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## MAKING HEALTH A PRIORITY: CONSTRAINED CHOICES AT THE GROCERY STORE

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Christy F. Brady, Student

Dr. Carrie Oser, Major Professor

Dr. Ana Liberato, Director of Graduate Studies

MAKING HEALTH A PRIORITY:  
CONSTRAINED CHOICES AT THE GROCERY STORE

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DISSERTATION

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A dissertation submitted in partial fulfillment of the  
Requirements for the degree of Doctor of Philosophy in the  
College of Arts & Sciences  
At the University of Kentucky

By  
Christy Freadreacea Brady

Lexington, Kentucky

Chair: Dr. Carrie Oser, Associate Professor of Sociology

Lexington, Kentucky

2016

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## ABSTRACT OF DISSERTATION

### MAKING HEALTH A PRIORITY: CONSTRAINED CHOICES AT THE GROCERY STORE

Mounting evidence of the deleterious health effects of poor diet, obesity, and correlated conditions underscore the need to understand how social factors influence food choices. A variety of factors contribute to the diets that Americans consume including limited time, limited income, lack of cooking skills, food deserts, and cheap, convenient foods in abundant portions in grocery stores and restaurants. These contextual factors serve as constraints that impact an individual's ability to prioritize health when shopping for food. Using the three paper dissertation format, this project will utilize a Constrained Choice Theory (CCT) framework to investigate sociodemographic trends in priorities in shopping for food, the prevalence of shared priorities within social networks, and the outcomes of those priorities as measured by the nutritional quality of grocery purchases.

Constrained Choice Theory provides a useful framework for examining health behavior. It conceptualizes individual health decisions as a product of social forces acting upon individual priorities. These forces exist on three levels: social policy, community actions, and work/family. This paper will focus in particular on the community action level by examining how network and group membership impacts priorities, and the work/family level by investigating how factors like requiring convenient foods, being married, or having children impact food choices. This research represents a new application of CCT as grocery priorities have not been previously examined under this framework.

Data are derived from a spring 2011 survey of 410 Lexington, KY families with children. The 20 minute, IRB approved paper survey was distributed via area churches, daycares, and community organizations in socioeconomically diverse neighborhoods. Respondents were directed to return the survey via mail or to a locked box at the location from which they obtained it. Though responses initially included a large number of high socioeconomic status families, results were balanced by recruiting additional participants from low income areas. Participants were offered their choice of a check for \$15 or a \$15 donation to the location where they obtained the survey.

Paper one identifies and interprets sociodemographic variation in food priorities such as budget, taste, and health among families with children. The unique application of the CCT framework allows for an analysis of sociodemographic trends in food shopping priorities, which will provide direction for public health planners seeking to reduce

incidence of diseases with a dietary component. Data are analyzed using STATA 13 for logistic regression. Overall, this study concludes that income is an important consideration in how constrained a family feels by budget and how able they are to choose foods based on pleasurable taste. Income, therefore, is an important factor in the food choices a family makes, and a critical point of intervention. Being married/cohabitating and having kids are also contexts in which constraints on food shopping become apparent with partners wanting to prioritize nutrition, but finding that more difficult with children in the household. These results also indicate a critical juncture at which food constraints should be addressed.

Paper two addresses the following question: do respondents perceive those in their social network as having priorities that reflect the same contextual constraints, personal preferences, or health priorities? Network agreement is examined first among intimate partners, then among other adult family members, and finally, among friends. Correlation is investigated using ordinal logistic regression in STATA 13. The results of this study confirm that there is a correlation between respondent food priorities when shopping for food and partner, family, and friend food priorities. The relationships are correlated across budget, taste, convenience, nutrition and health. These results have important implications for dietary intervention programs that focus on the individual instead of larger social networks.

Paper three examines the impact of prioritizing budget, convenience, or health on the nutritional quality of grocery purchases. As part of the initial survey, grocery store receipts were collected and coded for nutritional value based on the NuVal® food scoring system, which considers over thirty dimensions of nutritional quality. Ordinary least squares regression analyses and mediation analyses are performed using STATA 13 to assess correlation between shopping priority and NuVal® score. Prioritizing budget reduces the overall nutritional quality of a parent's purchases, an effect partially mediated by income. Prioritizing convenience has no effect, while prioritizing health results in an increased NuVal® score.

