., 2009; Wilde & Nord, 2005). Low income families also have limited access to the cost savings strategies available to higher income families (Wiig & Smith, 2009).

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Research is mixed regarding access to food (Golan et al., 2008; Jetter & Cassady, 2006; Monsivais et al., 2010) and shopping patterns among low income families (Darko et al., 2013; French et al., 2010; Jilcott et al., 2010; Jilcott et al., 2011; Jilcott-Pitts et al., 2012; Kurkowski et al., 2012; LeDoux & Vojnovic, 2012; Dammann Wiig & Smith, 2010), but employment (Sharkey et al., 2011), minority race, low income, having a female head of household, being single, and having a lower level of education are related to higher risk of family food insecurity (Coleman-Jenkins et al., 2014). In addition, greater likelihood of food insecurity is related to having a caregiver in the home who smokes (Armour et al., 2008; Kirkpatrick & Tarasuk, 2008), higher levels of caregiver stress (Jilcott et al., 2011), and elevated caregiver depression (Melchior et al., 2009; Whitaker et al., 2006). Overall, these factors combine to heighten the risk of food insecurity among low income families. It is possible that low income families may be forced to choose more expensive stores due to proximity and transportation, limiting their purchasing power. In addition, families with children experience higher rates of food insecurity (Coleman-Jensen et al., 2014), and health outcomes related to food insecurity, specifically obesity, is more common among women than men (Larson & Story, 2010).

Gaps in the literature. No research that examines the cumulative impact of risk factors associated with family food insecurity was identified. There is also limited research that explores the relationship between the community nutrition environment, or what food stores exist in a community and how close they are to family homes, and family food insecurity. No research that examined the moderating role of cumulative risk was identified. As each of the risk factors is associated with heightened risk of food insecurity, the accumulation of these experiences may not only increase risk of food

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insecurity, but they may alter the relationship between food insecurity and the community nutrition environment. Higher cumulative risk may intensify risk of food insecurity when supermarkets are unavailable and inaccessible and corner stores and convenience stores are more available and accessible. This indicates a need for greater research examining the intersection of cumulative risk, food environments, and food insecurity. The literature that currently exists is limited in how the nutrition environment is conceptualized (Kirkpatrick & Tarasuk, 2010) or is geographically limited to rural border communities (Sharkey et al., 2011) or Canadian cities (Kirkpatrick & Tarasuk, 2010. Additional research regarding food insecurity and nutrition environments that includes a broader definition of the community nutrition environment, specifically including non-discount supermarkets, corner stores, and convenience stores, not just discounted supermarkets and food assistance programs, is needed. Research that helps understand family food insecurity in U.S. cities is essential, as cities experience the highest rates of food insecurity (Coleman-Jensen et al., 2014). In addition, food insecurity and food environment research among families with early adolescent girls is essential as families with children are more likely to experience food insecurity. Also, adolescents may be an important turning point in the relationship between food insecurity and obesity, and women are more likely to experience obesity later in life (Larson & Story, 2010). Although some connection between the nutrition environment and food insecurity was noted in rural Texas border communities (Sharkey et al., 2011), whether or not this same relationship would exist in an urban community such as Baltimore is unclear.

D. Adapted Model Community Nutrition Environments

The model of community nutrition environments and the cumulative risk model provide a framework for understanding the constructs that relate to eating patterns (Glanz et al., 2005). However, the model is vague about how constructs within the environment interact. This dissertation used an adapted version of this model to better integrate how environmental constructs interact, specifically elements of the community nutrition environment and the organizational nutrition environment while accounting for individual constructs through the use of a cumulative risk index (see Figure 1.1). The CRI was comprised of poverty, race, education, household composition, marital status, employment, smoking, stress, and depression. The community nutrition environment was defined as accessibility (distance to the nearest store) and availability (presence within a quarter mile of the family home) of supermarkets, corner stores, and convenience stores in a community. The organizational nutrition environment was defined as the risk of family food insecurity. Although eating outside of the home is common and represents a large portion of the American diet (USDA, 2014), what is available in the home also plays a role in what people eat. Likewise, what food outlets are available in the community determines what food is available in the home. The review of the literature suggests that when low income families have limited access to affordable foods, they may be at an increased risk of food insecurity.

In the adapted version of the model of community nutrition environment the community nutrition environment and cumulative risk are related to the organizational nutrition environment, represented by the risk of family food insecurity (see Figure 1.1).

Figure 1.1
Adapted Version of the Model of the Community Nutrition Environments
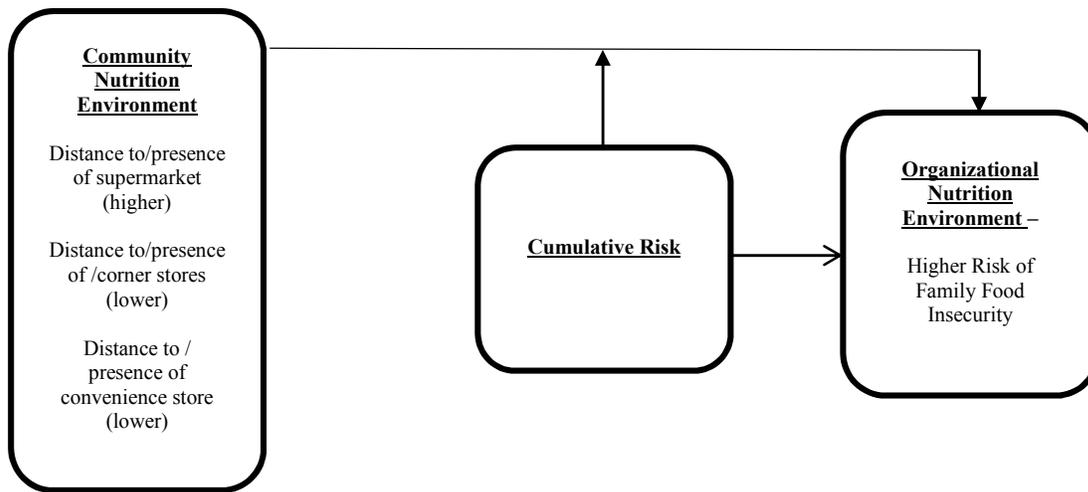
The community nutrition environment is associated with family food insecurity, through

accessibility (distance) and availability (presence) of different food outlets. Specifically

higher accessibility (i.e., shorter distance) to the closest supermarket and lower

accessibility (i.e., longer distance) to the nearest convenience or corner store increase the

likelihood of family food insecurity. In addition, lower availability of supermarkets, but

higher availability of corner and convenience stores will increase the risk of family food

insecurity. These relationships are also related to the cumulative experience of individual

level food insecurity risk factors, namely, race, poverty, marital status, household

composition, caregiver education, unemployment or under employment, depression,

stress, and having a smoker in the home. In the original model, Glanz and colleagues

(2005) propose that individual variables mediate or moderate the relationship between

environmental variables and eating behaviors, but did not specify which. This

dissertation examines the CRI comprised of individual variables as a moderator between

the community nutrition environment and the organizational nutrition environment. The

CRI examines the effect of experiencing multiple risk factors, accounting for their compounding effects.

The cumulative experience of these variables may moderate the relationship between the community nutrition environment and risk of family food insecurity. Current literature suggests that accessibility of food stores for low income families should include cost (Darko et al., 2013; Wiig & Smith, 2009), transportation (Wiig & Smith, 2009), neighborhood safety (Franco et al., 2008), food storage options (Food Research and Action Center, 2012), and availability of healthy food (Andreyeva et al., 2008; Franco et al., 2008; Jetter & Cassady, 2006; Liese, et al., 2007; Leone et al., 2008). The adapted version of the community nutrition environments will focus solely on distance to nearest food store and presence of food stores based on the data available.

1. **Importance to social work and social justice.**

This dissertation plays an important social work role from the practice, research, and policy perspective. Developing a better understanding of how community level economics impact individuals builds the knowledge base needed by social workers to practice from a person-in-environment perspective. As social workers, we need to understand how communities affect our clients. This is essential on two levels: it adheres to the National Association of Social Workers (NASW, 2008) Code of Ethics value of service, which requires social workers to address the needs of our clients; and it provides social workers with better information in the development of community level interventions and policies to improve access to affordable, healthy foods. If accessibility and availability of corner stores and convenience stores escalate the likelihood of family food insecurity, interventions should focus on increasing affordability and availability of

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food within these stores and improved accessibility and availability of supermarkets, such as increased access to transportation (Walker, Fryer, Butler, Keane, Kriska, & Burke, 2011). In addition, social workers are potential advocates for increases in SNAP benefits, both in terms of who is eligible for benefits, and the amount of benefits. The amount of the benefit is particularly important to consider given the high rate of food insecurity among SNAP recipients (Wilde & Norde, 2005).

This dissertation contributes to social work practice, as many households who experience food insecurity belong to marginalized or oppressed groups, particularly low income, female-headed, or minority households (Coleman-Jensen et al., 2014). The NASW (2008) specifies the core value of social justice as a vital element of social work practice. This stresses the responsibility of social workers to improve accessibility and opportunity for oppressed groups, including the overall food security of marginalized people. Whitaker (1993) stresses that decreasing household food insecurity is not just a charitable responsibility, but also a social justice responsibility. He emphasizes the need to develop policies that affect broader food access issues. This means developing policies and interventions that not only serve as an emergency buffer to food insecurity, but ensuring that policies and interventions with communities build food security in a meaningful way that prevents a need for emergency buffers. Additionally, this dissertation contributes to the social work knowledge base, as little is currently known about the association between the community nutrition environment and family food insecurity.

E. Research Aim and Hypotheses

   This dissertation addressed gaps in the literature through examining the association between the community nutrition environment and food insecurity among low income urban families, specifically families with early adolescent girls. Based on the adapted version of the model of community nutrition environments (Glanz et al., 2005) and the literature reviewed, this study examined whether the community nutrition environment (accessibility and availability) predicts family food insecurity after controlling for the cumulative effects of sociodemographics and psychosocial risk factors related to family food insecurity.

Specifically the dissertation tested the following hypotheses in a sample of low-income families:

1. Higher cumulative risk is related to heightened risk of family food insecurity.

2. Accessibility of the community nutrition environment, as represented by distance to the nearest food outlets, is related to risk of family food insecurity. Specifically, higher risk of family food insecurity is related to:

    a. Greater distance to the nearest supermarket.

    b. Shorter distance to the nearest corner store.

    c. Shorter distance to the nearest convenience store.

3. Cumulative risk moderates the relationship between accessibility of the community nutrition environment, as represented by distance to the nearest food outlets, and the risk of family food insecurity, such that a higher score on the CRI will intensify the relationship between accessibility of the community nutrition environment and food insecurity.

4. Availability of the community nutrition environment, as represented by presence of food outlets in the community, is related to risk of family food insecurity. Specifically, higher risk of family food insecurity is related to:

   a. Not having supermarkets in a quarter mile radius of participants' homes.

   b. Having corner stores in a quarter mile radius of participants' homes.

   c. Having convenience stores in a quarter mile radius of participants' homes.

5. CRI moderates the relationship between the availability of the community nutrition environment, as represented by the presence of food outlets in the community, and the risk of family food insecurity, specifically, higher cumulative risk will intensify the relationship between availability of the nutrition environment and food insecurity.

II: METHOD

The current study takes place in Baltimore City, Maryland. Baltimore is situated on the Inner Harbor of the Chesapeake Bay. Overall, Baltimore experiences rates of poverty well above the national and state averages (23.8% versus 14.5% and 9.8%, respectively) (U.S. Census Bureau, 2015). Nearly two-thirds of Baltimore residents identify as Black or African American alone (63%) and just under one third identifies as White or Caucasian alone (32%) (U.S. Census Bureau, 2015). Less than 5% of city residents identify as Hispanic or Latino.

Children's Health Watch (2011) reported high levels of food insecurity among Baltimore City youth, ranging from 13% among infants and toddlers to 48% among adolescents 12 – 17 years old. According to the Baltimore Food Policy Initiative (2012), 20% of all Baltimore City residents and 26% of African American residents live in a food desert or an area with limited access to healthy foods, high poverty, and low vehicle ownership. In addition, many areas of the city are considered food swamps, meaning that the area is designated as a food desert, but also experiences high access to corner stores and carryout and fast food restaurants (Johns Hopkins Center for a Livable Future, 2012). Despite ongoing efforts by city officials, researchers, and non-profit organizations, the contextual food environment of Baltimore, coupled with high poverty and food insecurity place families at considerable risk for negative health outcomes related to diet. It is within this context that the current study occurred.

A. Data Sources

This dissertation included data from two sources. First, data regarding family food insecurity, family demographics, and psychosocial factors came from the *Challenge! in Schools* study (Hager, Witherspoon, Gormley, Latta, Pepper, & Black,

2013). The dissertation also utilized Maryland Food System Map data for Baltimore City compiled by Johns Hopkins Center for a Livable Future (JHCLF, 2012).

1. *Challenge!* **in Schools.**

Challenge! In Schools is a randomized control trial testing an obesity prevention and health promotion intervention with sixth and seventh grade girls in an urban school setting. This dissertation used data collected from the intervention participants' caregivers regarding *family* food insecurity, demographics, and psychosocial measures. The *Challenge! in Schools* study was conducted in schools that had greater than 75% of students receiving free or reduced lunch and a population of 70% or more African American/Black students (Hager et al., 2013). Data were collected from caregivers between 2009 and 2012 in several ways: (1) research assistants mailed surveys to participants' homes with a self-addressed return envelope, (2) research assistants sent surveys home with students to give to the caregiver, or (3) research assistants gave the survey directly to the caregiver, to be returned in the mail or directly to the research assistant. This dissertation used the baseline data from the *Challenge!* study. A total of 828 girls from a potential pool of 1,840 girls consented to participate in the study, 789 were randomized to either the control or intervention group. Among caregivers, 471 returned the caregiver questionnaire, 455 had a child who was randomized for participation. Because home addresses were necessary to map distance between family homes and food outlets, only participants with a known home address were included in this dissertation. Of the 455 caregivers with children included in the study, there was a home address available for 450 families.

2. Maryland Food System Map data for Baltimore City.

Community nutrition environment data for Baltimore City were obtained from the Maryland Food System Map, compiled by the JHCLF. Store information was obtained using the food licensing records attained from the Baltimore City Health Department. Researchers at the JHCLF conducted a drive through verification in all study neighborhoods to ensure that all stores were included, and that all stores on the lists were still open for business (A. Behrens, personal communication, February 19, 2013). This dissertation used the data last updated in 2009, a timeframe consistent with the beginning of data collection in the *Challenge!* study.

B. Sample Characteristics

Of the 450 families included in this dissertation, 85% of the caregivers were mothers (see Table 2.1). Nearly all caregivers (94%) had the teens living with them all of the time, with the remaining splitting their time with another caregiver. The majority of the caregivers were African American/Black (90%) and the majority of the teens were African American/ Black (91%). Over half of the caregivers were single (57%), with slightly more than a quarter reporting that they were married (27%). Half of the families (49%) lived at or below the poverty line. Using a definition of poverty that included living at or below 135% of the Federal Poverty Guideline, receipt of Temporary Aid to Needy Families (TANF) or Temporary Cash Assistance (TCA) benefits, caregiver medical assistance, and free school lunch or breakfast, 86% of the sample was living in poverty.

Table 2.1
Sample Characteristics (n = 450)

	N	%	Valid %
Caregiver race/ethnicity			
African American/Black	395	87.8	89.6
Caucasian/White	29	6.4	6.6
Asian American	1	.2	.2
Native American	1	.2	.2
Multi-racial/ethnic	9	2.0	2.0
Latino/Hispanic	6	1.3	1.4
Missing	9	2.0	
Adolescent girls' race/ethnicity			
African American/Black	399	88.7	91.3
Caucasian/White	18	4.0	4.1
Asian American	1	.2	.2
Multi-racial/ethnic	13	2.9	3.0
Latino/Hispanic	6	1.3	1.4
Missing	13	2.9	
Caregiver gender			
Male	21	4.7	4.7
Female	424	94.2	95.3
Missing	5	1.1	
Caregiver marital status			
Single	248	55.1	56.6
Married	118	26.2	26.9
Widowed	9	2.0	2.1
Divorced	37	8.2	8.4
Separated	26	5.8	5.9
Missing	12	2.7	
Food security status			
Food secure	203	45.1	48.1
Food insecure	219	48.7	51.9
Missing	28	6.2	
Receipt of food assistance			
No	188	41.8	43.0
Yes	249	55.3	57.0
Missing	13	2.9	

Table 2.1 Continued
Sample Characteristics (n = 450)

	N	%	Valid %
Caregiver BDI-II			
Minimal depression	282	62.7	63.8
Mild depression	91	20.2	20.6
Moderate depression	54	12.0	12.2
Severe depression	15	3.3	3.4
Missing	8	1.8	
Primary caregiver			
No	8	1.8	1.8
Yes	433	96.2	98.2
Missing	9	2.0	
Relationship to teen			
Mother	379	84.2	85.4
Father	20	4.4	4.5
Grandmother	25	5.6	5.6
Other	20	4.4	4.5
Missing	6	1.3	

C. Procedures

In addition to secondary analysis of data (described below in the measurement section) collected from the *Challenge!* study (Hager et al., 2013) and the Maryland Food Systems Map, home addresses from the *Challenge!* data were geocoded in order to analyze their spatial relationship with food outlets from the Maryland Food Systems Maps. Geocoding is the process of adding a "point," typically in the form of geographic coordinate values, to an address (Mitchell, 2005). Geocoding allows for calculation of the distance between points of interest, in this case the families' homes and the different stores. Distance between geocoded home addresses and geocoded store addresses was calculated for the closest supermarkets, corner stores, and convenience stores for each home using ArcGIS software following path distance, the distance based on the shortest actual path families would take in order to reach the stores (i.e., following sidewalks).

The number of supermarkets, corner stores, and convenience stores within a quarter of a mile following path distance was mapped and counted for each participant using ArcGIS 10.1 software.

D. Measures

1. Food insecurity.

Family food insecurity status was measured with a two-item brief measurement developed by Hager and colleagues (2010) using a large, national sample of children and caregivers in a health setting. The two-item screening tool for food insecurity consists of two questions taken from the United States Food Security Survey Module, an 18-item measure, generally considered the gold standard in detecting family food insecurity (Bickel, Nord, Price, Hamilton & Cook, 2000): 1) "within the past 12 months we worried whether our food would run out before we got money to buy more" and 2) "within the past 12 months, the food we bought just didn't last and we didn't have money to get more." Answering affirmatively to either or both of these questions indicates a risk of food insecurity in the family.

The two-item measure has good sensitivity (97%) and good specificity (83%) (Hager et al., 2010). Results of the initial assessment of the measure indicate good convergent validity with regard to health and behavioral outcomes often associated with food insecurity, specifically poor child and caregiver health, caregiver depression, increased risk of hospitalization, and increased developmental risk for children (Hager et al., 2010). For this dissertation, families were categorized as either not at risk for food insecurity (coded 0) if they answered "no" to both questions or at risk for food insecurity

(coded 1) if they answered "yes" to one or both questions. This binary measurement of

food insecurity serves as the outcome of interest for this dissertation.

2. Community nutrition environment.

This dissertation studied food store accessibility, the distance participants travel to

the nearest supermarket, corner store, and convenience store, as well as store availability

based on the presence of stores within a community, conceptualized as a quarter mile

radius.

Accessibility. The path distance to the nearest supermarket, corner store, and

convenience store was calculated for each participant. Path distance measures the

shortest walking distance following sidewalks between points of interest. According to a

review of food environment literature conducted by Caspi, Sorensen, Subramanian, and

Kawachi (2012), distance to food outlets can be conceptualized as accessibility of the

food environment. The distance from the home to the nearest of each type of food venue

represented a separate variable in the analysis. The distance is reported in feet and miles.

In multivariate analyses, distance is reported in quarter mile units.

Availability. The number of supermarkets, corner stores, and convenience stores

within a one quarter mile radius was calculated. A one quarter mile radius was chosen

because it is considered to be a walkable distance (Baltimore City Food Policy Task

Force, 2010). Store presence and density is conceptualized as availability of the food

environment (Caspi, et al., 2012)[1]. Supermarkets and convenience stores were

operationalized dichotomously, as either having a store present (coded 1), or not having a

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[1] Definitions of availability in regard to the food environment can differ by research focus and methodology. Although it is sometimes conceptualized as having access to healthy food, Caspi et al.'s (2012) systematic review of food environment literature found that availability in studies using GIS methods is typically conceptualized as store density within a certain area from the home.

store present (coded 0). There were a greater number of corner stores present, so this variable was operationalized as "no stores present" (coded 0), "1 – 2 stores present" (coded 1) and "3 or more stores present" (coded 2). These categories were chosen as there was variability across values that allowed for analysis of difference between the categories. The categorization intuitively made sense, as having one or two stores present makes a store available to a family, but does not allow for strong competition in pricing and options between stores. Three or more stores present near the home not only makes a store type available to families, but also gives families some measure of choice and increased competition between stores.

Store type[2]. JHCLF (2012) identified four types of food stores: supermarkets, corner stores, behind the glass stores, and convenience stores.

Supermarkets. Supermarkets are large stores that sell all food types, including meat, produce, seafood, canned foods, and packaged foods (JHCLF, 2012).They have 50 or more employees, three or more cash registers, and are typically part of a larger chain.

Corner stores. Corner stores are smaller stores that carry snacks, sodas, and candy, but have a limited amount of fresh or frozen foods available (JHCLF, 2012). In addition to having less food than supermarkets, they are typically owned and operated independently, with name recognition within the neighborhood, but not beyond. They generally are the size of one to two typical Baltimore row homes. JHCLF (2012) separates out "Behind Glass" corner stores, which meet the same criteria as corner stores, but all goods are placed behind plexiglass. This dissertation combined corner stores with behind glass stores and both are referred to as corner stores in this dissertation.

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[2] In the preceding literature review, store type is more broadly defined. For purposes of operationalization, the precise definitions used by JHCLF are employed.

Convenience stores. JHCLF (2012) defines these stores as being typical chain convenience stores that carry packaged and canned foods, with some stores carrying prepared foods or limited produce. They are different from corner stores in that they are typically chain stores with recognition beyond neighborhood boundaries, such as 7-11 or Royal Farms. In addition to limited food options, these stores are often attached to gas stations (Franco et al., 2008).

3. Cumulative risk index.

In order to address the cumulative role of individual factors related to family food insecurity, a CRI was calculated for caregivers based on their membership in a high-risk group for individual variables with previously supported associations to food insecurity. The CRI is comprised of: (1) race, (2) poverty, (3) employment status, (4) marital status, (5) education, (6) female head of household, (7) smoking, (8) stress, and (9) depression. Development of the CRI was guided initially by literature, but also by what data were available.

Race. Food insecurity occurs more frequently in African American and Latino households (Coleman-Jensen et al., 2014). Participants who identified as Black/African American, Asian, Latino, Native American, or Other were categorized as high risk (coded 1). Those who identified as White were categorized as low risk (coded 0).

Poverty. Poverty is associated with higher rates of food insecurity among U.S. households (Coleman-Jensen et al., 2014). Families living at or below 135% of federal poverty guidelines, or receiving medical assistance for the caregiver, TANF/TCA benefits, or receiving free school lunch or breakfast were categorized as high risk for

poverty (coded 1). Those above 135% of the federal poverty guidelines and receiving none of the above benefits were categorized as low risk for poverty (coded 0).

Employment. As employment status is linked with food insecurity (Sharkey et al., 2011), those who were unemployed, receiving disability, on medical leave, retired, or working less than 20 hours per week were categorized as high risk (coded 1). Those who work 20 or more hours per week were categorized as low risk for employment (coded 0).

Marital status. Food insecurity is more common among single parent households (Coleman-Jensen et al., 2014). Marital status was categorized as high risk for those who identified as single, divorced, separated, or widowed (coded 1) and categorized as low risk for those who were married (coded 0).

Education. Education is linked with household food insecurity, such that lower levels of caregiver education is associated with higher rates of food insecurity (Laraia et al., 2006; Sharkey et al., 2011; Yu et al., 2010). Those with an education level less than a high school diploma were categorized as high risk (coded 1) and those who graduated high school or earned a GED or greater were categorized as low risk (coded 0).

Female-headed household. Food insecurity is more common among households headed by women (Coleman et al., 2014; Laraia et al., 2009). Households having a female head were categorized as high risk (coded 1) and those with a married couple or male as head of household were categorized as low risk (coded 0).

Smoking. Smoking is associated with heightened risk of food insecurity (Armour et al., 2008; Kirkpatrick & Tarasuk, 2008) and increased severity of food insecurity (Cutler-Triggs et al., 2008) Having a smoker in the home was categorized as high risk (coded 1) and they were categorized as low risk if no one in the home smoked (coded 0).

Perceived stress. Food insecurity is more common among those who experience high levels of stress (Gucciardi et al., 2009; Jilcott et al., 2011). Perceived stress was measured using the Perceived Stress Scale (PSS). The PSS contains 14 items rated on a four point Likert scale ranging from 0 (*Never*) to 4 (*Very often*) (Cohen, Kamarck, & Mermelstein, 1983) and was scored as directed. Overall, scores range from 0 to 56, with higher scores representing increased stress. Cronbach's alpha scores range from .84 to .86 in college and community samples, and the PSS demonstrates predictive validity when compared to depressive symptoms and life-events (Cohen et al., 1983).

As there are no clinical cut-offs for the Perceived Stress Scale, those above the 75th percentile (scores > 28) on the 0 - 56 scale were categorized as high risk (coded 1). Those at the 75th percentile or lower (scores ≤ 28) were categorized as low risk (coded 0). This is consistent with Sameroff, Seifer, Barocas, Zax, and Greenspan's (1987) work with cumulative risk, which used the 75th percentile as a cutoff for high risk for measures that did not have specific categories.

Depression. Depression is associated with food insecurity (Melchior et al., 2009; Whitaker et al., 2006) and decreases the likelihood of a family becoming FS (Lent et al., 2009). Depression was measured by the Beck Depression Inventory II (BDI-II). The BDI-II includes 21 self-report items that measure depressive symptoms and severity (Beck, Steer, & Brown, 1996). The BDI-II uses a four-point Likert scale that ranges from 0 (*Not at all*) to 3 (*Severely*), with higher scores representing increased experience of depressive symptoms. Results were scored as directed. Participants are categorized as having minimal depression (0 – 31) (coded 0), mild depression (14 – 19) (coded 1), moderate depression (20 – 28) (coded 2), or severe depression (29 – 63) (coded 3) (Beck

et al., 1996). The BDI-II displays good internal consistency (Cronbach's α = .90) as well as strong criterion validity regarding a diagnosis of depression among African American samples (Grothe, Dutton, Jones, Bodenlos, Ancona, & Brantley, 2005). For the CRI, those with moderate or severe depression were categorized as high risk (coded 1) and those with minimal or mild depression were categorized as low risk (coded 0).

  Cumulative risk index. For each high risk group the caregivers belong to, they received a score of 1, which was then summed for a CRI score ranging from 0 – 9. High risk for each variable is defined above and in Table 2.2 below. There were complete risk data for 366 of 450 cases (81%). For those with data for seven or eight of the nine risk variables, a prorated value was calculated using the number of risk variables experienced and the valid number of variables with complete data (Cornelius & Harrington, 2014; Schafer & Graham, 2002; Shrive, Stuart, Quan, & Ghali, 2006). Using a prorated variable for CRI, 442 cases (98%) had sufficient data to calculate a CRI.

Table 2.2
Cumulative Risk Index of Food Insecurity

Risk Variable	Low Risk	High Risk
Race	White	Black, Asian, Latino, Native American, or Other
Poverty	Above Poverty Threshold	At/Below Poverty Threshold and/or receipt of TANF, TCA, or caregiver medical assistance.
Employment	Employed for 20 or more hours per week	Unemployed, receiving disability, retired, on medical leave, working less than 20 hours per week.
Marital Status	Married	Single/Divorced/Separated/Widowed
Education	High School or Above	Less than High School
Head of Household	Male/Married Couple	Female
Smoking	No Smokers	Smoker in the Home
Stress	75th Percentile and Below	Above the 75th Percentile (28 or greater)
Depression	Minimal or Mild Depression	Moderate or Severe Depression

E. Data Analysis

ArcGIS® software by ESRI was used to: (1) map family home addresses and stores addresses, (2) calculate the distance between family home addresses and the nearest supermarket, corner store, and convenience store, and (3) count the number of supermarkets, corner stores, and convenience stores within a quarter mile of family home addresses. Data were then exported from ArcGIS to a dBASE file, exported to Excel, and exported to SPSS where they were merged with the *Challenge!* data using a unique identifier for each case. This data set was used for all data analysis. Preliminary data analysis included assumption checking, descriptive statistics, and bivariate analyses. A series of logistic regression analyses were run to test the likelihood of a family being food secure versus at risk of being FI based on cumulative risk and the local food environment. Data analysis was performed using IBM© SPSS© Statistics Version 22.

1. Preliminary data analysis.

Prior to analysis, all data were examined for logistic regression assumptions, missing cases, distribution problems (e.g., skewness and kurtosis), and outliers. The data were analyzed using univariate descriptive statistics. Relationships between all variables were examined using chi-square analysis, independent samples *t*-tests, Pearson correlation coefficients, and Spearman correlation coefficients.

Assumptions. Prior to data analysis, the data were checked for logistic regression (LR) assumptions and no violations were found. This included assessing predictor variables for multicollinearity, which were all within acceptable ranges, with variance inflation factors below 10 and tolerance values greater than .20 (Tabachnik & Fidell,

2007). The data were also checked for linear relationships between continuous predictor variables and the dependent variable.

Missing data. The data were examined to determine the level of missing data per variable, and across analyses. For food security status, 422 of 450 cases (94%) had complete data. Using a prorated variable for CRI, 442 cases (98%) had complete data. All store variables (distances to nearest stores and presence of stores within a quarter mile) had complete data for all 450 cases. Cases with any missing data were deleted listwise, leaving 411 of 450 (91%) cases for the multivariate analyses.

Normality. The distributions of all continuous variables were checked for normality by examining the level of skewness and kurtosis for each continuous variable. The skewness and kurtosis statistics for all continuous variables were within an acceptable range.

Outliers. All data were checked for outliers using Tabachnik and Fidel's (2012) cutoff of a z-score +/-3.29. Outliers were identified for distance to supermarkets, corner stores, and convenience stores. There were 15 outliers for distance to supermarket and 3 outliers each for distance to corner and convenience store. These data were Winsorized to maintain their uniqueness. Windsorization is the process of transforming values that are outliers to a value just above the highest value in the data set not considered an outlier. Data analysis was run with both the original data and the Winsorized data and compared. As the Winsorization did not affect the outcome, the original data were used for the final analyses (Cohen, Cohen, West, & Aiken, 2003).

Univariate analyses. Frequency distributions for all variables were examined in order to assess the distribution of the data across categories. In addition, mean scores and

standard deviations were calculated for distance to the closest supermarket, corner store, and convenience store, as well as mean caregiver scores and standard deviations for the BDI-II and the PSS.

Bivariate analyses. Bivariate analyses were conducted to improve understanding of how the variables related to each other, as well as to examine any differences in risk variables between FS and FI caregivers. Independent samples *t*-tests were used to examine the differences between FS and FI caregivers in BDI-II, PSS scores, CRI, and distance to the nearest supermarket, corner store, and convenience store. Chi-square tests were used to examine differences in race, poverty, marital status, household composition, level of education, employment, and smoking status between FS and FI caregivers. Chi-square analyses were also conducted to test the relationship between food security status and whether or not there was a supermarket, corner store, or convenience store within a quarter mile of the caregivers' home address.

Post-hoc exploratory analyses. During the data analysis process, receipt of food assistance, specifically Women, Infants, and Children (WIC) and SNAP benefits, was examined for a relationship to food insecurity. Based on its bivariate association with food insecurity, and its protective relationship with food insecurity (Black et al., 2008), it was added to the multivariate models as a control variable. Participants who received either or both types of assistance were categorized as yes (coded 0), those who had income within eligibility guidelines, but received neither were categorized as eligible, not receiving (coded 1), and those who were above income guidelines for receipt of food

assistance were categorized as not eligible (coded 2) [3]. There were complete food

assistance data for 439 cases (98%).

2. **Hypothesis 1: Higher cumulative risk is related to heightened risk of family food insecurity.**

A *t*-test was used to examine the initial hypothesis that cumulative risk differs for FI and FS families. Family food insecurity was the grouping variable and CRI was the continuous variable. The relationship was also examined using logistic regression, with risk of food insecurity as the binary outcome and CRI as the predictor, controlling for the receipt of food assistance.

3. **Hypothesis 2: Accessibility of the community nutrition environment, as represented by distance to the nearest food outlets, is related to higher risk of family food insecurity.**

I hypothesized that accessibility of the community nutrition environment (distance to the nearest food outlets) is associated with the organizational nutrition environment (family food insecurity). Logistic regression (LR) analysis was used to examine whether or not distance to the nearest store is related to the risk of food insecurity. The CRI and receipt of food assistance were added to the model as covariates, and distance to the nearest supermarket, corner store, and convenience store were entered as predictors. Risk of family food insecurity was entered as the outcome variable.

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[3] Food assistance in the multivariate analyses is different than the food assistance variables used as a proxy for poverty in the CRI. Here it refers to those receiving SNAP or WIC benefits, which were not included as a proxy for poverty.

4. **Hypothesis 3: Cumulative risk moderates the relationship between accessibility of the community nutrition environment, as represented by distance to the nearest food outlets, and the risk of family food insecurity.**

The moderating effect of the CRI on the relationship between distance to nearest stores and family food insecurity was tested by adding interaction terms to the logistic regression analysis used to address Hypothesis # 2. Interaction terms were built for the CRI by distance to the nearest supermarket, corner store, and convenience store.

5. **Hypothesis 4: Availability of the community nutrition environment, as represented by presence of food outlets, is related to greater risk of family food insecurity.**

I hypothesized that availability of the community nutrition environment (presence of food stores in the community) is associated with the organizational nutrition environment (family food insecurity). LR was used to examine whether or not availability of food stores in the community is related to the risk of food insecurity. The CRI and receipt of food assistance were added to the model as covariates. Presence of supermarkets, corner stores, and convenience stores within a quarter mile of participants' homes were entered as predictors, and risk of family food insecurity was added as the outcome variable.

6. **Hypothesis 5: Cumulative risk moderates the relationship between availability of the community nutrition environment, as represented by distance to the nearest food outlets, and the risk of family food insecurity.**

The moderating effect of cumulative risk on the relationship between availability of food stores within a quarter mile of the family home and family food insecurity was

tested by adding interaction terms added to the logistic regression model in hypothesis 4. Interaction terms were built for the CRI by availability of supermarkets, corner stores, and convenience stores within a quarter mile.

III: RESULTS

This chapter begins with a summary of sample characteristics, as well as a summary of presence of proximity and distance to supermarkets, convenience stores, and corner stores in participants' communities. It is followed by group comparisons between FS and FI participants and the results of the logistic regression models used to test the five hypotheses. This chapter finishes with a summary of the results.

A. Sample Characteristics

There were a large number of FI participants, with over half of the participants reporting food insecurity (52%). In addition, over half of the participants (57%) received either WIC or SNAP benefits, 30% were eligible for benefits, but not receiving them, and 13% were not eligible for SNAP benefits. Overall, most caregivers experienced minimal (64%) or mild symptoms of depression (21%), falling within a normal range. A small number experienced moderate (12%) or severe symptoms of depression (3%), above the normal range of symptoms. The mean score on the PSS was 23.47 ($SD = 7.18$) (see Table 3.1). Although there are not clinical cutoffs for the PSS, the mean score is 19.62 ($SD = 7.49$) in normative populations (Cohen & Williamson, 1988), suggesting potentially higher levels of stress in the current sample.

The participants had a mean of 4.52 on the CRI ($SD = 1.7$) (see Table 3.1). The majority of participants were high risk with regard to race, poverty, marital status, and household composition (see Table 3.2). The largest portion of participants had a score between three and six (75.8%) on the nine point index. In order to protect participant anonymity, cumulative risk scores were aggregated by neighborhood. A map displaying cumulative risk aggregated by neighborhood is displayed in Figure 3.1. The maps

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display the mean CRI score for all participants in the neighborhood. A mean

neighborhood score is presented to protect the privacy of individual participants. The

light green areas of the map represent areas that had no research participants. In

neighborhoods with participants, darker shades of blue represent a higher aggregate CRI

score.