Taken as a whole, the three papers reveal the presence of constrained choices operating in several ways. Financial factors, relationship factors, and sociodemographic trends are of particular importance. First, financial considerations reduce the likelihood of prioritizing nutrition when shopping for food. Further, those with higher incomes make more healthful purchases overall than those with lower incomes. Public policy that reduces the cost of healthy food or increases individual income would be beneficial in helping families make more nutritious grocery purchases. Secondly, relationship factors like social network membership and familial status play an important role in food choice. Social norms established among partners, friends, and other family members may influence choices made at the grocery store, while shopping for a spouse or children is shown to make healthy choices a greater priority, but make those choices more difficult to achieve with children in the family. Programs that address community level dietary patterns or particularly target the needs of families could prove useful. Finally, unique constraints among sociodemographic groups also merit policy attention. In addition to variation by income group and familial status, variation is also present by sex, race, and weight category. Future research should identify constraints unique among those groups for more targeted dietary intervention.

KEYWORDS: Diet Quality, Constrained Choice Theory, Social Networks and Health,  
Food Priorities, Grocery Shopping

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November 28, 2016

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CONSTRAINED CHOICES AT THE GROCERY STORE

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## Chapter 1

### Introduction

The relationship between food and health is widely accepted. Many of the primary health concerns of Americans, such as obesity and correlated conditions, have been directly connected to diet. With more than one-third of American adults and 17% of youth considered obese, obesity and related conditions have become a significant health problem for U.S. families (Ogden et al. 2014). Obesity is associated with coronary heart disease, type 2 diabetes, some cancers, high blood pressure, high cholesterol, stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis, and gynecological problems (Winkles, 2009). Though most would prefer to avoid diet related health concerns, studies have shown that few consume diets conducive to disease avoidance (Guthrie, Lin and Frazao 2002, Kant 2000, Patterson et al. 1990). A variety of factors contribute to the diets that Americans consume including limited time, financial considerations, lack of cooking skills, food deserts, and cheap, convenient foods in abundant portions in grocery stores and restaurants. These contextual factors serve as constraints that impact an individual's ability to prioritize health when shopping for food. The Constrained Choice Theory (CCT) framework states that decisions are made in a context that includes several layers of influence (Bird and Rieker 2008). Further, this theory states that the context in which priorities are chosen and decisions are made can have a significant impact on health.

## DISSERTATION PROJECT

Using the three paper format, this dissertation project will utilize a Constrained Choice Theory (Bird and Rieker 2008) framework to investigate sociodemographic trends in food provisioning priorities, the prevalence of shared priorities within social networks, and the outcomes of those priorities as measured by the nutritional quality of grocery purchases. An overview of Constrained Choice Theory will be provided as the unifying theoretical framework, followed by a description of data that will be used in this project. Each paper will be addressed individually regarding the research question, hypotheses, and analytic strategy.

The following questions will be addressed by this dissertation in the format of the three paper option. Question 1 will be addressed in Chapter 2, Question 2 in Chapter 3, and Question 3 in Chapter 4.

Q1: Are the grocery shopping priorities of disadvantaged sociodemographic groups, in particular low SES individuals and racial minorities who have an increased risk of negative health outcomes, more likely to reflect constrained choices than those of more privileged sociodemographic groups?

Q2: Do respondents perceive those in their social network as having priorities that reflect the same contextual constraints, personal preferences, or health priorities?

Q3: How do food priorities resulting from contextual constraints impact the healthfulness of a shopper's food choices?

### *Constrained Choice Theory*

Constrained Choice Theory builds upon several other sociological theories of action, beginning with Rational Choice Theory (RTC) (Bird and Rieker 2008). In RTC decisions are focused on efficiently achieving an objective (Homans 1961). RTC has been criticized in sociological applications for assuming a universally shared value system and asserting that the most rational choice will always be the most direct way to reach a goal in spite of many other possible paths (Bird and Rieker 2008). In response, Boudon's Cognitive Theory of Action (CTA) challenged RTC's narrow definition of rationality by introducing beliefs as a variable in decision making (Bird and Rieker 2008, Boudon 2003). Actions are located within a social and individual belief system, and those beliefs contribute to the definition of rationality in play when a decision is made (Boudon 2003). Building on this idea, CCT recognizes that individuals have agency and beliefs, but adds that decision makers must also consider competing priorities and resource limitations.