Table 3.1
Sample Characteristics

	% Missing	*M*	*SD*
Caregiver PSS	2.22	23.47	7.18
Poverty ratio	13.1	1.16	.80
Cumulative risk index	1.78	4.52	1.70

Table 3.2
High vs. Low Risk

	Low Risk		High Risk	
	N	%	N	%
Race	32	7.2	411	92.8
Poverty	62	14.1	377	85.9
Employment	257	59.4	176	40.6
Marital status	118	26.9	320	73.1
Household composition	174	39.3	269	60.7
Education	374	84.4	69	15.6
Smoking	252	62.4	152	37.6
Stress	308	70.0	132	30.0
Depression	373	84.4	69	15.6

Figure 3.1
Cumulative Risk Aggregated by Neighborhood

Cumulative Risk Index
- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.00
- 5.01 - 6.00
- 6.01 - 7.00
- 7.01 - 8.00
- 8.01 - 9.00
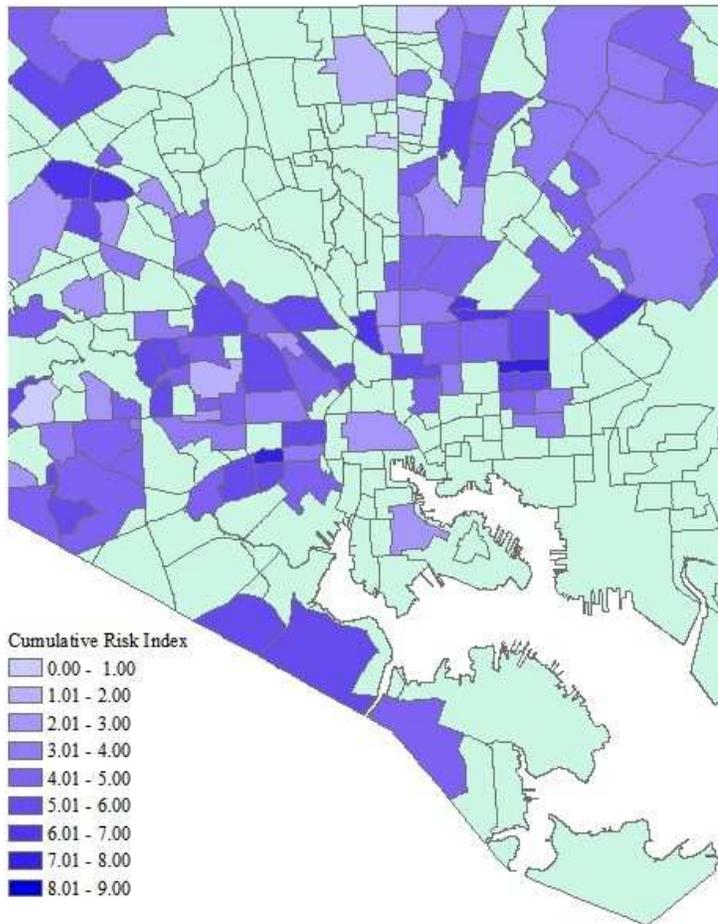
B. Community Store Accessibility and Availability

Over one-third (40%) of respondents had no food stores of any kind within a quarter mile of their home (see Table 3.3). The most common store type present was the corner store, with 54% of respondents having at least one corner store within a quarter mile. One quarter (27%) of respondents had 1-2 corner stores, and one quarter (27%) had 3 or more corner stores present within a quarter mile of the home. The maximum number of corner stores present within a quarter mile of family homes was 12. Convenience stores were less common with 19% of caregivers living within a quarter mile of a

convenience store. Among those with convenience stores present, 85% lived within a quarter mile of only one convenience store. The least common store type within a quarter mile of family homes was the supermarket, with only 7% of caregivers having a supermarket within this distance. No families had more than one supermarket within a quarter mile of their homes.

Table 3.3
Stores w/in ¼ Mile of Caregiver Addresses

	N	%
Supermarkets w/in ¼ mile		
Yes	32	7.1
No	418	92.9
Convenience store present w/in ¼ mile		
Yes	84	18.7
No	366	81.3
Corner store present w/in ¼ mile		
Yes	242	53.8
No	208	46.2
Corner stores w/in ¼ mile - 3 Category		
No corner stores	208	46.2
1 – 2 corner stores	120	26.7
3 or more corner stores	122	27.1
Any stores present w/in ¼ Mile		
Yes	273	60.7
No	177	39.3

The average distance travelled to the nearest stores varied by store type (see Table 3.4). Participants had to travel a mean of one third of a mile ($M = .33$, $SD = .29$, range: .01-1.76 miles) to reach the closest corner store. Mean distance to the nearest convenience store was about half a mile ($M = .54$, $SD = .32$, range: .00-1.97 miles) and .87 miles ($SD = .62$, range: .07-3.49 miles) to the nearest supermarket. See figures 3.2 – 3.4 below for distribution of food stores around Baltimore City neighborhoods. Similar to

the previous map, these maps include a mean CRI score aggregated by neighborhood. In addition, each map has points that represent the location of each store type throughout the city.

Table 3.4
Store Accessibility

	M	SD
Distance to nearest supermarket		
Feet	4,589.35	3,207.93
Miles	.87	.62
Distance to nearest convenience store (feet)		
Feet	2,831.13	1,664.30
Miles	.54	.32
Distance to nearest corner store (feet)		
Feet	1,743.59	1,552.95
Miles	.33	.29

C. Food Insecurity, Cumulative Risk, and Store Presence and Availability

Comparisons were made between FI and FS participants. This section reviews the relationship between food insecurity and cumulative risk. It also summarizes the association between food insecurity and store presence and availability.

1. Food security and cumulative risk.

Each of the variables within the CRI was examined individually to assess their relationship with food insecurity. FI and FS families differed significantly by race, with FI families more likely to identify as Black/African American, Asian, Latino, Native American, or Other (see Table 3.5). FI families were also more likely to be high risk for poverty when compared to FS families. FI families were more likely to be high risk for smoking, stress, and depression than FS families.

Figure 3.2
Supermarket Locations with Aggregated Cumulative Risk

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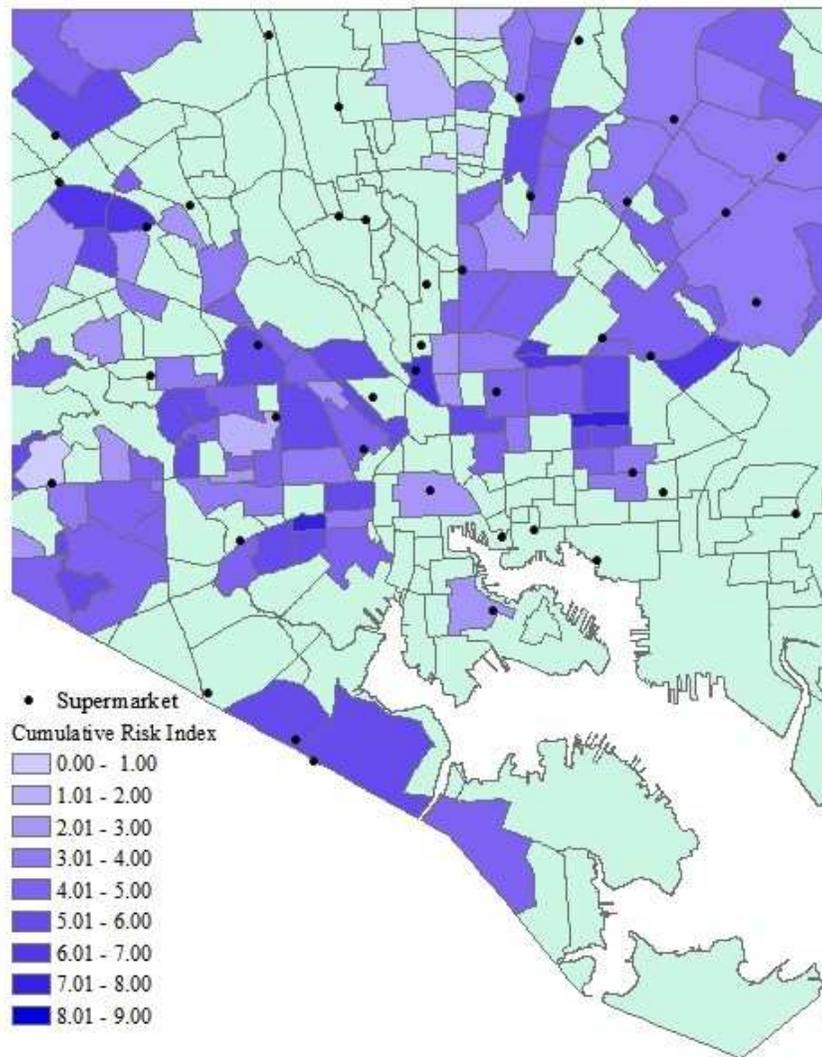
Figure 3.3
Convenience Store Locations with Aggregated Cumulative Risk

Convenience Stores
Cumulative Risk Index
- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.00
- 5.01 - 6.00
- 6.01 - 7.00
- 7.01 - 8.00
- 8.01 - 9.00
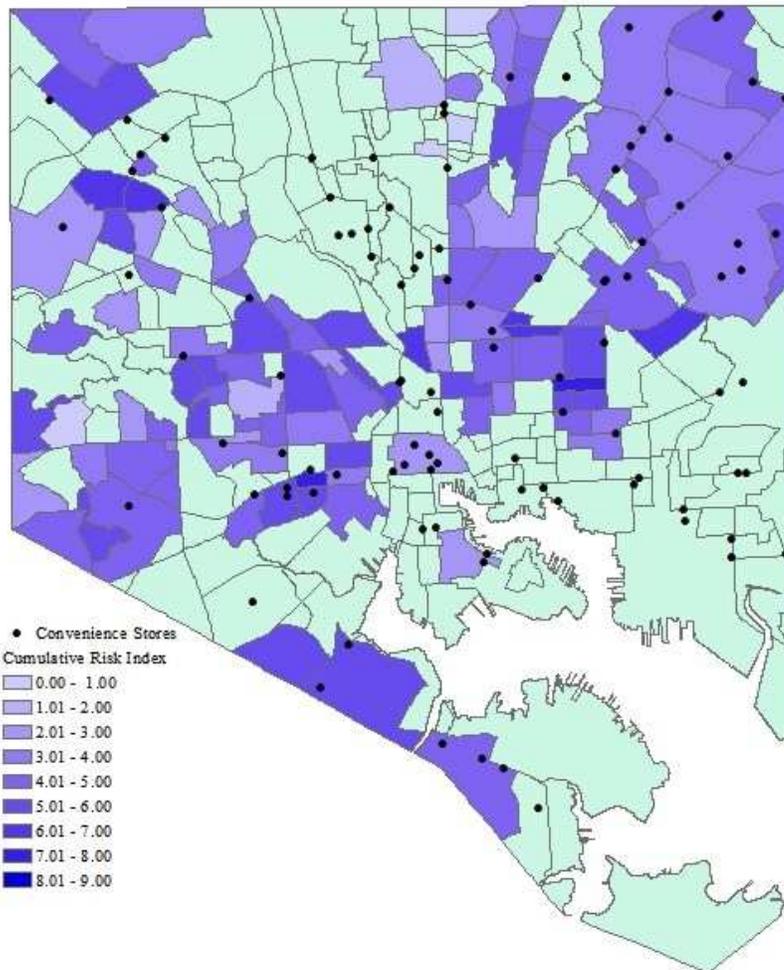
Figure 3.4
Corner Store Locations with Aggregated Cumulative Risk
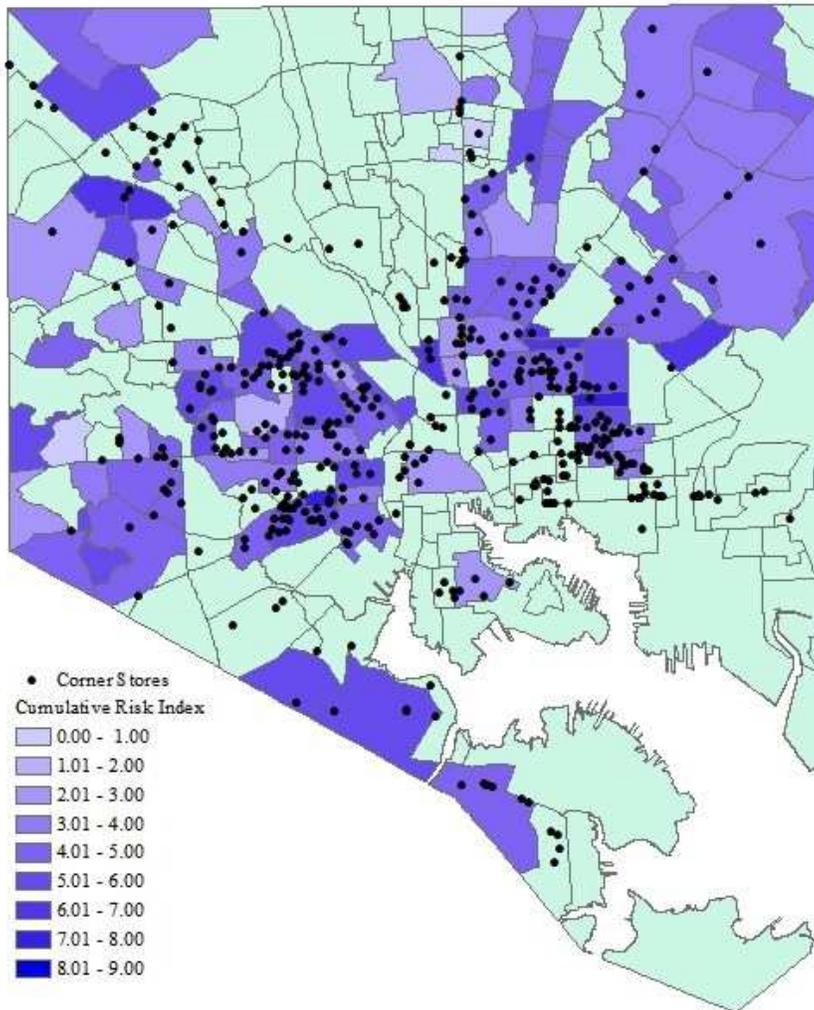
When comparing FI and FS caregivers across all four depression categories, there was a significant difference. The percentage of those who were FI increased as the depression category increased in severity: 43% among those with minimal depression, 63% among those with mild depression, 74% among those with moderate depression, and 77% among those with severe depression, whereas the number of depressed caregivers decreased among those who were FS. FI families were more likely to receive either SNAP or WIC benefits when compared to FS families. There were no significant differences between FI and FS families for marital status, female head of household, education, and employment. Overall, a greater percentage of FI families were high risk for race, poverty, smoking, stress, and depression than FS families. In addition, there was a significantly greater percentage of FI families receiving SNAP or WIC benefits.

There was a significant difference between FI and FS participants in score on the CRI, (see Table 3.6). FI participants scored nearly one point higher on the CRI than FS participants. Scores also differed for the PSS, with FI participants scoring 5.2 points higher than FS participants. Overall, FI participants experienced a higher mean score on the CRI and reported higher levels of stress.

Table 3.5

Chi-square Tests of Independence Comparing Sample Characteristics and Food Security Status

	Food Security Status					
	Food Secure		Food Insecure		χ^2	p
	N	%	N	%		
Cumulative risk index – Race					5.94	.015
Low risk	22	68.8	10	31.3		
High risk	178	46.4	206	53.6		
Cumulative risk index – Poverty					13.22	< .001
Low risk	42	70.0	18	30.0		
High risk	158	44.6	196	55.4		
Cumulative risk index – Employment					.561	.454
Low risk	118	49.0	123	51.0		
High risk	69	45.1	84	54.9		
Cumulative risk index - Marital status					2.71	.100
Low risk	60	55.0	49	45.0		
High risk	138	45.8	163	54.2		
Cumulative risk index - Head of household					.09	.761
Low risk	78	47.3	87	52.7		
High risk	122	48.8	128	51.2		
Cumulative risk index - Education					1.81	.178
Low risk	176	49.6	179	50.4		
High risk	25	40.3	37	59.7		
Cumulative risk index – Smoking					12.10	.001
Low risk	133	55.6	106	44.4		
High risk	52	37.1	88	62.9		
Cumulative risk index – Stress					34.56	< .001
Low risk	170	57.4	126	42.6		
High risk	33	26.2	93	73.8		
Cumulative risk index – Depression					15.65	< .001
Low risk	186	52.2	170	47.8		
High risk	17	25.8	49	74.2		
Caregiver BDI-II					25.97	< .001
Minimal depression	154	57.0	116	43.0		
Mild depression	32	37.2	54	62.8		
Moderate depression	14	26.4	39	73.6		
Severe depression	3	23.1	10	76.9		

Table 3.5 Continued
Chi-square Tests of Independence Comparing Sample Characteristics and Food Security Status

	Food Security Status				χ^2	p
	Food Secure		Food Insecure			
	N	%	N	%		
Food assistance					25.89	< .001
Yes	88	37.9	144	62.1		
Eligible, Not Receiving	68	55.3	55	44.7		
Not Eligible	42	72.4	16	27.6		

Table 3.6
Independent Samples t-tests Comparing Sample Characteristics and Food Security Status

	Food Security Status				t	p
	Food Secure		Food Insecure			
	M	SD	M	SD		
Cumulative risk index	4.02	1.64	4.92	1.60	-5.65	< .001
Caregiver PSS	20.72	6.69	25.92	6.64	-8.01	< .001

2. Food security and store accessibility and availability.

There were no significant differences between FI and FS caregivers with regard to having a supermarket, convenience store, or any store present within a quarter mile of the home (see Table 3.7). However, there was a significant difference for having a corner store present within a quarter mile of the home. Among those who lived within a quarter mile of a corner store, 43% were food secure, and 57% were food insecure.

Chi-square analysis also revealed a significant difference between FI and FS families for the number of corner stores within a ¼ mile. Among those who had no corner stores within a quarter mile, 46% were FI and 54% were FS. For caregivers living within a quarter mile of 1-2 corner stores, 61% were FI and 39% were FS. Among caregivers who lived within a quarter mile of 3 or more corner stores, 53% were FI and

47% were FS. The highest percentage of those who were FI lived within a quarter mile

of 1-2 corner stores and the highest percentage of those who were FS lived within a

quarter mile of no corner stores. Overall, those who had 1-2 corner stores had a

significantly higher percentage of FI participants than those who had no corner stores

present within a quarter mile (χ^2 = 6.37, p = .011). No significant difference existed

between those with 3 or more stores and those with no stores or with 1-2 stores within a

quarter mile. Independent samples t-tests revealed no significant differences between FI

and FS families in distance to the nearest supermarket, convenience store, or corner store

(see Table 3.8).