CCT adds elements of Symbolic Interactionism by allowing for decision makers to create their own definition of a social situation based on the meanings they assign and their resulting beliefs (Blumer 1986). For example, it is common knowledge that exercise contributes to good health, but one must

decide whether or not to exercise. An RTC decision maker would choose to exercise because good health is a universal value. A CTA decision maker would have to assess whether or not good health was important to him or her, and then reach a conclusion based on that information. A CCT decision maker would decide whether or not good health was important, develop his or her own definition of the situation by evaluating how much free time he or she had available and assessing the monetary cost of a gym membership or supplies relative to the reward of the activity.

### *Applications*

Constrained Choice Theory (CCT) examines the context in which health related decisions are made (Bird and Rieker 2008). Oriented primarily toward gender, CCT was designed to aid in understanding both what prevents men and women from prioritizing health and what factors contribute to choices that vary by gender (Bird and Rieker 2008). Bird and Rieker argue that social inequality has long been relied on to explain health disparities, but is in itself not enough to explain gender patterns because outcomes are not universally biased in one direction (2008). Gender is sometimes a health advantage, and sometimes a disadvantage. For example, women may experience greater longevity, but they also experience more chronic diseases. Thus inequality in gender, and by extension other social dimensions, is not enough to explain health disparities.

Instead of relying on inequality alone to explain health disparities, CCT examines contextual factors on three levels that influence both the constraints faced by individuals making decisions about their health and the impact of those constraints on biological processes. The three levels are work and family constraints, community/network constraints, and policy level constraints (see Figure 1.1).

Work and family constraints on an individual's dietary choices might include cooking skills, income, or one's work schedule. Community constraint may come from an individual's social network, or the community environment. Network constraints include norms about portion size, and what foods are considered appropriate for different occasions, while environmental factors might include proximity to

a grocery store or an abundance of fast food restaurants. Policy level constraints might include eligibility criteria for food assistance programs, or which crops are eligible for agricultural subsidies. Individuals may experience constraint that overlaps several levels. For instance, having rheumatoid arthritis might affect how much one can do around the house and be a work/family constraint, while the availability of good doctors introduces a community constraint, and the amount of paid time off for doctor appointments would be a policy level constraint. This project will focus on the first two areas of constraint by examining personal and network factors as they are manifest in priorities for food shopping, while recognizing that these areas are situated within a broader context.

Bird and Rieker (2008) have applied a CCT framework to investigate several arenas that influence health, particularly in gendered ways. At the community level, they review literature examining the health effects of neighborhood disorder and disintegration, social cohesion, crime rates, and school quality (Bird and Rieker 2008). They call for specific community level planning that encourages good health behaviors by eliminating costs of all kinds, like increased stress, financial burden, or safety concerns. At the work/family level, Bird and Rieker (2008) discuss the many roles men and women have as employees, children, parents, and siblings and the impact of managing competing demands on health related decisions. They again call for policy level interventions that support a work/life balance, and also suggest a workplace and household distribution of responsibility less dependent on traditional gender norms.

The Constrained Choice Theory framework lays the groundwork for two lines of inquiry. First, it encourages research that identifies sociodemographic health disparities, with a particular focus on gender differences. Second, it makes clear that it will be necessary to identify the underlying constraints behind those differences on a number of levels before health disparities can be resolved. One example of research in the CCT framework sought to identify gender differences in fast food consumption and physical activity by examining work time commitments at the level of married couples (Fan et al. 2015). Fan and colleagues examined how many hours per week each spouse works, how much flexibility each spouse

has, and how often each consumes fast food or engages in exercise (Fan et al. 2015). The study found that when men worked about 50 hours per week and women whose husbands worked 45-50 hours per week, fast food consumption went up, consistent with CCT expectations that limited time would result in constrained health behaviors (Fan et al. 2015). However, for men, working more than 50 hours per week represents a decreased likelihood of consuming fast food, perhaps because spouses adjust their schedules to take on more at home (Fan et al. 2015). Regarding exercise, women who worked more than 45 hours per week and were married to men who did likewise were more likely to work out (Fan et al. 2015). A key factor in both choosing fast food and choosing to exercise was schedule flexibility, which proved more important than hours worked. If one spouse had considerable flexibility in his or her schedule, that freed up time for both that spouse and his or her partner since the spouse with a flexible schedule could take care of more duties outside of work (Fan et al. 2015). This study reinforces that constraints on the work/family level influence health decision making, but finds that the constraint is actually lack of flexibility rather than work hours.