Table 3.7
Chi-square Tests of Independence Comparing Store Presence and Food Security Status

| | Food Security Status | | | | χ^2 | p |
| | Food Secure | | Food Insecure | | | |
	N	%	N	%		
Supermarket w/in ¼ mile					3.00	.082
Yes	19	63.3	11	36.7		
No	184	46.9	208	53.1		
Convenience store w/in ¼ mile					0.02	.891
Yes	40	48.8	42	51.2		
No	163	47.9	177	52.1		
Corner store w/in ¼ mile					4.79	.029
Yes	98	43.2	129	56.8		
No	105	53.8	90	46.2		
Corner Stores w/in ¼ Mile - 3 Category					6.40	.041
No corner stores	105	53.8	90	46.2		
1 - 2 corner stores	44	38.9	69	61.1		
3 or more corner stores	54	47.4	60	52.6		
Stores w/in ¼ Mile					2.97	.085
Yes	115	44.7	142	55.3		
No	88	53.3	77	46.7		

Table 3.8
Independent Samples t-tests Comparing Distance to Nearest Stores (in Miles) and Food Security Status

| | Food Security Status | | | | | |
| | Food Secure | | Food Insecure | | t | p |
	M	SD	M	SD		
Distance to nearest supermarket	.90	.67	.86	.60	0.69	.489
Distance to nearest convenience store	.53	.30	.55	.34	-0.66	.511
Distance to nearest corner store	.36	.30	.31	.29	1.72	.087

D. Association between Covariates and Predictors

There was no significant relationship between the CRI and distance to the nearest convenience store (see Table 3.9). However, a higher score on the CRI had a small effect size with farther distance to the nearest supermarket and the nearest corner store (Cohen, 1992).

Table 3.9
Correlation – Accessibility of the Community Nutrition Environment and Cumulative Risk Index (Pearson)

	1	2	3	4
Distance to closest supermarket				
Distance to closest convenience store	.194[**]			
Distance to closest corner store	.194[**]	.267[**]		
Cumulative risk index	.093[*]	-.007	-.129[**]	

** .01
*.05

There was no significant relationship between cumulative risk and the presence of a supermarket or convenience store within a quarter mile of the home (see Table 3.10). A greater score on the cumulative risk did have a small effect size on the presence of corner stores within a quarter mile of the home.

Table 3.10
Correlation – Availability of the Community Nutrition Environment and Cumulative Risk
Index (Spearman)

	1	2	3	4
Supermarket (w/in ¼ mile)				
Convenience store (w/in ¼ mile)	.134**			
Corner store (w/in ¼ mile)	-.004	.215**		
Cumulative risk index	-.068	-.012	.108*	

** .01
*.05

E. Hypothesis 1: Higher Cumulative Risk Index will be Related to Heightened Risk of Family Food Insecurity

An independent samples *t*-test was used to test the relationship between food

security status and the CRI. On average, the CRI score was nearly one point higher for

FI participants compared to FS participants (see Table 3.6). I used logistic regression

analysis ($n = 411$) to examine the hypothesis that the CRI was related to the risk of food

insecurity, after controlling for the receipt of food assistance (SNAP and/or WIC

benefits). Hosmer-Lemeshow Goodness of Fit tests indicate that the model fit is

adequate ($\chi^2_{(7)} = 4.19$, $p = .840$). The model explained between 9% (Cox and Snell R^2)

and 13% (Nagelkerke R^2) of the variance in family food security status and correctly

classified 63% of cases, including correctly identifying 58% of those who were FS and

68% of those who were FI. The CRI and food assistance were significantly related to

family food security status. Each additional factor on the CRI increased the odds of

being FI by 30% (OR = 1.30, $p < .001$). Those who did not receive food assistance had

38% lower odds of being FI (OR = .62, $p = .042$) and those who were not eligible for

food assistance had 61% lower odds of being FI (OR = .39, $p = .011$) compared to those

who did not receive food assistance (see Table 3.11). Overall, a higher score on the CRI

and receipt of food assistance are related to greater likelihood of being FI.

Table 3.11
Hypothesis 1 Logistic Regression Model

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Cumulative risk index	.262	.074	12.495	1	.000	1.300	1.124	1.503
Receipt of foods assistance[+]			8.176	2	.017			
Eligible, not receiving	-.482	.237	4.142	1	.042	.618	.388	.982
Not eligible	-.935	.367	6.478	1	.011	.393	.191	.807
Constant	-.848	.398	4.555	1	.033	.428		

[+] Reference category: receiving food assistance

F. Hypothesis 2: Accessibility of the Community Nutrition Environment as Represented by Distance to the Nearest Food Outlets Is Related to the Risk of Family Food Insecurity

Logistic regression analysis was performed to test the hypothesis that after

controlling for the CRI and receipt of food assistance, distance to the nearest

supermarket, corner store, and convenience store would predict food security status. The

logistic regression model ($n = 411$) examining the distance to the nearest supermarket,

corner store, and convenience store had adequate fit (Hosmer Lemeshow Goodness of fit

$\chi^2_{(8)} = 1.31, p = .995$). The model explained between 10% (Cox and Snell R^2) and 13%

of variance (Nagelkerke R^2) and correctly classified 63% of the cases, identifying 54% of

FS participants and 72% of FI participants. Distance to any of the stores did not

significantly predict family food insecurity (see Table 3.12). The CRI and receipt of food

assistance remained significant predictors of food security status. Each additional point

on the CRI raised the odds of food insecurity by 31% ($OR = 1.31, p < .001$). Those who

did not receive food assistance had 39% lower odds of being FI (OR .608, $p = .038$) and

those who were not eligible had 61% lower odds of being FI (OR = .389, *p* = .011) in

comparison to those who received food assistance. Overall, the CRI and receipt of food

assistance were associated with the likelihood of being FI, and distance to the nearest

supermarket, corner store, and convenience store was not associated with the risk of

being FI[4]. In addition, there was little change in the odds ratio for cumulative risk and

receipt of food assistance in comparison to the odds ratio for hypothesis 1.

Table 3.12
Hypothesis 2a – 2c Logistic Regression Model (Distance in ¼ Miles)

	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B) Lower	Upper
Cumulative risk index	.267	.075	12.683	1	.000	1.306	1.127	1.512
Receipt of foods assistance[+]			8.238	2	.016			
Eligible, not receiving	-.497	.239	4.318	1	.038	.608	.380	.972
Not eligible	-.943	.371	6.458	1	.011	.389	.188	.806
Distance to supermarket	-.060	.043	1.962	1	.161	.942	.866	1.024
Distance to convenience store	.092	.086	1.139	1	.286	1.096	.926	1.297
Distance to corner store	-.058	.095	.374	1	.541	.943	.783	1.137
Constant	-.773	.448	2.979	1	.084	.462		

[+] Reference category: receiving food assistance

G. Hypothesis 3: Cumulative Risk Index Moderates the Relationship Between Accessibility of the Community Nutrition Environment, as Represented by Distance to the Nearest Food Outlets, and the Risk of Family Food Insecurity

Logistic regression (*n* = 411) was used to test the hypothesis that the CRI

moderated the relationship between the community nutrition environment, represented by

distance to the nearest stores, and risk of family food insecurity.   Hosmer-Lemeshow

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[4] Exploratory analyses were conducted, examining separate logistic regression models for each store type, within each hypothesis. The separate models did not differ from models with all store types. As the hypotheses are meant to explore the overall food environment (all store types), I retained the models that included all store types.

Goodness of Fit tests indicate an adequate fit for the model examining distance to store and CRI ($\chi^2_{(8)}$ = 11.71, p = .165) and the model explained between 11% (Cox and Snell R^2) and 15% (Nagelkerke R^2) of the variance in family food insecurity. The model correctly classified 65% of the cases, identifying 54% of FS participants and 75% of FI participants. As in the previous models, those who did not receive food assistance had 38% lower odds of being FI than those who received food assistance (OR = .625, p = .051) but this was just above the cutoff for significance (see Table 3.13). Those who were not eligible for food assistance had 59% lower odds of being FI in comparison to those who received food assistance (OR = .411, p = .018). The CRI main effect was not significantly associated with the odds of being FI after the interaction terms were added to the model. However, the interaction between CRI and distance to nearest corner store term significantly predicted food security status. For each one unit increase on the CRI, a quarter mile increase in distance to the nearest corner store raised the odds of being FI by 17% (OR = 1.17, p = .030). Overall, the interaction between distance to nearest corner store and CRI and receipt of food assistance was associated with increased odds of being FI.

To interpret the interaction, I followed Bickel's (2007) recommendation for interpreting interactions in regression analysis to determine the odds of food insecurity at ⅛ mile, ¼ mile, and ½ mile across 3 to 7 on the CRI. These odds ratios were then plotted to allow for a visual interpretation of the moderating effect of cumulative risk on the relationship between distance to the nearest corner store and food insecurity (see Figure 3.5). For those with a CRI score of six or seven, odds of being FI increased with greater

distance to the nearest corner store. For those with a CRI score of five or below, odds of

being FI stayed relatively stable or decreased slightly.

Table 3.13
Hypothesis 3 – Logistic Regression Model (Distance in ¼ Miles)

	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B) Lower	Upper
Cumulative risk index	.060	.161	.140	1	.708	1.062	.775	1.455
Receipt of food assistance[+]			7.276	2	.026			
Eligible, not receiving	-.470	.241	3.824	1	.051	.625	.390	1.001
Not eligible	-.890	.375	5.623	1	.018	.411	.197	.857
Distance to supermarket	-.121	.150	.656	1	.418	.886	.661	1.188
Distance to convenience store	.112	.268	.175	1	.675	1.119	.662	1.891
Distance to corner store	-.756	.339	4.970	1	.026	.470	.242	.913
Cumulative risk index * distance to supermarket	.010	.029	.122	1	.727	1.010	.954	1.070
Cumulative risk index * distance to convenience store	-.008	.056	.018	1	.893	.993	.890	1.107
Cumulative risk index * distance to corner store	.156	.072	4.702	1	.030	1.168	1.015	1.345
Constant	.231	.811	.081	1	.776	1.259		

[+] Reference category: receiving food assistance

Figure 3.5
Interaction between Cumulative Risk Index and Distance to Nearest Corner Store in Feet
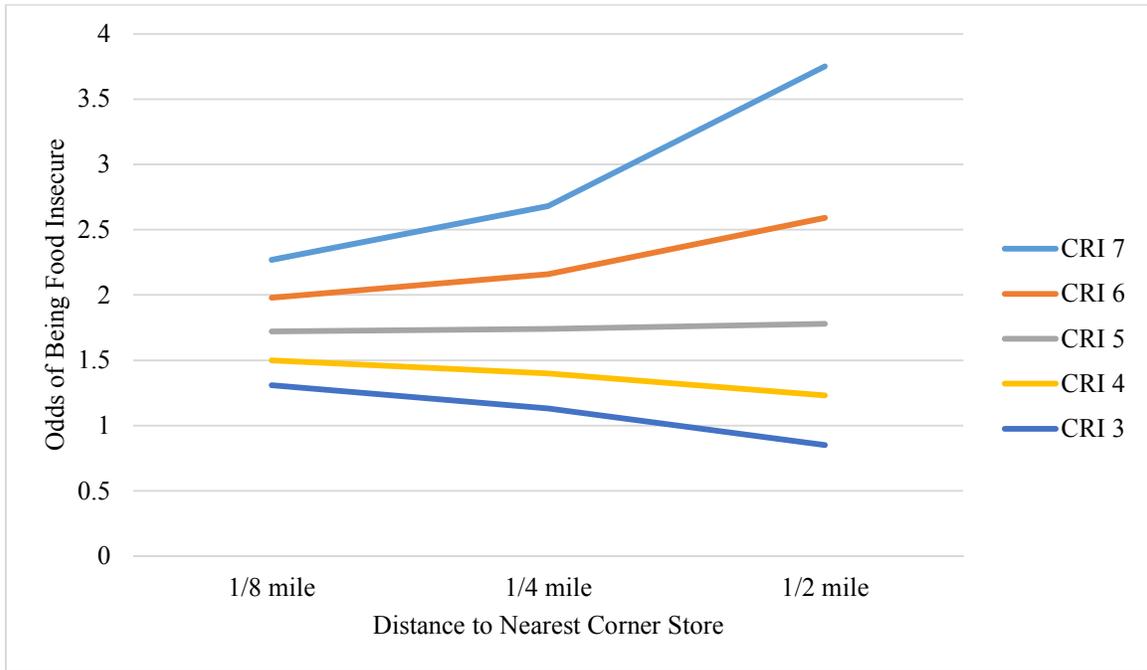
H. Hypothesis 4a – 4c: Availability of the Community Nutrition Environment as Represented by Availability of Food Outlets is Related to the Risk of Family Food Insecurity

The logistic regression model ($n = 411$) examining the relationship between the presence of food stores in the community and the risk of family food insecurity was an adequate fit according to Hosmer-Lemeshow Goodness of Fit test ($\chi^2_{(8)} = 14.56$, $p = .068$). The model predicted between 11% (Cox and Snell R^2) and 15% of the variance in food insecurity (Nagelkerke R^2) and classified 62% of the cases, correctly identifying 55% of FS participants and 70% of FI participants. The CRI and receipt of food assistance remained significant predictors of food security status. For each one unit increase in the CRI, the odds of being FI in comparison to being FS increased by 30% (OR = 1.30, $p < .001$). Those who did not receive food assistance had a 38% decrease in

the odds of being FI (OR = .62, *p* =.043) and those who were note eligible had a 60%

decrease in likelihood of being FI in comparison to those who received food assistance

(OR = .399, *p* = .013). Having convenience stores present within a quarter mile of family

homes did not significantly predict food insecurity (see Table 3.14).

Having a supermarket present within a quarter mile of the family home and the

number of corner stores present within a quarter mile of family households were close to

being statistically significant overall, and are worthy of further investigation, particularly

those who have 1 – 2 corner stores within a quarter mile of the home. Those who live

within a quarter mile of 1 – 2 corner stores are potentially at higher risk of being FI in

comparison to those who have no stores present.

Table 3.14
Hypothesis 4a – 4c Logistic Regression Model (Presence of Stores w/in ¼ Mile)

	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B) Lower	Upper
Cumulative risk index	.264	.076	12.213	1	.000	1.303	1.123	1.511
Receipt of food assistance[+]			7.824	2	.020			
Eligible, not receiving	-.486	.240	4.114	1	.043	.615	.384	.984
Not eligible	-.920	.372	6.109	1	.013	.399	.192	.827
Supermarket present	-.800	.428	3.486	1	.062	.449	.194	1.041
Convenience store present	-.047	.273	.029	1	.864	.954	.559	1.630
Corner store present[*]			5.511	2	.064			
1 – 2 corner stores present	.595	.263	5.107	1	.024	1.814	1.082	3.040
3 or more corner stores present	.075	.257	.085	1	.770	1.078	.651	1.784
Constant	-.974	.424	5.276	1	.022	.378		

[+] Reference category: receiving food assistance
*Reference category: no corner stores present.

I. **Hypothesis 5: Cumulative Risk Index will Moderate the Relationship between the Availability of the Community Nutrition Environment as Represented by the Presence of Food Outlets and the Risk of Family Food Insecurity**

Logistic regression ($n = 409$) was used to test the hypothesis that cumulative risk moderated the relationship between availability of the community nutrition environment, represented by the number of stores present within ¼ mile of the family home, and risk of family food insecurity. Hosmer-Lemeshow Goodness of Fit tests indicate an adequate fit for the model examining distance to store and CRI ($\chi^2_{(8)} = 8.79$, $p = .361$) and explained between 12% (Cox and Snell R^2) and 16% (Nagelkerke R^2) of the variance in food insecurity. The model correctly classified 63% of the cases, identifying 52% of FS participants and 73% of FI participants. Similar to the previous model, those who did not receive assistance had 39% lower odds of being FI (OR = .62, $p = .045$) and those who did were not eligible for food assistance had 58% lower odds of being FI in comparison to those who received food assistance (OR = .42, $p = .024$). Cumulative risk was associated with a 44% increase in the odds of being FI (OR = 1.44, $p = .001$) (see Table 3.15). The interaction terms between the CRI and the presence of supermarkets, convenience stores, and corner stores within a quarter mile of the family household were not associated with the odds of being FI. The main effects for presence of supermarkets, convenience stores, and corner stores within a quarter mile of family homes were not significantly associated with the odds of being FI. Overall, receipt of food assistance and higher CRI are associated with greater likelihood that a family would be FI, but the interaction between cumulative risk and the availability of supermarkets, convenience stores, and corner stores was not significantly associated with the odds of being FI.

Table 3.15
Hypothesis 5 – Logistic Regression Model (Presence of Stores w/in a ¼ Mile)

	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B) Lower	Upper
Cumulative risk index	.367	.115	10.229	1	.001	1.444	1.153	1.808
Receipt of foods assistance+			6.946	2	.031			
Eligible, not receiving	-.487	.243	4.005	1	.045	.615	.381	.990
Not eligible	-.862	.381	5.128	1	.024	.422	.200	.891
Supermarket present	-2.540	1.639	2.402	1	.121	.079	.003	1.958
Convenience store present	.248	.816	.093	1	.761	1.282	.259	6.340
Corner store present*			3.421	2	.181			
1 – 2 corner stores present	1.337	.796	2.820	1	.093	3.807	.800	18.119
3 or more corner stores present	1.169	.865	1.828	1	.176	3.219	.591	17.534
Cumulative risk index by supermarket present	.372	.335	1.235	1	.266	1.451	.753	2.796
Cumulative risk index by convenience store present	-.058	.167	.123	1	.726	.943	.680	1.308
Cumulative risk index by corner store present*			2.007	2	.367			
Cumulative risk index by 1-2 corner stores present	-.167	.167	1.002	1	.317	.846	.610	1.174
Cumulative risk index by 3 or more corner stores present	-.231	.176	1.713	1	.191	.794	.562	1.122
Constant	-1.450	.588	6.089	1	.014	.234		

+ Reference category: receiving food assistance
*Reference category: no corner stores present.

J. Summary of Findings

Overall, the findings were mixed. Higher cumulative risk was associated with higher odds of family food insecurity. Store accessibility and availability were not associated with family food insecurity, but the relationship between accessibility of corner stores and food insecurity was moderated by cumulative risk. Cumulative risk did not moderate the relationship between accessibility of supermarkets and convenience stores and the likelihood of food insecurity. Cumulative risk did not moderate the

relationship between FI and availability of any store type. Overall, the role of corner

stores in family food access is unclear, particularly in the context of cumulative risk.

Although they are typically more expensive and carry less quality food, they may serve

as an important source of food for those who experience the greatest risk of FI in urban

communities.

VI: DISCUSSION

The purpose of this dissertation was to examine if the community nutrition environment (accessibility and availability) was associated with risk of family food insecurity after controlling for cumulative risk and receipt of food assistance. This chapter discusses the findings of the study and how they relate to theory and prior literature. The findings were mixed, with some hypotheses supported and others not supported. Strengths and limitations of the study are also addressed. This chapter concludes with a review of implications for practice, policy, research, and education.

A. Cumulative Risk and Food Insecurity

The adapted version of the model of community nutrition environments includes pathways between cumulative risk and the organizational nutrition environment, specifically food insecurity. The hypothesis that greater cumulative risk would be associated with higher odds of being FI was supported - a higher score on the CRI was associated with greater likelihood of being FI. This finding is similar to prior research examining the cumulative experiences of social risk related to child health and well-being, which found that higher cumulative risk was associated with poorer outcomes (Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Bauman, Silver, & Stein, 2006; Frank et al., 2010; Suglia, Duarte, Chambers, & Boynton-Jarrett, 2012; Trentacosta et al., 2008). The findings from this study indicate that families who experience a greater number of risk factors are more likely to experience food insecurity.

Poverty's relationship to food insecurity is important, but poverty alone cannot explain heightened risk of food insecurity. Bauman et al. (2006) suggests that if poverty were the true underlying cause that ties other sociodemographic, psychosocial, and

behavioral factors to the odds of a particular outcome (in this case, food insecurity), then cumulative risk would not have a significant relationship with the outcome. Poverty has an established relationship with all other factors included in the CRI (Garrett et al., 2011; Santiago, Wadsworth, & Stump, 2011; U.S. Census Bureau, 2013).

There are also relationships between other variables in the CRI that may amplify their effects on FI. Stress increases the likelihood of smoking (Gucciardi et al., 2009), smoking is twice as likely among those who are depressed (Mendelsohn, 2012), and stress, particularly chronic stress, is associated with depression (Hammen, 2005). Stress and depression are also both more common among single mothers than among married mothers (Cairney, Boyle, Offord, & Raccine, 2003). In the context of these complex relationships, the association between odds of food insecurity and cumulative risk make inherent sense. Although each factor plays a role in food insecurity, their multiplicative effect is much greater.

These findings are important as the relationship between food insecurity and cumulative risk is an understudied area, particularly with food insecurity as an outcome, rather than a component of the CRI. Although cumulative risk has been utilized in other areas, its use in food insecurity research is novel. The results of this dissertation suggest that a cumulative risk model of predicting food insecurity is a useful tool in understanding how multiple risk experiences interact with food insecurity. In addition, the cumulative risk model, from a statistical standpoint, allows several individual variables to be combined, thereby reducing risk of multicollinearity between variables and increasing power in the model.

B. Community Nutrition Environment and Family Food Insecurity

In the adapted version of the model of community nutrition environments, the community nutrition environment, both in terms of accessibility and availability, is related to the organizational nutrition environment (family food insecurity) controlling for cumulative risk. The hypothesis that low accessibility (longer distance) of supermarkets and high accessibility (shorter distance) of corner stores and convenience stores would be associated with higher odds of food insecurity was not supported. This contradicts the findings of Sharkey et al. (2011) that greater distance to the store in which families purchased the bulk of their food was associated with adult food insecurity. Although this dissertation did not look specifically at the store in which each family shopped, it did examine the relationship between FI and the main stores typically used for food purchasing: supermarkets, convenience stores, and corner stores, and found no significant relationship. A survey of South Baltimore residents indicated that families spend nearly half (49%) of their food budget at supermarkets, but visit corner stores to purchase food most frequently (Palmer et al., ND). The lack of association between food store accessibility and food insecurity in this dissertation suggests that in low income communities with limited presence of supermarkets, families might find ways to access supermarkets. One potential explanation is that the sample in the current study is able to navigate other resources to access supermarkets, despite a low percentage of participants who live within a quarter mile of a supermarket (less than 10%). The participants may also access resources in the community, such as charitable food programs, that possibly help to lessen food insecurity.

It is also possible that the results of this dissertation differ from the Sharkey et al. (2011) study due to geographic or contextual differences. The current dissertation was conducted in an urban setting and the Sharkey et al (2011) study occurred in a rural setting. Those in urban settings possibly have a greater variety of resources to rely on in times of need. In addition, the participants in the Sharkey et al. (2011) study were Mexican immigrant families and the sample in this study was predominantly African American/Black. The two groups may differ in regard to community level social capital, such that those who recently immigrated have less social capital, which is related to lower likelihood of food security (Martin, Rogers, Cook, & Joseph, 2003).

The findings of this study are similar to Kirkpatrick and Tarasuk's (2010) research that demonstrated no relationship between FI and distance to the nearest discount supermarket or charitable food program. Although the food stores analyzed were different in the current dissertation, the setting was similar - a large, urban community. Urban residents are less likely to be isolated from food sources than rural residents. Residents of rural communities are more likely to report fear of stigma in using charitable food programs than urban residents (DeMarco, Thorburn, & Kue, 2009). It is conceivable that the lack of a relationship in the current dissertation, as well as in the Kirkaptrick and Tarasuk (2010) study, is partially explained by greater access of charitable food programs. The role of charitable programs protective value in food security status of Baltimore residents is unclear. It is possible that urban residents do not have the same stigma attached to charitable programs as those in small communities, encouraging greater participation in these programs. In addition, many of the participants in the current study lived within easy walking distance to multiple corner stores, which is

less likely to occur in rural communities. Having three or more corner stores within walking distance may contribute to price competition between stores in urban communities.

An important consideration when comparing rural and urban settings is the availability of transportation – both public and personal. Rose and Richards (2004) reported that car ownership and distance to supermarkets combined to influence shopping and diet outcomes. Public transportation may also relate to shopping patterns. Most Baltimore neighborhoods have access to a bus line (Yum, 2007). Prior research suggests that access to public transportation increases access to supermarkets in urban communities, especially among those living in high distress neighborhoods (Larsen & Gilliand, 2008). Given the presence of public transportation in Baltimore, it is possible that it serves to protect those who lack access to a supermarket. Rural residents, however, have limited access to public transportation, and typically travel much greater distances to reach stores. The relationship between FI and accessibility of stores may be unique to rural communities, as families in these communities travel much farther, and lack of a household vehicle and limited to no public transportation would increase families' risk of running short on food.

However, it is important to note the varied reliability of Baltimore's public transportation system (see Table 4.1). Public transportation in Baltimore is made up of several disjointed components – one light rail line, one metro line, and bus network which covers the majority of the city. Comparison of on time performance statistics for fiscal year 2012 by these different elements indicates high performance for the metro and light rail (97% and 96% respectively) versus 83% for the bus system (State of Maryland,

2014). It is also important to note that performance rates for the light rail and metro lines remained consistently high between fiscal year 2007 and 2012, but bus service on time performance was considerably lower until fiscal year 2010, which saw improvements that have since declined. Access to public transportation is important, but reliability and on time performance of public transportation can also affect shopping habits. Another important component of transportation in Baltimore is "hacking", the practice of getting a ride form a passerby. This is a system used throughout the city, possibly in response to a late bus. It can be considered a form of social capital that might allow caregivers to access stores that may otherwise be difficult to access.

Table 4.1
Public Transportation Statistics – Average On Time Performance

On Time Performance	2007	2008	2009	2010	2011	2012
Bus	71.5%	70.8%	73.2%	87.0%	85.1%	82.7%
Metro	94.8%	96.8%	97.6%	95.3%	97.3%	96.5%
Light Rail	99.2%	98.2%	99.1%	97.0%	97.5%	96.1%

Source: State of Maryland, StateStat: Reports, Graphs, & Meeting Summaries, 2014

I hypothesized that availability of the community nutrition environment, or presence of food stores in a community, would be associated with the odds of being FI. Specifically, I hypothesized that not having a supermarket, having a convenience store, and having a greater number of corner stores within a quarter mile of the family home would be associated with higher odds of being FI. This hypothesis was not supported, but both the presence of a supermarket and presence of corner stores were close to significant in their association with odds of food insecurity, potentially suggesting a smaller effect size that the current study did not have the statistical power to detect. Although these findings did not reach significance at $p < .05$, they merit some

consideration.   The availability of a supermarket was associated with a lower risk of

being FI (p = .058) and availability of corner stores was associated with a higher risk of

being FI (p = .054). Specifically, participants who had one or two corner stores present

within a quarter mile of the family home had higher odds of being FI in comparison to

those who had no corner stores near the home. Many families report that although they

prefer to shop at supermarkets, they will use the closest stores available in between trips

to the supermarket (Bodor et al., 2010), seeing a tradeoff between the cost to get to the

supermarket and the price difference in more expensive stores close to home (Alkon et

al., 2013). The findings of this study suggest that having a supermarket within a quarter

mile of the home may decrease the odds of being FI. This is likely due in part to the

price and selection of food available in supermarkets versus corner stores and

convenience stores (Azuma et al., 2010; Block & Kouba, 2006; Horowitz et al., 2004;

Krukowski et al., 2010; Leone et al., 2011; Liese et al., 2007; Miller et al., 2012). As

food is less expensive in supermarkets, it allows the family budget to stretch further. In a

high risk sample like the current study, this is essential.

The availability of one or two corner stores present within a quarter mile of the

family home, in comparison to no stores, was close to being significantly related to the

odds of being FI. Having three or more stores was not significantly associated with the

odds of FI. It is possible that having one or two stores is associated with higher odds of

FI because one or two corner stores do not allow for the same level of price competition

that three or more corner stores would. Lower competition may lead to higher prices, in

turn taking up a larger portion of the family budget. Corner stores are typically more

expensive for staple items that families may purchase more frequently, such as bread and

milk (Hendrickson, Smith & Eikenberg, 2006). Families use corner stores in between trips to the supermarket, and having limited price competition may lead to higher spending among those who have one or two stores in comparison to those who have none and seek more affordable food sources outside the neighborhood. There was a lack of a relationship between accessibility (distance) of the community nutrition environment and FI, but a nearly significant relationship between availability (store presence) of the community nutrition environment and FI, specifically presence of corner stores. This indicates that having a limited number of corner stores present nearby heightens risk for families, but that overall, families are able to navigate greater distances in Baltimore City in order to shop at less expensive stores.

C. Cumulative Risk as a Moderator between the Community Nutrition Environment and Family Food Insecurity

The adapted version of the model of community nutrition environments also included a pathway between the community nutrition environment and organizational nutrition environment that was moderated by cumulative risk. The hypothesis that cumulative risk moderates the relationship between accessibility of supermarkets, corner stores, and convenience stores and the odds of being FI was partially supported. This moderation model was significant for accessibility of corner stores and cumulative risk, but not for accessibility of supermarkets and convenience stores. As cumulative risk increased and distance to the nearest corner store increased, the odds of being FI steadily rose. As cumulative risk decreased and distance to the nearest corner store increased, the odds of being FI decreased. For families at high risk and living a greater distance from corner stores, greater risk of FI may be related to a lack of resources that allow families to

easily get out of the community. It may be that those with the highest CRI scores are least likely to have access to a personal vehicle, thereby relying more heavily on public transportation. The process of using public transport for shopping, particularly for a large amount of groceries, is cumbersome.   Having a corner store nearby may provide families with some protection, even if it does not provide access to lower cost, higher quality food. It is possible that not having a store present forces families to shop farther from their homes. Leaving their community may provide a wider variety of options for food shopping, leading to greater affordability. It also may provide a measure of timeliness and convenience for caregivers, particularly those balancing work and caregiving responsibilities.

Another important consideration for high risk families is the role of energy security, also related to FI (Cook et al., 2008). For high risk families, lacking consistent power may also relate to use of a corner store. Households without power may also lack access to a stove for cooking. Corner stores may provide access to prepared foods that do not require cooking appliances and electricity.   For those high risk families lacking access to cooking in the home, living farther away from a corner store may potentially reduce meal frequency, and contribute to diet changes and anxiety regarding food. Overall, the measure for FI in this dissertation identified all families who experienced a change in diet and/or anxiety around procuring food as being FI. Having a high level of risk and living in a community isolated from food sources is likely to contribute to anxiety around food, whether it means households experience dietary changes or not. However, it is important to note, that overall, there was a high level of food insecurity among this sample, and even among families with CRI scores below the mean still

experienced higher odds of being FI, particularly if they lived shorter distances to the nearest corner store. For lower risk families, it is possible that living closer to corner stores increases risk due to higher prices in those stores.

The final hypothesis tested in this dissertation was that cumulative risk would moderate the association between availability of the community nutrition environment and odds of family food insecurity. This hypothesis was not supported. The relationship between having supermarkets, convenience stores, and corner stores present in the community and likelihood of being FI was not moderated by cumulative risk, indicating that low risk families and high risk families have similar experiences with regard to food insecurity and availability of the community nutrition environment. This is possibly due to the relatively high presence of corner stores and low presence of supermarkets throughout the sample. Conversely, cumulative risk did moderate the relationship between accessibility of the community nutrition environment and risk of food insecurity within longer distances. As availability looks at the presence of stores within a quarter mile of the home and accessibility looks at the distance to the nearest store, no matter how far, this potentially indicates that cumulative risk has less influence on the relationship between the community nutrition environment and food insecurity. Both high and low risk families are likely to experience similar barriers navigating travel to the store. However, as the distance to the nearest stores increases, barriers to accessing stores become more relevant, and more difficult for high risk families to navigate. High risk families are also probably more likely to experience those barriers, such as vehicle ownership or fare for public transportation. It is also important to consider the poverty of time concept here (Caprio et al., 2008). Using public transportation to access a

supermarket likely takes more time than stopping by a corner store. For working caregivers, this option may be the most feasible.

D. Food Insecurity and Food Assistance

Receipt of food assistance was associated with higher odds of being FI in the multivariate models. Initially this was added to the model as food assistance programs such as SNAP and WIC are meant to serve as protection from food insecurity for low income families (Black et al., 2008). On first glance, it appears that food assistance is a factor in heightened food insecurity. However, it is likely that those who receive food assistance are already most likely to experience more severe levels of food insecurity due to income eligibility requirements associated with these programs. There is some evidence that SNAP prevents families from experiencing more severe levels of food insecurity, if not entirely alleviating food insecurity (Nord & Golla, 2009). This suggests that although SNAP alone does not ameliorate food insecurity entirely, it is important in protecting people from more severe levels of food insecurity. It is also important to consider the measurement of food insecurity. Having anxiety about food supplies would designate a family as being at risk of food insecurity in this dissertation. It is likely that having to rely on food assistance would contribute to feelings of anxiety around food, identifying a caregiver as being FI. Despite the association between receiving food assistance and higher odds of being FI, it is essential to note that food assistance does not increase the likelihood of food insecurity. Rather, it is likely the high rates of food insecurity among those who qualify for food assistance, as well as measurement of food insecurity, underlying this association. In addition, it may reflect a need for increased an increase in the level of benefits provided in order to fully protect families from food

insecurity. In the current study, over half of the participants (56%) were eligible for and receiving either SNAP or WIC benefits. In comparison, 30% were eligible for assistance, but not receiving it. Among those receiving the benefits, 38% were FS in comparison to 55% within those eligible but not receiving, and 72% among those not eligible for benefits. Those who are experiencing the most severe levels of food insecurity may also be the most likely to seek help from formal sources. In addition, those who were receiving food assistance had significantly lower poverty ratios than both those who were eligible and not receiving and those who were not eligible. There are several possible reasons for this. It may be that those who experience the greatest poverty are the most likely to seek formal assistance, but those experience less severe poverty may rely on more informal sources. It is also possible that those who are seeking formal services do not have access to informal supports, such as family and other forms of social capital.

E. Strengths and Limitations

There are some important limitations to consider in the dissertation. A post-hoc power analysis using GPower (Buchner, Erdfleder, Faul, & Lang, 2009) indicates that the sample of 409 caregivers for the LR models was adequate for detecting medium and large effect sizes, but not for detecting small effect sizes. Therefore, small effect sizes regarding the relationship between the community nutrition environment and food insecurity may have been missed. The use of a brief screening tool for food insecurity did not provide the fully nuanced picture of food insecurity that the U.S. Food Security Survey Module provides, as it is unable to differentiate between low, very low, or marginal food security. There was also little variability for some of the food environment variables, specifically only 7% of families lived near a supermarket. In addition, the

current study was cross-sectional in nature and did not allow for any causal inferences regarding the relationship between the community nutrition environment and family food insecurity. Food insecurity is typically a transient experience (Ryu & Bartfield, 2012), and this study focused on food insecurity over the year preceding the study. It is possible that some participants in the study experienced food insecurity in the past, but were not FI at the time of the study. Temporality is also an important consideration. The store data were collected in 2009, and the *Challenge!* data were collected between 2009 – 2012. It is very possible, if not likely, that some of these stores closed during this time period, and new ones opened.

The limited definition of the community nutrition environment based solely on accessibility and availability food stores was also a limitation as prior research indicates that other issues, such as access to a car (Wiig & Smith, 2009), food storage capability (Food Research and Action Center, 2012), and cost of food (Darko et al., 2013; Wiig & Smith, 2009) play a role in how low income families access food. Community was conceptualized based on distances from the home address and did not account for other travel patterns of families that may provide access to different food outlets, such as those near places of employment or in the communities of family members. Nor did the dissertation directly address where the participants shop.

Another limitation is the conceptualization of the cumulative risk index. The current dissertation was limited to risk factors available in the secondary data set. With regard to behavioral risk factors, smoking was included, but not other substance use/abuse behaviors associated with food insecurity. In addition, immigration status, which is associated with food insecurity (Chilton et al., 2009), was not included in the

CRI. Last, there are components of the CRI that have a bidirectional relationship with food insecurity – specifically stress and depression (Huddleston-Casas, 2009; Lent et al., 2009). Finally, the findings are not generalizable beyond families with early adolescent girls in an urban setting and study design does not allow for inference of causality.