CCT is relatively new and while the theoretical application by Bird and Rieker (2008) provides a road map, there is little empirical examination to date (with the study by Fan and colleagues (2015) being an exception). As such, this dissertation presents an opportunity to make a unique contribution to the literature through applying it to other health issues. Understanding different health issues through this framework will be the first step in understanding barriers to ameliorating health and ultimately removing those barriers.

### *Contributions to the Literature*

This dissertation project will expand food-choice literature and applications of the CCT framework in several ways. First, since CCT and other gendered health work has been criticized for focusing on one narrow dimension of identity (Hankivsky 2012), this project will expand the application of CCT from gender to other sociodemographic groups by investigating differences in food shopping

related priorities by race, income, marital status, age, number of children, and BMI category as well as gender. Interaction variables will also be explored where appropriate, which will provide more information about individual social context. Consistent with an intersectionality paradigm, results will not be interpreted to imply that any sociodemographic variable is explanatory (e.g. being female will result in living longer), but will rather use sociodemographic outcomes as an invitation to discover social constraints imposed upon groups that result in health outcomes (e.g. females are socialized to engage in less risk taking behavior, which may prevent earlier deaths). In addition, this project will examine how social network factors, the middle level of the CCT constraint paradigm, may function as constraints or preset opportunities for improving health. This level of constraint has not been addressed by previous empirical research and therefore represents a unique contribution of this dissertation. Further, this project will engage a novel empirical measure, the NuVal score, to quantify the nutritional impact of contextual constraints on grocery purchases, extending empirical applications of CCT. The NuVal score was developed by NuVal LLC and utilizes a proprietary algorithm that considers over 30 dimensions of nutrition (both positive and negative) to create one composite score indicating the relative nutritional quality of grocery items rather than examining only one dimension of a food item such as fat or salt. Finally, this study expands on previous work that has considered only one potential constraint by considering concurrent constraints such as temporal, financial, and social considerations.

*Sociodemographic groups experience unique contextual constraints*

In general, people widely recognize basic dietary advice like limiting fat and sodium and consuming plenty of fruits and vegetables (Beardsworth et al. 2002). In practice, however, research has shown that different sociodemographic groups make disparate choices when it comes to food and these choices are often inconsistent with dietary recommendations (Baker et al. 2006, Beardsworth et al. 2002, Contento, Basch and Zybert 2003, Kirk and Gillespie 1990, Nayga 2000, Wardle et al. 2004). Constrained Choice Theory recognizes that many different contextual factors impact the decisions that

individuals make regarding food choices, and in many cases choosing the healthiest food item, which may appear the most rational choice, is not the best choice in context (Bird and Rieker 2008).

Sociodemographic groups are located in unique contexts that constrain the choices available to them. Perhaps most obviously, those in lower income categories face financial constraints in making food choices. Further, groups may share similar priorities, but for different reasons. For example, women may find convenience more important than men since they are more likely to be responsible for preparing food for their families (Lake et al. 2006, Schafer and Schafer 1989), while minorities may prioritize convenience because they are less likely to live in close proximity to a grocery store (Morland, Wing and Roux 2002). Moreover, lower income areas are less likely to have grocery stores and more likely to have fast food establishments (Baker et al. 2006), which may make fast food more convenient than shopping for and preparing food for time/income strapped families (Devine et al. 2006). Contextual factors like these indicate that different sociodemographic groups are making food choices in distinct social contexts, and therefore may make different choices regarding food priorities. While previous research has explored the importance of nutrition in different sociodemographic groups (Beardsworth et al. 2002, Boek et al. 2012, Nayga 1997, Wardle et al. 2004), this project will address deficiencies in the literature by examining the importance of other competing and constraining priorities in grocery shopping.

#### *Social networks as influences on health behavior*

A respondent's social network is located at the intersection of work/family constraints, and community constraints. A social network consists of a central person, in this case the respondent, and all the people to which he or she is connected. In addition, the people connected to the central person's connections have been shown to influence the central person (Christakis and Fowler 2009). Research has shown that an individual's social network influences health in a variety of ways including in health behaviors and in health outcomes (House 2002, Langlie 1977, Link and Phelan 1995, Pescosolido 1992, Umberson and Montez 2010).

People often choose others like themselves as members of their social networks (McPherson, Smith-Lovin and Cook 2001). It follows that individuals within a social network would hold similar beliefs about food provisioning. Moreover, network members are likely to be sociodemographically similar, and therefore face similar challenges and constraints in choosing a healthy diet. Research has shown that people who are close may monitor one another's health habits and reinforce positive behavior, reinforcing good choices (Umberson and Montez 2010), but also that when a close contact engages in negative behaviors, those behaviors can become normalized as well (Christakis and Fowler 2009). For example, Christakis and Fowler note that when one person in a network quits smoking, the people who are close to that individual are also more likely to do so (Christakis and Fowler 2009). However, if an individual becomes obese, others in the network are also likely to put on weight and become obese (Christakis and Fowler 2009). Other research has shown that with whom you eat influences what one chooses to eat, and how much one chooses to eat as individuals adjust their eating behavior to match that of their companions (Clendenen, Herman and Polivy 1994, Vartanian, Herman and Wansink 2008). Network influences, therefore, are clearly an important part of the context in which one makes food decisions. They represent opportunities for positive behavior change, but also challenges for changing normed behaviors.

This dissertation study will apply a CCT framework to examine whether participants perceive their partners, other adult family members, and friends as having priorities that reflect similar contextual constraints, personal preferences, and health priorities when shopping for food. The research above suggests that there will be agreement between participants and members of their network, and that engaging in behavior consistent with others is part of network membership, however there have been no known studies to address this issue to date.

### *Concurrent constraints impact shoppers' choices*

Despite our best intentions, nutrition and health often lose out to competing factors like taste, convenience, low-priced processed food, social occasions, and budget (Blaylock et al. 1999, Kirk and Gillespie 1990). These competing priorities reflect contextual constraints that impact dietary choices. Shoppers whose top priorities reflect contextual constraints are likely concerned about time and money, making decisions by choosing low-cost items and items that are easy to prepare and will keep well. Constraints in time and money are housed in Bird and Reiker's work/family level of constraint as they are often directly tied to employment situation (2008). One's job determines both how much money one has to spend on food and how much time one has free to prepare and consume it. Perceived time constraints result in dietary compromises like relying on convenient, easy to prepare foods or fast food even when one would prefer to make other choices (Bava, Jaeger and Park 2008). Moreover, financial considerations leave lower income shoppers less concerned with nutrition, and more concerned with finding foods that "fill you up" for a low price than higher income shoppers (Caraher et al. 1998).

Other work/family level constraints include household preferences in taste and food production related values. Personal preference shoppers are locating foods within their own value systems. They likely choose foods that offer a reward like a favorite familiar flavor, or the satisfaction of a moral act. For example, it does not matter how healthfully one shops if no one will eat the food once it is home because it does not fit with their value system for taste or quality. Research has shown that when making a list of priorities, mothers typically put nutrition first, but the item that most often appears on mothers' lists is the competing demand of catering to the taste of the family (Kirk and Gillespie 1990). Other research has shown that taste is most important, before all other factors, when choosing what to eat (Glanz et al. 1998).

Shoppers who prioritize health, on the other hand, are focused on physical well-being and may be trying to maintain or achieve good health through their choices. They prioritize health above contextual

constraints or personal preferences, and may make lifestyle adjustments to accommodate their priorities. They may choose to allocate a different proportion of their budget toward food than other items, they may choose a job that allows time for cooking, or they may avoid foods that taste good but do not meet their nutritional needs.

The decisions people make regarding food are complicated, but the lexicographic decision rule (Bettman 1979) suggests that people rarely go beyond their top 2-3 priorities when making choices, asking themselves which items meet their primary need and then using secondary and tertiary priorities to differentiate between similar products when necessary. It follows that shoppers whose top three priorities reflect contextual constraints would make different food choices than shoppers whose top 3 priorities reflect personal preferences or prioritize health. While previous research has examined constraints individually, often primarily income (Bava, Jaeger and Park 2008, Caraher et al. 1998, Devine et al. 2009, Drewnowski and Darmon 2005, Grunert 2005, Shepherd et al. 1996, Wagstaff and Van Doorslaer 2000), this project will instead address multiple constraints simultaneously by considering the items among a shoppers' top 3 priorities instead of only their first priority. This approach is more consistent with the lexicographic decision rule (Bettman 1979) and therefore better represents the shopper's experience.