Despite potential limitations, the current dissertation also has several key strengths. It addressed an area of research that is vastly understudied, contributing to a better understanding of how the community nutrition environment relates to the organizational nutrition environment. The study hypotheses are based in theory and literature, and contribute to further development of theory revolving around food environments by examining the relationship between components of the food environment. The model of community nutrition environments was not clear on how the organizational nutrition environment and the community nutrition environment related to each other. This study evaluates that relationship, contributing to an understanding of this relationship. In addition, this dissertation contributes to theory by evaluating whether or not the cumulative risk model also works in predicting food insecurity. This dissertation also used GIS, a method that provides a clear picture of food environments using mapping and distance.

The inclusion of the CRI is also an important strength of this study. Although food insecurity has been a component of cumulative risk in prior research (Frank et al., 2010; Suglia et al., 2012), I did not locate research including food insecurity as an outcome of interest in relation to cumulative risk. The significant findings related to cumulative risk and food insecurity provide practitioners, researchers, and policy makers with useful information about how accumulation of risk contributes to greater odds of

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food insecurity and potential points of intervention that may have a cumulative effect in lessening the likelihood of food insecurity.

F. Implications

The current dissertation found an association between higher cumulative risk and heightened risk of food insecurity. Within the food environment, accessibility of food stores was not associated with the likelihood of food insecurity. However, availability of supermarkets and corner stores were nearly significant in relationship to a higher likelihood of food insecurity. Cumulative risk moderated the relationship between accessibility of the food environment and likelihood of food insecurity. It did not moderate the relationship between availability of the food environment and risk of food insecurity. Given these findings, implications for micro and macro practice, as well as future research should be considered.

1. Implications for micro practice.

Cumulative risk provides a "big picture" of what is going on in clients' lives. However, a micro social work practitioner can address certain risk factors in individual work. Micro practitioners should screen for and monitor food insecurity among families who experience an accumulation of risk factors, and empower clients to determine which risk factors to address first, working with them to create goals and objectives to address risks. Addressing one risk factor may have multiplicative effects on overall risk. For instance, caregivers may choose to address smoking cessation, alleviating some risk related to food insecurity. Additionally, some psychosocial factors related to food insecurity, specifically, stress and depression, have a bidirectional relationship with food insecurity. Practitioners should also be cognizant of clients' hierarchy of needs in

addressing food insecurity, and address fundamental biological needs related to food and other basic needs. Lessening the effects of food insecurity may lead to lower levels of depression, which can potentially lower the risk of food insecurity even more. The relationship between cumulative risk and food insecurity may work both ways: although each additional risk factor is related to an increased risk of food insecurity, addressing each risk factor may have a cumulative effect in decreasing not only the risk of food insecurity, but also other components of cumulative risk.

It is necessary to consider whether or not risk factors are modifiable when considering intervention (Hooper, Burchinal, Zeisel, & Neebe, 1998). Clearly some risk factors are not modifiable, i.e., race, and others are so multifaceted in nature that a single point of intervention may be to complex, such as poverty. Single caregivers have less time to spend on food preparation (Mancino & Newman, 2007; Rose & Richards, 2004), which may lead to higher spending on foods that require less time for preparation. Single caregivers also have less time for food shopping (Rose & Richards, 2004), which may lower the ability to shop around for the best prices on food due to time constraints and childcare issues. Research suggests a strong relationship between high levels of stress and depression and low control over meal planning, both purchasing and preparation of food, among pregnant women (Fowles, Stang, Bryant, & Kim, 2012). Social workers should be cognizant of these risks, and work with clients to address them, or when appropriate, refer clients to outside services.

Micro practitioners can also focus on building social ties for high risk families, as higher social cohesion and greater social capital are related to lower risk for FI (Martin et al., 2004; Walker, Holben, Kropf, Holcomb, & Anderson, 2007). They may also work

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with individuals to build financial capital, through assistance with jobs, as this may alleviate some financial burdens related to stress and food insecurity. Prior research examining the relationship between cumulative risk and behavioral outcomes showed that there was not a point at which the accumulation of risk factors leveled out. This suggests that it is important for interventions to focus on eliminating any risk factor possible (Appleyard et al., 2005). With regard to risk of food insecurity, addressing all risk factors at one time is not realistic. In addition, addressing one risk factor may be more realistic than addressing another. For instance, assisting a client with smoking cessation is a more practical short-term goal than addressing education or poverty, which are more long-term goals. However, practitioners should maintain awareness of their cumulative effect on food insecurity, and work with clients on those goals they choose to address.

Educators must improve social work students' understanding of food insecurity, risk associated with food insecurity, and food access, especially among those experiencing multiple risks. Educators should also prepare students to work with clients on risk factors associated with food insecurity. Social workers will encounter clients who are food insecure, as well as clients who experience multiple risk factors for food insecurity. Knowledge about food insecurity and risk factors related to it will assist practitioners in identifying and addressing these risks.

2. **Implications for macro practice.**

Hamm and Bellows (2003) advise that building community food security is essential to individual and family food security. They suggest community level programming that empowers community members and connects with the local food system in a sustainable way. Encouraging community programs and events that

acknowledge the importance of connecting with other community members in a way that focuses on dignity of all involved will promote the concept of food as a right shared by all community members. There are a variety of food justice activities occurring throughout Baltimore, through programs such as Baltimarket, Baltimore Green Space, and various urban farming programs that connect communities and youth with urban farming experiences, and work to build community food security.   There are also structural strengths in the Baltimore food environment that should be considered, specifically the presence of markets. There are six large public market places located throughout the city. Currently these markets provide some fresh meats and produce, but there are a greater number of stalls serving prepared foods. Macro social work efforts can work to build on the resources already in existence in the community such as these public market places, as well as encourage community members to utilize these resources. Another element unique to Baltimore that can promote community food security is the presence of Arabbers, horse drawn food carts that sell food throughout the city. For communities with limited access to produce or personal vehicles, these food vendors can be a source of fruits and vegetables for low-income families. However, their presence in the city is dwindling amidst concerns regarding animal welfare and facilities. Macro social workers can potentially work with food vendors to maintain animal health and health codes as these vendors potentially offer access to fruits and vegetables for some of the city's most vulnerable neighborhoods.

Macro social work practice, both in and outside of Baltimore, can expand on concepts of community food security, and support communities in sustaining these activities. Macro practice can play a role in building social capital and cohesion,

focusing on creation of programs that bring people together to share in the production and consumption of food, not simply the donation of non-perishable items. Macro practitioners can also build programs that increase access to food for high risk families living at farther distances from stores through the promotion of gleaning (gathering of food) food from local food sources that would otherwise dispose of leftover foods. This may include gleaning produce from farms to distribute in the community or gleaning from restaurants and caterers for use in local soup kitchens. The goal is not only to distribute food to those who need it, but to do so in a way that utilizes the resources already in existence in the local food system (Hamm & Bellows, 2003).

Social work educators can increase awareness of the food environment in the social work arena. Social justice is a core value of social work, and food justice is an essential component of social justice. Problem-based learning can connect social work students with local food justice activities through creation of programs and services promoting food security in high risk families and communities. This can be done by engaging students in program development activities, community needs and asset assessments, and community organizing activities. Pearson, Wong, Ho, and Wong (2007) recommend that educators can use a supportive, rather than authoritative approach to engage students in hands-on learning activities. Problem-based learning approaches enhance knowledge attained in the classroom through encouragement of skill acquisition in practice setting (Dochey, Segers, Van den Bossche, & Gijbels, 2003). A problem-based learning approach will prepare students to be active in working with communities to build a healthy food environment.

Although the CRI is comprised of individual factors, it is also a macro issue. Some factors may require individual intervention, but others, such as poverty and racism are systemic issues. In other words, it is not being Black, per se, that puts people at risk. Rather it is the institutional structures around race that create heightened risk of FI for families of color. Alkon and Agyeman (2013) posit that the evolution of the food system into a large-scale industrial entity coalesces with the effects of institutional racism in the United States to create a secondary food system that both limits people of color in their access to healthy foods and fails to incorporate people of color into a burgeoning food justice movement. Macro social workers should concentrate on organizing efforts that build awareness of racial disparities in the food system and employ organizing methods that include community members in addressing issues of food access and food security. This provides both empowerment for individuals, and better solutions for communities.

Macro practitioners can also work to affect federal, state, and local policies related to food assistance. At the federal level, SNAP provides an essential safety net for low income families. However, families report that SNAP helps alleviate some, but not all of the stress of securing food security (Edin et al., 2013). Recent cuts to SNAP benefits heighten risk of FI among vulnerable families. Rather than cutting spending on food assistance, funding to assist high risk families should be increased to protect them from food insecurity. Federal SNAP benefits are provided to families living at or below 130% of the federal poverty guidelines (USDA, 2014). Some states provide food assistance to families at higher incomes. Maryland provides SNAP benefits to families living at or below 200% of the federal poverty guidelines (Maryland Department of Human Resources, 2013). This extension of benefits for those in between 130 – 200% of

federal poverty guidelines should be considered for all U.S. residents, not just those in certain states. Social work practitioners can advocate for this policy change, as well as advocate for potential increases to benefits, rather than cuts.

Local policy is also important in FI. Current local policy in Baltimore allows for doubling of SNAP dollars spent on produce at local farmers' markets, up to $5. To provide greater protection for those receiving SNAP, increases in this limit, as well as extending this programming to other city food outlets may contribute to families' purchasing power. The Baltimore City Food Policy Initiative is currently in the process of developing a local food plan. Promotion of food security, especially among vulnerable individuals and neighborhoods, must be a key component of this plan. This should include promoting food security through increased resources for high risk families, increased transportation opportunities for isolated neighborhoods, and addressing the cost of food in smaller, independently operated corner stores

3. Implications for research.

The results of this study suggest several key research implications. The models included in this dissertation can be expanded upon in terms of diet and healthy food availability. Qualitative research suggests that children's eating habits influence shopping patterns among low income families, as caregivers want to be sure that children will eat the foods they buy, and that food will not go to waste (Wingert, Zachary, Fox, Gittlesohn, & Surkan, 2014). This includes less healthy foods, and may act as one of the ways in which food insecurity affects diet among children. Although Wingert and colleagues (2014) did not study food insecurity, understanding a barrier such as fear of wasting food is essential in high risk families. It also contributes to an understanding of

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why some high risk families choose less healthy food options, even when they may be able to access more healthy choices. Adding dietary outcomes, such as micro nutrients, macro nutrients, and daily food intake to the model will help to determine if food insecurity, community nutrition environments, and cumulative risk are associated with dietary outcomes. In addition, examining what foods are actually available in stores will contribute to a greater understanding of how the food environment relates to cumulative risk and food insecurity. As data regarding availability of healthy food in the stores become available from the Center for a Livable Future, these should be added to the model to account for what actually exists in the stores, as this may also play a role.

High community level deprivation, high community disorder and low social cohesion are associated with food insecurity (Carter, Dubois, Tremblay & Taljaard, 2012). In addition, demographics, specifically race and income (Baker et al., 2006; Beaulac, Kristjansson, & Cummins, 2009; Franco et al., 2008; Galvez et al., 2008; Moore & Diez Roux, 2006; Moreland et al., 2002; Powell et al., 2007; Richardson et al., 2012), are associated with what types of stores exist in a community. These community level variables along with race and income should be included in future research to provide a better understanding of how community level variables are associated with food insecurity and the nutrition environment.

The current study takes place in an urban setting, with a predominantly high risk, low income, African American sample. Future research is needed to determine if these findings hold across geographic settings and demographic compositions. It is possible that these findings may differ in rural communities, where lack of a personal vehicle has a greater impact than in an urban setting with access to public transportation. It is also

possible that different racial groups have different experiences with regard to food insecurity and food stores. Prior research indicates that immigration status plays a role in the risk of family food insecurity (Chilton et al, 2009). It is possible that among immigrant populations, experiences of food insecurity are affected by accessibility and availability of food stores, as in the Sharkey et al. (2011) study. In addition, the role of cumulative risk, which may look very different for immigrant populations, is not known. Future research should explore potential differences across community context, urbanization, and immigration status.

Qualitative research may also provide an expanded understanding of how families living in community nutrition environments low in supermarket access and availability, but high in access to and availability of corner and convenience stores navigate these food systems to maintain food security. There is also a need to focus research on those high risk families living in communities isolated from food sources. Qualitative methods may provide a deeper understanding of this experience.

G. Conclusion

Food insecurity occurs among 14.3% of all households in the United States, and in one in five households with children (Coleman-Jensen et al., 2014). The rates among single, female-headed households, Black and Latino households, and households living at or below 185% of the federal poverty threshold are even higher. Other factors that contribute to higher risk of food insecurity include lower education (Laraia, Siega-Riz, Gundersen, & Dole, 2006; Yu, Lombe & Nebbit, 2010), low employment (Sharkey, Dean, and Johnson, 2011), having a smoker present in the home (Armour et al. 2008; Kirkpatrick & Tarasuk, 2008), higher depression (Melchoir et al., 2009; Whitaker et al.,

2006), and elevated stress (Gucciardi et al., 2009; Jilcott et al., 2011). In the current

dissertation, half of participants were FI. There was also a high level of accumulation of

these risk factors associated with higher odds of FI. In the current dissertation, half of

participants were FI, and half experienced more than four of the risk variables.

In Baltimore City there is a high presence of corner stores and convenience stores,

and low presence of supermarkets. Using GIS to connect store data with cumulative risk

and FI data, this study increases understanding of the relationship between cumulative

risk, community nutrition environments, and food insecurity. At first glance, the

community nutrition environment is not associated with the likelihood of food insecurity

in this setting. However, elevated levels of cumulative risk may alter this relationship,

such that high levels of risk affect the role of different food sources, particularly corner

stores. More specifically, at higher levels of cumulative risk, greater distances to corner

stores increase the likelihood of food insecurity. Given the complexity of the issue at

both a micro and macro level, social workers are well placed to contribute to policy,

research, and intervention related to cumulative risk, community nutrition environments,

and food insecurity.   The core values of social justice and service are realized when these

issues are addressed. This study can provide guidance to future social work research and

interventions in promoting food security among all individuals and communities.

Appendix A – Measurement and Definition of Food Security Status in the U.S.

Household Food Security Status	Number of Affirmative Responses on the USFSS* – Households with Children	Number of Affirmative Responses on the USFSS – Households without Children	Possible Indicators
Food Security	0 – 2	0 – 2	None
Marginally food security	3 – 7	3 – 5	Problems or anxiety accessing food with no actual dietary change
Low food security	8 – 12	6 – 8	Reduction in quality, variety, or desirability of foods with no disruptions of food intake or eating patterns
Very low food security	13 – 18	9 – 10	One or more household members experienced reduced intake of food due to a lack of money and/or food

Note. Taken from Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide to measuring household food security* (United States Department of Agriculture, Food Nutrition Service, Number 6). Available on their website: http://www.fns.usda.gov/fsec/files/fsguide.pdf and United States Department of Agriculture, Economic Research Service. (2012). Survey tools.. Available online: http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#.UZz2OKK1GjI
*United States Food Security Survey

Appendix B – Definition of Food Stores

	Size	Employees	Products	Chain Affiliation
Supercenters			Food and general merchandise (Jilcott et al., 2011)	
Supermarkets	4+ cash registers (Galvez et al., 2008) Larger than grocery stores (Lee et al., 2010)	Greater than 50 (Franco et al., 2008)	Food only (Jilcott et al., 2011)	Yes (Franco et al., 2008; Lee et al., 2010; Richardson et al., 2012)
Grocery Stores (Corner Stores)	2 -3 cash registers (Galvez et al., 2008) Smaller than supermarkets (Lee et al., 2010)		Limited food options (Franco et al., 2008) Less selection than supermarkets (Lee et al., 2010)	Independently operated (Franco et al., 2008; Lee et al., 2010; Richardson et al., 2012)
Convenience Stores	1 cash register (Galvez et al., 2008)		Limited food options (Franco et al., 2008; Lee et al., 2010) Often attached to gas stations (Franco et al., 2008; Lee et al., 2010; Richardson et al., 2012)	

References

Alaimo, K., Olson, C. M., & Frongillo Jr, E. A. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. *Pediatrics*, *108*(1), 44-53.

Alkon, A. H., & Agyeman, J. (2011). *Cultivating food justice: race, class, and sustainability*. MIT Press.

Alkon, A. H., Block, D., Moore, K., Gillis, C., DiNuccio, N., & Chavez, N. (2013). Foodways of the urban poor. *Geoforum*, *48*, 126-135.

Andreyeva, T., Blumenthal, D. M., Schwartz, M. B., Long, M.W., & Brownell, K. D. (2008). Availability and prices of foods across stores and neighborhoods: The case of New Haven, Connecticut. *Health Affairs, 27*(5), 1381-1388. doi: 10.1377/hlthFF.27.5.1381

Anema, A., Vogenthaler, N., Frongillo, E. A., Kadiyala, S., & Weiser, S. D. (2009). Food insecurity and HIV/AIDS: Current knowledge, gaps, and research priorities. *Current HIV/AIDS Reports, 6*(4), 224-231.

Appleyard, K., Egeland, B., Dulmen, M. H., & Alan Sroufe, L. (2005). When more is not better: The role of cumulative risk in child behavior outcomes.*Journal of child psychology and psychiatry*, *46*(3), 235-245.

Armour, B. S., Pitts, M. M., & Lee, C. W. (2008). Cigarette smoking and food insecurity among low-income families in the United States, 2001. *American Journal of Health Promotion, 22*(6), 386-392.

Azuma, A. M., Gilliland, S., Vallianatos, M., & Gottlieb, R. (2010). Food Access, Availability, and Affordability in 3 Los Angeles Communities, Project CAFE, 2004-2006. *Preventing chronic disease*, *7*(2). Available from PubMed.

Baker, E. A., Schootman, M., Barnridge, E., & Kelly, C. (2006). The role of race and poverty in access to foods that enable individuals to adhere to dietary guidelines. *Preventing Chronic Disease, 3*(3), A76 - 87.   Retrieved PubMed Central.

Baltimore City Food Policy Initiative. (2012). Food desert map key demographic findings. Available online: http://archive.baltimorecity.gov/Government/AgenciesDepartments/Planning/BaltimoreFoodPolicyInitiative/FoodDeserts.aspx

Baltimore City Food Policy Task Force. (2010). Food deserts. Available online: http://www.baltimorecity.gov/Government/AgenciesDepartments/Planning/BaltimoreFoodPolicyInitiative/FoodDeserts.aspx

Bauman, L. J., Silver, E. J., & Stein, R. E. (2006). Cumulative social disadvantage and child health. *Pediatrics*, *117*(4), 1321-1328.

Beck, A. T., Steer, R. A., Brown, G. K., & Manual, B. D. I. (1996). The Psychological Corporation. *San Antonio, TX*, 1-38.

Belsky, D. W., Moffitt, T. E., Arseneault, L., Melchior, M., & Caspi, A. (2010). Context and sequelae of food insecurity in children's development. *American journal of epidemiology*, *172*(7), 809-818. doi: 10.1093/aje/kwq201

Bickel, R. (2007) *Multilevel analysis for applied research: It's just regression.* New York, NY: Guilford Press.

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide to measuring household food security* (United States Department of Agriculture, Food Nutrition Service, Number 6). Available on their website: http://www.fns.usda.gov/fsec/files/fsguide.pdf

Beaulac, J. K., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease, 6*(3), A105.

Black, M., Hager, E., Merry, B., & Quigg, A. (2008). *Food security: Ensuring the health of Baltimore's babies* (University of Maryland Hospital for Children Summer 2008 Newsletter). Available from the Baltimore City Health Department's website: www.baltimorehealth.org/info/2008_08_15.FoodSecurity.pdf he program

Block, D. & Kouba, J. (2006). A comparison of the availability and affordability of a market basket in two communities in the Chicago area. *Public Health Nutrition, 9*(7), 837-845. doi: 10.1017/PHN2005924

Bodor, J. N., Rose, D., Farley, T. A., Swalm, C., & Scott, S. K. (2008). Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. *Public Health Nutrition*, *11*(4), 413-420. doi: 10.1017/S1368980007000493

Bodor, J. N., Ulmer, V. M., Dunaway, L. F., Farley, T. A., & Rose, D. (2010). The rationale behind small food store interventions in low-income urban neighborhoods: insights from New Orleans. *The Journal of nutrition*, *140*(6), 1185-1188. doi: 10.3945/jn.109.113266

Bronte-Tinkew, J., Zaslow, M., Capps, R., Horowitz, A., & McNamara, M. (2007). Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *The Journal of Nutrition, 137*(9), 2160-2165.

Brownell, K. D., & Frieden, T. R. (2009). Ounces of prevention—the public policy case for taxes on sugared beverages. *New England Journal of Medicine,360*(18), 1805-1808.

Buchner, A., Erdfelder, E., Faul, F., & Lang, A. (2009). G*Power (Version 3.1.2)[Computer program]. Available: http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/

Burchinal, M. R., Roberts, J. E., Hooper, S., & Zeisel, S. A. (2000). Cumulative risk and early cognitive development: a comparison of statistical risk models. *Developmental psychology*, *36*(6), 793. doi.org/10.1037/0012-1649.36.6.793

Bustillos, B., Sharkey, J. R., Anding, J., & McIntosh, A. (2009). Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. *Journal of the American Dietetic Association*, *109*(5), 883. doi:10.1016/j.jada.2009.02.011

Cairney, J., Boyle, M., Offord, D. R., & Racine, Y. (2003). Stress, social support and depression in single and married mothers. *Social psychiatry and psychiatric epidemiology*, *38*(8), 442-449.

Caprio, S., Daniels, S. R., Drewnowski, A., Kaufman, F. R., Palinkas, L. A., Rosenbloom, A. L., & Schwimmer, J. B. (2008). Influence of Race, Ethnicity, and Culture on Childhood Obesity: Implications for Prevention and Treatment A

consensus statement of Shaping America's Health and the Obesity Society.

Diabetes Care, *31*(11), 2211-2221. doi: 10.2337/dc08-9024

Carter, M. A., Dubois, L., Tremblay, M. S., & Taljaard, M. (2012). Local social

environmental factors are associated with household food insecurity in a

longitudinal study of children. *BMC public health*, *12*(1), 1038 - 1048.

doi:10.1186/1471-2458-12-1038

Casey, P. H., Simpson, P. M., Gossett, J. M., Bogle, M. L., Champagne, C. M., Connell,

C., . . . Weber, J. (2006). The association of child and household food insecurity

with childhood overweight status. *Pediatrics, 118*(5), e1406-13. doi:

10.1542/peds.2006-0097

Casey, P. H., Szeto, K. L., Robbins, J. M., Stuff, J. E., Connell, C., Gossett, J. M., &

Simpson, P. M. (2005). Child health-related quality of life and household food

security. *Archives of Pediatrics & Adolescent Medicine, 159*(1), 51-56. doi:

10.1001/archpedi.159.1.51

Caspi, C. E., Sorensen, G., Subramanian, S. V., & Kawachi, I. (2012). The local food

environment and diet: a systematic review. *Health & place*, *18*(5), 1172-1187.

Children's Health Watch (2011). Food insecurity among children: A look at Baltimore

City. (Policy Action Brief). Available online:

http://www.childrenshealthwatch.org/wp-

content/uploads/fiamongbaltkids_brief_jan11.pdf

Chilton, M., Black, M. M., Berkowitz, C., Casey, P. H., Cook, J., Cutts, D., . . . Frank, D.

A. (2009). Food insecurity and risk of poor health among US-born children of

immigrants. *American Journal of Public Health, 99*(3), 556-562. doi: 10.2105/AJPH.2008.144394

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*(1), 155.

Cohen, J., Cohen, P., West, S. & Aiken, L. (2002). *Applied multiple regression/correlation Analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Routledge Academic.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385-396.

Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2014). *Household food security in the United States in 2013* (Economic Research Report 141). Retrieved from the United Sates Department of Agriculture Economic Research Service website: http://www.ers.usda.gov/publications/err-economic-research-report/err141.aspx

Connell, C. L., Yadrick, M. K., Simpson, P., Gossett, J., McGee, B. B., & Bogle, M. L. (2007). Food supply adequacy in the Lower Mississippi Delta. *Journal of nutrition education and behavior*, *39*(2), 77-83. doi.org/10.1016/j.jneb.2006.10.007

Cook, J. T., & Frank, D. A. (2008). Food security, poverty, and human development in the United States. *Annals of the New York Academy of Sciences, 1136*, 193-209. doi: 10.1196/annals.1425.001

Cook, J. T., Frank, D. A., Berkowitz, C., Black, M. M., Casey, P. H., Cutts, D. B., . . . Nord, M. (2004). Food insecurity is associated with adverse health outcomes among human infants and toddlers. *The Journal of Nutrition, 134*(6), 1432-1438.

Cook, J. T., Frank, D. A., Casey, P. H., Rose-Jacobs, R., Black, M. M., Chilton, M., ... & Cutts, D. B. (2008). A brief indicator of household energy security: associations with food security, child health, and child development in US infants and toddlers. *Pediatrics*, *122*(4), e867-e875.

Corapci, F. (2008). The role of child temperament on Head Start preschoolers' social competence in the context of cumulative risk. *Journal of applied developmental psychology*, *29*(1), 1-16. doi:10.1016/j.appdev.2007.10.003

Cornelius, L. J., & Harrington, D. (2014). *A Social Justice Approach to Survey Design and Analysis*. Oxford University Press.

Cutler-Triggs, C., Fryer, G. E., Miyoshi, T. J., & Weitzman, M. (2008). Increased rates and severity of child and adult food insecurity in households with adult smokers. *Archives of Pediatrics & Adolescent Medicine*, *162*(11), 1056-1062.

Dammann Wiig, K., & Smith, C. (2010). Race, homelessness, and other environmental factors associated with the food-purchasing behavior of low-income women. *Journal of the American Dietetic Association*, *110*(9), 1351-1356.

Darko, J., Eggett, D. L., & Richards, R. (2013). Shopping Behaviors of Low-income Families during a 1-Month Period of Time. *Journal of Nutrition Education and Behavior*. doi.org/10.1016/j.jneb.2012.05.016

De Marco, M., Thorburn, S., & Kue, J. (2009). "In a country as affluent as America, people should be eating": Experiences with and perceptions of food insecurity among rural and urban Oregonians. *Qualitative health research*, *19*(7), 1010-1024.

Dochy, F., Segers, M., Van den Bossche, P., & Gijbels, D. (2003). Effects of problem-

    based learning: a meta-analysis. *Learning and instruction*, *13*(5), 533-568.

    doi:10.1016/S0959-4752(02)00025-7

Duffy, P., Zizza, C., Jacoby, J., & Tayie, F. A. (2009). Diet Quality is Low among

    Female Food Pantry Clients in Eastern Alabama. *Journal of Nutrition Education*

    & Behavior, *41*(6), 414-419. doi:10.1016/j.jncb.2008.09.002

Edin, K., Boyd, M., Mabli, J., Ohls, J., Worthington, J., Greene, S., Redel, N., &

    Sridharan, S. (2013). *SNAP food security in-depth interview study: Final report.*

    (Family Programs Report). Retrieved from the United Sates Department of

    Agriculture Food and Nutrition Service website:

    http://www.fns.usda.gov/sites/default/files/SNAPFoodSec.pdf

Eicher-Miller, H. A., Mason, A. C., Weaver, C. M., McCabe, G. P., & Boushey, C. J.

    (2011). Food insecurity is associated with diet and bone mass disparities in early

    adolescent males but not females in the United States. *The Journal of Nutrition,*

    141(9), 1738-1745. doi: 10.3945/jn.111.142059

Evans, G. W. (2003). A multimethodological analysis of cumulative risk and allostatic

    load among rural children. *Developmental psychology*, *39*(5), 924.

    doi.org/10.1037/0012-1649.39.5.924

Evans, G. W., Kim, P., Ting, A. H., Tesher, H. B., & Shannis, D. (2007). Cumulative

    risk, maternal responsiveness, and allostatic load among young

    adolescents. *Developmental psychology*, *43*(2), 341. doi.org/10.1037/0012-

    1649.43.2.341

Farley, T. A., Rice, J., Bodor, J. N., Cohen, D. A., Bluthenthal, R. N., & Rose, D. (2009).

    Measuring the food environment: shelf space of fruits, vegetables, and snack

    foods in stores. *Journal of Urban Health*, *86*(5), 672-682. doi: 10.1007/s11524-

    009-9390-3

Feeding America (2010). Hunger in America 2010. Available online:

    http://www.feedingamerica.org/hunger-in-america/our-research/hunger-in-

    america/hunger-in-america-2010.html

Food Research and Action Center. (2012). Rising food costs bearing down even harder

    on low-income shoppers. Available online: http://frac.org/rising-food-costs-

    bearing-down-even-harder-on-low-income-shoppers/

Fowles, E. R., Stang, J., Bryant, M., & Kim, S. (2012). Stress, depression, social support,

    and eating habits reduce diet quality in the first trimester in low-income women: a

    pilot study. *Journal of the Academy of Nutrition and Dietetics*, *112*(10), 1619-

    1625.

Franco, M., Diez Roux, A. V., Glass, T. A., Caballero, B., & Brancati, F. L. (2008).

    Neighborhood characteristics and availability of healthy foods in Baltimore.

    American Journal of Preventive Medicine, 35(6), 561-567. doi:

    10.1016/j.ampre.2008.7.003

Frank, D. A., Casey, P. H., Black, M. M., Rose-Jacobs, R., Chilton, M., Cutts, D., ... &

    Cook, J. T. (2010). Cumulative hardship and wellness of low-income, young

    children: Multisite surveillance study. *Pediatrics*, *125*(5), e1115-e1123.

Franklin, B., Jones, A., Love, D., Puckett, S., Macklin, J., & White-Means, S. (2012). Exploring mediators of food insecurity and obesity: A review of recent literature. *Journal of Community Health, 37*(1), 253-264. doi: 10.1007/s10900-011-9420-4

French, S. A., Wall, M., & Mitchell, N. R. (2010). Household income differences in food sources and food items purchased. *International Journal of Behavioral Nutrition and Physical Activity*, *7*, 77. Retrieved from BioMed Central.

Fulp, R. S., McManus, K. D., & Johnson, P. A. (2009). Barriers to purchasing foods for a high-quality, healthy diet in a low-income African American community. *Family & community health*, *32*(3), 206-217. doi: 10.1111/j.1365-2672.1988.tb01892.x

Galvez, M. P., Morland, K., Raines, C., Kobil, J., Siskind, J., Godbold, J., & Brenner, B. (2008). Race and food store availability in an inner-city neighbourhood. *Public Health Nutrition, 11*(6), 624-631. doi: 10.1017/S1368980007001097

Garrett, B. E., Dube, S. R., Trosclair, A., Caraballo, R. S., Pechacek, T. F., & Centers for Disease Control and Prevention (CDC). (2011). Cigarette smoking—united states, 1965–2008. *MMWR Surveill Summ*, *60*(Suppl), 109-113.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association*, *98*(10), 1118-1126. doi.org/10.1016/S0002-8223(98)00260-0,

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: Concepts and measures. *American Journal of Health Promotion,* 19(5), 330-333. doi:10.4278/0890-1171-19.5.330

Golan, E., Stewart, H., Kuchler, F., & Dong, D. (2008). Can low-income Americans afford a healthy diet. *Amber Waves, 6*(5), 26-33. Retrieved from the U.S. Department of Agriculture.

Grothe, K. B., Dutton, G. R., Jones, G. N., Bodenlos, J., Ancona, M., & Brantley, P. J. (2005). Validation of the Beck Depression Inventory-II in a low-income African American sample of medical outpatients. *Psychological assessment, 17*(1), 110.

Grutzmacher, S., & Gross, S. (2011). Household food security and fruit and vegetable intake among low-income fourth-graders. *Journal of Nutrition Education and Behavior, 43*(6), 455-463. doi: 10.1016/j.jneb.2010.10.004

Gucciardi, E., Vogt, J. A., DeMelo, M., & Stewart, D. E. (2009). Exploration of the relationship between household food insecurity and diabetes in Canada. *Diabetes Care, 32*(12), 2218-2224.

Gundersen, C., Lohman, B. J., Garasky, S., Stewart, S., & Eisenmann, J. (2008). Food security, maternal stressors, and overweight among low-income US children: Results from the national health and nutrition examination survey (1999-2002). *Pediatrics, 122*(3), e529-40. doi: 10.1542/peds.2008-0556

Hager, E. R., Quigg, A. M., Black, M. M., Coleman, S. M., Heeren, T., Rose-Jacobs, R., ... & Frank, D. A. (2010). Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics, 126*(1), e26-e32. doi: 10.1542/peds.2009-3146

Hager, E., Witherspoon, D., Gormley, C., Latta, L., Pepper, M., & Black, M. (2013). The perceived and built environment surrounding urban schools and physical activity

among adolescent girls. *Annals of Behavioral Medicine, 45*(Supplemental 1), p. s68-75. doi:10.1007/s12160-012-9430-1

Hamm, M. W., & Bellows, A. C. (2003). Community food security and nutrition educators. *Journal of Nutrition Education and Behavior*, *35*(1), 37-43.

Hammen, C. (2005). Stress and depression. *Annu. Rev. Clin. Psychol.*, *1*, 293-319.

Hendrickson, D., Smith, C., & Eikenberry, N. (2006). Fruit and vegetable access in four low-income food deserts communities in Minnesota. *Agriculture and Human Values*, *23*(3), 371-383. doi:10.1007/s10460-006-9002-8

Hernandez, D. C., & Jacknowitz, A. (2009). Transient, but not persistent, adult food insecurity influences toddler development. *The Journal of Nutrition, 139*(8), 1517-1524. doi: 10.3945/jn.109.105593

Holben, D. H., & Pheley, A. M. (2006). Diabetes risk and obesity in food-insecure households in rural Appalachian Ohio. *Preventing Chronic Disease, 3*(3), A82.

Hooper, S. R., Burchinal, M. R., Roberts, J. E., Zeisel, S., & Neebe, E. C. (1998). Social and family risk factors for infant development at one year: An application of the cumulative risk model. *Journal of Applied Developmental Psychology*, *19*(1), 85-96.

Horowitz, C. R., Colson, K. A., Hebert, P. L., & Lancaster, K. (2004). Barriers to buying healthy foods for people with diabetes: evidence of environmental disparities. *American Journal of Public Health*, *94*(9), p. 1549-1554. Retrieved from PubMed.

Howard, L. L. (2011). Does food insecurity at home affect non-cognitive performance at school? A longitudinal analysis of elementary student classroom behavior.

Economics of Education Review, *30*(1), 157-176.

doi:10.1016/j.econedurev.2010.08.003

Hromi-Fiedler, A., Bermúdez-Millán, A., Segura-Pérez, S., & Pérez-Escamilla, R.
(2011). Household food insecurity is associated with depressive symptoms among
low-income pregnant Latinas. *Maternal & child nutrition*, *7*(4), 421-430.

Huddleston-Casas, C., Charnigo, R., & Simmons, L. A. (2009). Food insecurity and
maternal depression in rural, low-income families: a longitudinal
investigation. *Public health nutrition*, *12*(8), 1133.

Jetter, K. M., & Cassady, D. L. (2006). The availability and cost of healthier food
alternatives. *American journal of preventive medicine*, *30*(1), 38-44.
doi:10.1016/j.amepre.2005.08.039

Jilcott, S. B., Hurwitz, J., Moore, J. B., & Blake, C. (2010). Qualitative perspectives on
the use of traditional and nontraditional food venues among middle-and low-
income women in Eastern North Carolina. *Ecology of food and nutrition*, *49*(5),
373-389. doi:10.1080/03670244.2010.507438

Jilcott, S. B., Wall-Bassett, E. D., Burke, S. C., & Moore, J. B. (2011). Associations
between food insecurity, supplemental nutrition assistance program (SNAP)
benefits, and body mass index among adult females. *Journal of the American
Dietetic Association*, *111*(11), 1741-1745.