#### *NuVal as a robust measure of nutrition quality*

This dissertation will utilize a composite measure of nutrition, the NuVal score, to quantify the nutritional outcome of constrained priorities when shopping for food. This projects builds on existing research by utilizing a more thorough method of nutritional assessment to quantify the dietary impact of constrained choices on grocery purchases. NuVal is unique in that it considers both positive (e.g. vitamins, healthy fats) and negative (e.g. unhealthy fats, empty calories) when evaluating a food choice. Other research has focused primarily on singular components of a food item such as fat or protein (Powell-Wiley et al. 2014, Ransley et al. 2003) or categories of foods like cereal or fast food (Glanz et al. 1998). The NuVal approach provides an index for a deeper understanding of nutritional variation.

## *Research Questions*

This dissertation will investigate the following three questions to extend the use of the CCT framework and address gaps in the literature related to food provisioning choices. In Chapter 2, the following question is explored. RQ1: Are the grocery shopping priorities of disadvantaged sociodemographic groups, in particular low SES individuals and racial minorities who have an increased risk of negative health outcomes, more likely to reflect constrained choices than those of more privileged sociodemographic groups? It is hypothesized that different sociodemographic groups will be more likely to choose priorities that reflect constrained choices than other groups, based on existing literature. Chapter 3 will examine social networks by investigating the following research question: RQ2: Do respondents perceive those in their social network as having priorities that reflect the same contextual constraints, personal preferences, or health priorities? The hypothesis for this research question is that respondents will perceive that their partners', family members', and friends' priorities reflect similar contextual constraints, personal preferences and health priorities. The final research question is examined in Chapter 4. Specifically, RQ3: How do food priorities resulting from contextual constraints impact the healthfulness of a shopper's food choices? It is hypothesized that individuals with priorities reflecting contextual constraints or personal preference will make less healthful purchases than those who shop based health priorities.

These questions will be investigated using data collected via survey in spring 2011 in Lexington KY. Diverse families with children were asked to report their food provisioning priorities as well as those of the members of their social network. In addition, they provided grocery shopping receipts representative of a typical shopping trip. Full details about the dataset will be provided in Chapters 2, 3, and 4 as each question is addressed.

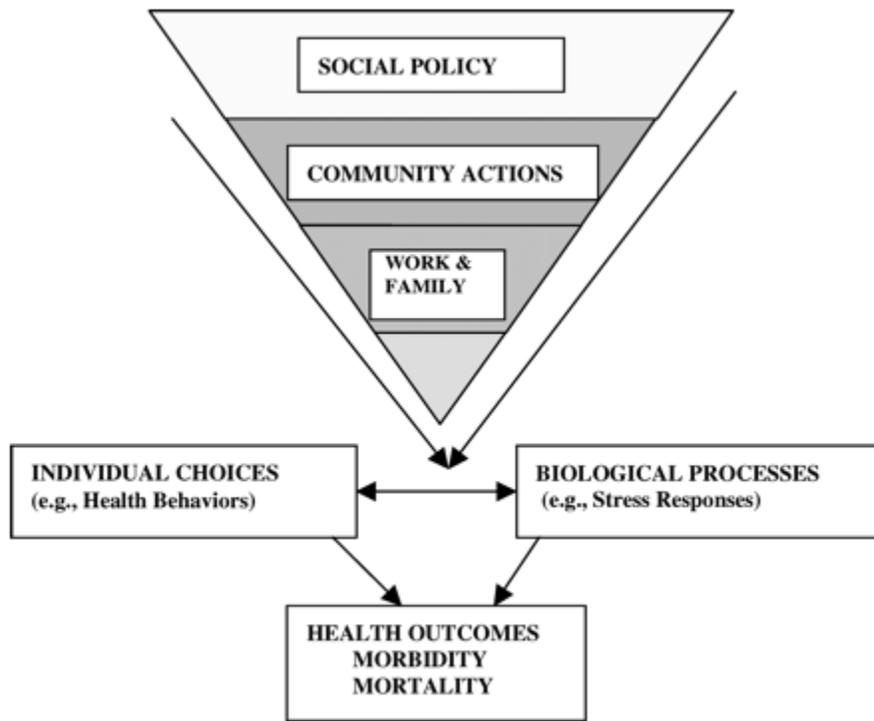
## KEY FINDINGS

The results of this research offer several key findings which are thoroughly addressed in Chapter 5. First, a better understanding of the way contextual constraints are reflected in sociodemographic food priorities will identify groups of parents who struggle to make health a priority. In the CCT framework, this is the first step in effective health interventions. Findings will allow health educators to better tailor programs that promote healthy eating to address constraints experienced by the groups they plan to reach and begin a broader societal discussion about the constraints that result in relegating health to a lower priority.