Jilcott, S. B., Wall-Bassett, E. D., Moore, J. B., & Sharkey, J. R. (2011). Use of
Traditional and Nontraditional Food Venues Among Female Participants in the
Supplemental Nutrition Assistance Program (SNAP). *Journal of Hunger &
Environmental Nutrition*, *6*(1), 64-74. doi:10.1080/19320248.2011.551028

Jilcott Pitts, S. B., McGuirt, J. T., Carr, L. J., Wu, Q., & Keyserling, T. C. (2012). Associations between Body Mass Index, Shopping Behaviors, Amenity Density, and Characteristics of the Neighborhood Food Environment among Female Adult Supplemental Nutrition Assistance Program (SNAP) Participants in Eastern North Carolina. *Ecology of Food and Nutrition*, *51*(6), 526-541. doi:10.1080/03670244.2012.705749

Johns Hopkins Center for a Livable Future (2012). Maryland Food System Map. Available online: http://mdfoodsystemmap.org/

Jyoti, D. F., Frongillo, E. A., & Jones, S. J. (2005). Food insecurity affects school children's academic performance, weight gain, and social skills. *The Journal of Nutrition*, *135*(12), 2831-2839.

Kirkpatrick, S. I., & Tarasuk, V. (2008). Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. *The Journal of nutrition*, *138*(3), 604-612.

Kirkpatrick, S. I., & Tarasuk, V. (2010). Assessing the relevance of neighbourhood characteristics to the household food security of low-income Toronto families. *Public health nutrition*, *13*(07), 1139-1148.

Kumanyika, S. (2007). Obesity prevention concepts and frameworks. *Handbook of Obesity Prevention*, 85-114. doi: 0.1007/978-0-387-47860-9_5.

Kursmark, M., & Weitzman, M. (2009). Recent findings concerning childhood food insecurity. *Current Opinion in Clinical Nutrition and Metabolic Care, 12*(3), 310-316. doi: 10.1097/MCO.0b013e3283298e37

Kushel, M. B., Gupta, R., Gee, L., & Haas, J. S. (2006). Housing instability and food

    insecurity as barriers to health care among low-income Americans. *Journal of*

    General Internal Medicine, 21(1), 71-77. doi: 10.1111/j.1525-1497.2005.00278.x

Krukowski, R. A., McSweeney, J., Sparks, C., & West, D. S. (2012). Qualitative study of

    influences on food store choice. *Appetite*. doi:10.1016/j.appet.2012.06.019,

Krukowski, R. A., Smith West, D., Harvey-Berino, J., & Prewitt, T. E. (2010).

    Neighborhood impact on healthy food availability and pricing in food stores.

    Journal of Community Health, 35, 315-320. doi: 10.1007/s10900-010-9224-y

Laraia, B. A., Borja, J. B., & Bentley, M. E. (2009). Grandmothers, fathers and

    depressive symptoms are associated with food insecurity among low income first-

    time African-American mothers in North Carolina. *Journal of the American*

    Dietetic Association, *109*(6), 1042.

Laraia, B. A., Siega-Riz, A. M., Gundersen, C., & Dole, N. (2006). Psychosocial factors

    and socioeconomic indicators are associated with household food insecurity

    among pregnant women. *The Journal of Nutrition*,*136*(1), 177-182.

Larson, N. I., & Story, M. T. (2011). Food insecurity and weight status among US

    children and families: a review of the literature. *American Journal of Preventive*

    Medicine, *40*(2), 166-173.

Larsen, K., & Gilliland, J. (2008). Mapping the evolution of'food deserts' in a Canadian

    city: Supermarket accessibility in London, Ontario, 1961–2005.*International*

    Journal of Health Geographics, *7*(1), 16.

Lee, R. E., Heinrich, K. M., Medina, A. V., Regan, G. R., & Reese-Smith, J. Y. (2010).

    A picture of the healthful food environment in two diverse urban cities.

    Environmental Health Insights, 4, 49-60. Available from PubMed.

LeDoux, T. F., & Vojnovic, I. (2012). Going outside the neighborhood: The shopping

    patterns and adaptations of disadvantaged consumers living in the lower eastside

    neighborhoods of Detroit, Michigan. *Health & place*, 19(1), p. 1 - 14. doi:

    10.1016/j.healthplace.2012.09.010

Lent, M. D., Petrovic, L. E., Swanson, J. A., & Olson, C. M. (2009). Maternal mental

    health and the persistence of food insecurity in poor rural families. *Journal of

    Health Care for the Poor and Underserved*, *20*(3), 645-661.

Leone, A. F., Lee, J. S., Rigby, S., Kurtz, H., Johnson, M. A., Betterley, C., & Park, S.

    (2011). Store Type and Demographic Influence on the Availability and Price of

    Healthful Foods, Leon County, Florida, 2008. *Preventing chronic disease*, *8*(6).

    Available from PubMed.

Liese, A. D., Weis, K. E., Pluto, D., Smith, E., & Lawson, A. (2007). Food store types,

    availability, and cost of foods in a rural environment. *Journal of the American

    Dietetic Association*, *107*(11), 1916. doi: 10.1016/j.jada.2007.08.012

Mabli, J., Cohen, R., Potter, F. & Zhao, Z. (2010). *Hunger in America in 2010: National

    report prepared for Feeding America* (Mathmateica Policy Research, Inc.

    Reference No. 06251-600). Available from Feeding American website:

    http://feedingamerica.issuelab.org/resource/hunger_in_america_2010_national_re

    port

Mancino, L., & Newman, C. (2007). *Who has time to cook? How family resources influence food preparation* (No. 55961). United States Department of Agriculture, Economic Research Service.

Martin, K. S., Rogers, B. L., Cook, J. T., & Joseph, H. M. (2004). Social capital is associated with decreased risk of hunger. *Social Science & Medicine*, *58*(12), 2645-2654.

Maryland Department of Human Resources (2013). *Family investment programs: Income guidelines as of 12/2013.* Available online: http://www.dhr.state.md.us/blog/wp-content/uploads/2012/10/iag.pdf

Matheson, D. M., Varady, J., Varady, A., & Killen, J. D. (2002). Household food security and nutritional status of Hispanic children in the fifth grade. *The American Journal of Clinical Nutrition, 76*(1), 210-217.

Melchior, M., Caspi, A., Howard, L. M., Ambler, A. P., Bolton, H., Mountain, N., & Moffitt, T. E. (2009). Mental health context of food insecurity: a representative cohort of families with young children. *Pediatrics*, *124*(4), e564-e572.

Mello, J. A., Gans, K. M., Risica, P. M., Kirtania, U., Strolla, L. O., & Fournier, L. (2010). How is food insecurity associated with dietary behaviors? an analysis with low-income, ethnically diverse participants in a nutrition intervention study. *Journal of the American Dietetic Association, 110*(12), 1906-1911. doi: 10.1016/j.jada.2010.09.011

Mendelsohn, C. (2012). Smoking and depression: A review. *Australian family physician*, *41*(5), 304.

Miller, C., Bodor, J. N., & Rose, D. (2012). Measuring the Food Environment: A

    Systematic Technique for Characterizing Food Stores Using Display Counts.

    Journal of Environmental and Public Health, *2012*. doi:10.1155/2012/707860

Mitchell, A. (2005). *The ESRI guide to GIS analysis, volume 2: Spatial measurements*

    and statistics. Redlands, CA: ESRI Press.

Monsivais, P., Mclain, J., & Drewnowski, A. (2010). The rising disparity in the price of

    healthful foods: 2004–2008. *Food policy*, *35*(6), 514-520.

    doi.org/10.1016/j.foodpol.2010.06.004

Moore, L. V., & Diez Roux, A. V. (2006). Associations of neighborhood characteristics

    with the location and type of food stores. *American Journal of Public Health*,

    96(2), 325-331. doi:10.2105/AJPH.2004.058040

Moreland, K., Wing, S., Diez Roux, A., & Poole, C. (2002). Neighborhood

    characteristics associated with the location of food stores and food service places.

    American Journal of Preventive Medicine, 22(1), pp. 23 - 29.

Nair, P., Schuler, M. E., Black, M. M., Kettinger, L., & Harrington, D. (2003).

    Cumulative environmental risk in substance abusing women: early intervention,

    parenting stress, child abuse potential and child development. *Child abuse &*

    neglect, *27*(9), 997-1017. doi:10.1016/S0145-2134(03)00169-8

National Association of Social Workers. (2008). NASW code of ethics. *Washington, DC:*

    NASW.

Nord, M., & Golla, A. M. (2009). *Does SNAP decrease food insecurity? Untangling the*

    self-selection effect. (Economic Research Report Number 85). Retrieved from the

    USDA Website http://www.ers.usda.gov/media/184824/err85_1_.pdf

Parker, E. D., Widome, R., Nettleton, J. A., & Pereira, M. A. (2010). Food security and

    metabolic syndrome in U.S. adults and adolescents: Findings from the national

    health and nutrition examination survey, 1999-2006. *Annals of Epidemiology,*

    20(5), 364-370. doi: 10.1016/j.annepidem.2010.02.009

Palmer, A., Smith, J., Haering, S. A., & McKenzie, S. (2007). *Understanding and*

    addressing food security in southwest Baltimore. Available from Center for a

    Livable Future: http://www.jhsph.edu/research/centers-and-institutes/johns-

    hopkins-center-for-a-livable-future/_pdf/research/clf_reports/OROSWreport2009-

    1-1.pdf

Pearson, V. Wong, D. K., Ho, K. M., & Wong, Y. C (2007). Problem based learning in

    an MSW programme: A study of learning outcomes. *Social Work Education,*

    26(6), 616. doi: 10.1080/02615470701456533

Powell, L. M., Slater, S., Mirtcheva, D., Bao, Y., & Chaloupka, F. J. (2007). Food store

    availability and neighborhood characteristics in the United States. *Preventive*

    Medicine, 44(3), 189-195. doi:10.1016/j.ypmed.2006.08.008

Richardson, A. S., Boone-Heinonen, J., Popkin, B. M., & Gordon-Larsen, P. (2012). Are

    neighbourhood food resources distributed inequitably by income and race in the

    USA? Epidemiological findings across the urban spectrum. *BMJ Open, 2*(2), 1-

    9. Doi: 10.1136/bmjopen-2011-000698

Rosas, L. G., Harley, K., Fernald, L. C., Guendelman, S., Mejia, F., Neufeld, L. M., &

    Eskenazi, B. (2009). Dietary associations of household food insecurity among

    children of Mexican descent: Results of a binational study. *Journal of the*

American Dietetic Association, 109(12), 2001-2009. doi: 10.1016/j.jada.2009.09.004

Rose, D., & Richards, R. (2004). Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public health nutrition*, *7*(08), 1081-1088.

Rose-Jacobs, R., Black, M. M., Casey, P. H., Cook, J. T., Cutts, D. B., Chilton, M., ... & Frank, D. A. (2008). Household food insecurity: associations with at-risk infant and toddler development. *Pediatrics*, *121*(1), 65-72. doi: 10.1542/peds.2006-3717

Rutter, M (1979). Protective factors in children's response to stress and disadvantage. *Annals of the Academy of Medicine, 8*(3), 324 – 338. Retrieved from Google Scholar.

Ryu, J. H., & Bartfeld, J. S. (2012). Household food insecurity during childhood and subsequent health status: the early childhood longitudinal study—kindergarten cohort. *American Journal of Public Health*, *102*(11), e50-e55.

Sameroff, A., Gutman, L. M., & Peck, S. C. (2003). Adaptation among youth facing multiple risks: Prospective research findings. In S. Luthar (ed.), Resilence and vulnerability: Adaptation in the context of childhood adversities, (pp. 364-391). New York, NY: Cambridge University Press.

Sameroff, A. J., Seifer, R., Barocas, R., Zax, M., & Greenspan, S. (1987). Intelligence quotient scores of 4-year-old children: Social-environmental risk factors. *Pediatrics*, *79*(3), 343-350. Retrieved from Google Scholar.

Santiago, C. D., Wadsworth, M. E., & Stump, J. (2011). Socioeconomic status, neighborhood disadvantage, and poverty-related stress: Prospective effects on

psychological syndromes among diverse low-income families. *Journal of Economic Psychology*, *32*(2), 218-230

Schafer, J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological methods*, *7*(2), 147. doi.org/10.1037/1082-989X.7.2.147

Seligman, H. K., Laraia, B. A., & Kushel, M. B. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of Nutrition, 140*(2), 304-310. doi: 10.3945/jn.109.112573

Sharkey, J. R., Dean, W. R., & Johnson, C. M. (2011). Association of household and community characteristics with adult and child food insecurity among Mexican-origin households in colonias along the Texas-Mexico border.*Int J Equity Health*, *10*(1), 1-14.

Sharkey, J. R., Johnson, C. M., & Dean, W. R. (2011). Relationship of household food insecurity to health-related quality of life in a large sample of rural and urban women. *Women & Health, 51*(5), 442-460. doi: 10.1080/03630242.2011.584367; 10.1080/03630242.2011.584367

Sharkey, J. R., Nalty, C., Johnson, C. M., & Dean, W. R. (2012). Children's very low food security is associated with increased dietary intakes in energy, fat, and added sugar among Mexican-origin children (6-11 y) in Texas border colonias. *BMC Pediatrics, 12*, 16. doi: 10.1186/1471-2431-12-16

Shrive, F. M., Stuart, H., Quan, H., & Ghali, W. A. (2006). Dealing with missing data in a multi-question depression scale: a comparison of imputation methods. *BMC Medical Research Methodology*, *6*(1), 57. doi:10.1186/1471-2288-6-57

State of Maryland (2014). *Department of Transportation: Maryland Transit Administration*. Available online: http://www.statestat.maryland.gov/reports.html

Stewart, H. & Blisard, N. (2008). *Are low income households willing and able to budget for fruits and vegetables?* (Economic Research Report Number 54). Available from the U.S. Department of Agriculture Economic Research website http://www.ers.usda.gov/publications/err-economic-research-report/err54.aspx

Stuff, J. E., Casey, P. H., Szeto, K. L., Gossett, J. M., Robbins, J. M., Simpson, P. M., . . . Bogle, M. L. (2004). Household food insecurity is associated with adult health status. *The Journal of Nutrition, 134*(9), 2330-2335.

Suglia, S. F., Duarte, C. S., Chambers, E. C., & Boynton-Jarrett, R. (2012). Cumulative social risk and obesity in early childhood. *Pediatrics*, *129*(5), e1173-e1179.

Sullivan, A. F., Clark, S., Pallin, D. J., & Camargo, C. A.,Jr. (2010). Food security, health, and medication expenditures of emergency department patients. *The Journal of Emergency Medicine, 38*(4), 524-528. doi: 10.1016/j.jemermed.2008.11.027

Tabachnik, B.G. & Fidell, L.S. (2007). *Using multivariate statistics (5th ed.)*. Boston, MA: Allyn & Bacon.

Trentacosta, C. J., Hyde, L. W., Shaw, D. S., Dishion, T. J., Gardner, F., & Wilson, M. (2008). The relations among cumulative risk, parenting, and behavior problems during early childhood. *Journal of Child Psychology and Psychiatry*, *49*(11), 1211-1219.

United States Census Bureau (2013). *Annual Social and Economic (ASEC) Supplement.* Available online:http://www.census.gov/hhes/www/cpstables/032014/pov/toc.htm

United States Census Bureau (2015). *Baltimore City Quick Facts.* Available online: http://quickfacts.census.gov/qfd/states/24/24510.html

United States Department of Agriculture, Economic Research Service. (2012). Defining food security. Available online: http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx

United States Department of Agriculture, Economic Research Service. (2014). Food-away-from-home. Available online: http://www.ers.usda.gov/topics/food-choices-health/food-consumption-demand/food-away-from-home.aspx

United States Department of Agriculture, Economic Research Service. (2012). Survey tools. Available online: http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#.UZz2OKK1GjI

United States Department of Agriculture, Food and Nutrition Services (2009). Food Security. Available online: http://www.fns.usda.gov/fsec/

United States Department of Agriculture, Food and Nutrition Services. (2014). Supplemental Nutrition Assistance Program (SNAP): Eligibility. Available online: http://www.fns.usda.gov/snap/eligibility

Walker, R. E., Fryer, C. S., Butler, J., Keane, C. R., Kriska, A., & Burke, J. G. (2011). Factors influencing food buying practices in residents of a low-income food desert and a low-income food oasis. *Journal of Mixed Methods Research*, *5*(3) doi:10.11771558689811412971.

Walker, J. L., Holben, D. H., Kropf, M. L., Holcomb, J. P.,Jr, & Anderson, H. (2007). Household food insecurity is inversely associated with social capital and health in females from special supplemental nutrition program for women, infants, and

children households in Appalachian Ohio. *Journal of the American Dietetic Association, 107*(11), 1989-1993. doi: 10.1016/j.jada.2007.08.004

Whitaker, R. C., Phillips, S. M., & Orzol, S. M. (2006). Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. *Pediatrics, 118*(3), e859-68. doi: 10.1542/peds.2006-0239

Whitaker, W. H. (1993). A charity/justice partnership for US food security. *Social Work, 38*(4), 494-497. doi:10.1093/sw/38.4.494

Wicks, R., Trevena, L. J., & Quine, S. (2006). Experiences of food insecurity among urban soup kitchen consumers: insights for improving nutrition and well-being. *Journal of the American Dietetic Association*, *106*(6), 921-924.

Wiig, K., & Smith, C. (2009). The art of grocery shopping on a food stamp budget: factors influencing the food choices of low-income women as they try to make ends meet. *Public health nutrition*, *12*(10), 1726-1734. doi.org/10.1017/S1368980008004102

Wilde, P., & Nord, M. (2005). The effect of food stamps on food security: a panel data approach. *Applied Economic Perspectives and Policy*, *27*(3), 425-432. doi: 10.1111/j.1467-9353.2005.00239.x

Wingert, K., Zachary, D. A., Fox, M., Gittelsohn, J., & Surkan, P. J. (2014). Child as change agent. The potential of children to increase healthy food purchasing. *Appetite*, *81*, 330-336.

Yu, M., Lombe, M., & Nebbitt, V. E. (2010). Food stamp program participation, informal supports, household food security and child food security: A comparison of

African American and Caucasian households in poverty. *Children and Youth Services Review*, *32*(5), 767-773.

Yum, J. (2007). *Factors associated with elderly mobility: Examination of immigrant status and access to public transit*. ProQuest.

Ziliak, S. T. (2002). *Some tendencies of social welfare and the problem of interpretation.* (Cato Journal, Vol. 21, No. 3) Available from the Cato Institute website: http://www.cato.org/sites/cato.org/files/serials/files/cato-journal/2002/1/cj21n3-10.pdf