Second, demonstrating the importance of one's social network in eating related decisions can help shift the conversation from individual health decisions to community level factors that influence health. Understanding where shared food norms exist-between partners, between other adult family members, or between friends-can help define areas for effective intervention. From a CCT framework perspective, this would mean changing norms at the family level, and also at the community level to create an environment that supports healthy eating. At the work/family level, this could mean adjusting work schedules to allow more time to prepare meals, or allocating one's budget differently to allow more money to be spent on food. It is important that members of the same social network commit to these changes together to help change network-wide norms about eating.

Finally, this dissertation will make a third contribution to the literature through the unique use of NuVal scores to describe how shoppers' priorities are reflected in the nutritional quality of their purchases. The first step in employing the CCT framework is identifying affected groups. With the use of NuVal scores this project will not only identify affected groups, but will quantify the impact contextual constraints have on nutrition in comparison with those whose priorities do not reflect contextual constraints. This will provide data that demonstrates the potential gains in nutrition that could be made through the removal of contextual constraints that serve as barriers to good health.

Figure 1.1 Conceptualization of Constrained Choice Theory, (Bird and Rieker 2008)



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## Chapter 2

### Food Priorities: Sociodemographic Variation in Constrained Choices at the Grocery Store

Food has long been accepted as playing a role in health, and diet related health concerns continue to be prevalent in the United States. Health issues like obesity and correlated conditions have been connected to diet and have become problematic with more than one-third of American adults and 17% of youth classified as obese (Flegal et al. 2016, Ogden et al. 2014). Coronary heart disease, type 2 diabetes, high blood pressure, high cholesterol, stroke, some cancers, liver and gall bladder disease, sleep apnea and respiratory problems, osteoarthritis and gynecological problems have all been associated with obesity (CDC 2015a, Winkles 2009) and have an impact on the lives of individuals and their families, as well as health care costs for the nation (Allen, Thorpe and Joski 2015, Cawley and Meyerhoefer 2012).

Many of the aforementioned health problems are linked to personal health behaviors and the food environment and are distributed unequally among sociodemographic groups (Burke and Heiland 2008, Cossrow and Falkner 2004, Paeratakul et al. 2002). Public health officials often emphasize the importance of preparing and sharing meals at home to maintain control of the nutritional quality of one's food (USDA 2016, Wolfson and Bleich 2015), therefore it is critical to understand what influences the types of foods families bring into their homes. It is important to identify sociodemographic variation in constraints that prevent purchasing healthy food in order to remove barriers to good health. This is particularly important among groups that experience disproportionately high rates of diet-related disease. Prior research has identified sociodemographic variation in food consumption, but this paper will provide a unique focus on constraints perceived by parents as they shop for groceries. Parents are of particular interest because they are not only responsible for their own dietary patterns but also for those of the next generation. Recent research has shown that income challenges parents face while at the grocery store directly impact the food preferences children develop (Daniel 2016). This paper will extend that research by grounding its examination in other influential sociodemographic categories including income, gender, race, and age as well as considering familial status and weight category as factors in families' food priorities.

This paper is significant as it is the first application of the Constrained Choice Theory (CCT) (Bird and Rieker 2008) framework to identify and interpret sociodemographic variation in food priorities like budget, taste, and health among families with children. The unique application of the CCT framework allows for an interpretation of sociodemographic trends in food shopping priorities. Understanding the priorities families have when shopping for food can identify sociodemographic groups with barriers to healthy eating and provide direction for public health planners seeking to reduce incidence of diseases with a dietary component.

## BACKGROUND

### *Constrained Choice Theory*

Constrained Choice Theory is designed to explain the choices individuals make regarding their health (Bird and Rieker 2008). It states that social forces operate as constraints on individual choices which, when combined with biological predispositions, result in health outcomes (Bird and Rieker 2008). In CCT, the decision maker has agency in making a choice, but the choices themselves are limited. Exploring three overlapping levels of constraint, CCT looks at macro level factors like social policies that contribute to health, meso level factors such as the number of fast food outlets in a neighborhood, and micro (work/family) level factors including income and number of children (Bird and Rieker 2008). Together, these three levels comprise the social context in which health decisions occur. This study will focus in particular on the on the work/family levels of constraint.

CCT recognizes that many different contextual factors impact the decisions that individuals make regarding food choices and argues that in many cases choosing the healthiest food item, which may appear the most rational choice, is not the best choice in context (Bird and Rieker 2008). For example, priorities like budget or taste preference may represent work/family level contextual constraints that would influence one's food decisions. Unlike rational choice theory (Homans 1961) which is focused on maximizing outcome and Boudon's cognitive theory of actions (Boudon 2003) which is focused on

decisions in the context of one's value system, CCT presents a theory of action that takes into account the social context in which the decision is made (Bird and Rieker 2008). Though Bird and Rieker developed CCT specifically to analyze the ways in which constraints differentially impact the health of men and women, this paper will also explore differences within other sociodemographic characteristics as well as investigate familial constraints and explore the relationship with body mass index (BMI) category.

As a relatively new theory, CCT has not been widely applied as a theoretical tool in empirical research and only one known study has applied the theory to dietary choices. Specifically, research using CCT has examined married couples' fast food consumption and physical activity patterns as a function of the constraints of hours worked per week (Fan et al. 2015). Fan and colleagues (2015) found that flexibility in the workplace was more important than hours worked in predicting fast food consumption and exercise. The more flexible one's schedule, the more likely one was to avoid fast food and engage in physical activity (Fan et al. 2015). This study reinforces the presence or absence of contextual constraints as an influence of health behaviors.

#### *Contextual Constraint Variation*

Previous research has shown that individuals are familiar with basic dietary advice like limiting fat and sodium and consuming plenty of fruits and vegetables (Beardsworth et al. 2002), however few consume diets that would help them avoid diet related diseases (Guthrie, Lin and Frazao 2002, Kant 2000, Patterson et al. 1990). In addition, there is variation by sociodemographic group in following dietary recommendations with lower income and minority groups more likely to struggle to meet guidelines (Baker et al. 2006, Beardsworth et al. 2002, Contento, Basch and Zybert 2003, Kirk and Gillespie 1990, Nayga 2000, Wardle et al. 2004). Differing patterns in food consumption among sociodemographic groups is likely related to variation in incidence of diet related diseases. Obesity provides one example of a diet related condition that research has shown to differ among sociodemographic groups. For instance, women are more likely than men to be obese, and African Americans are more likely than whites to be

obese, with black women at the greatest risk for obesity, followed by white women (Burke and Heiland 2008). Further, the health effects of weight differ for African Americans, Whites, and Mexican Americans, and may differ by gender as well, with some health concerns manifesting at lower or higher BMIs for different groups (Burke and Heiland 2008, Zhang, Wang and Huang 2009). These differences may be the result of unique constrained choices among differing groups. For example, there is an established association between obesity and poverty which may mean other priorities compete with food for a family's dollars and constrain possible choices at the grocery store (Drewnowski and Darmon 2005). It is important to understand the ways in which dietary priorities differ in order to ameliorate diet related health disparities among sociodemographic groups.

### *Sociodemographic Contextual Constraints*

Sociodemographic groups are located in unique social contexts that constrain the choices available to them. As stated above, social context is comprised of the macro, meso, and micro level social factors described by Constrained Choice Theory like social policies, environmental and community factors, and life circumstances. For instance, those in lower income categories face financial contextual constraints when making food choices. Income category may be a result of an individual constraint that necessitates a job with a flexible schedule, a community-wide high unemployment level, or a national policy that establishes an insufficient minimum wage. Sociodemographic variation in income level results from the differing contextual constraints faced by different groups (Hoover and Yaya 2010), as do sociodemographic trends in food purchasing.

For example, lower income groups have been found to have less nutrition knowledge (Nayga 1997) and less access to healthy foods (Blaylock et al. 1999), and to prioritize cost and convenience when making food purchases (Glanz et al. 1998). Further, they are less likely to try new foods and to introduce new foods to their children for fear rejected food will result in wasted money (Daniel 2016). Higher income groups, on the other hand, demonstrate greater nutrition knowledge, even when controlling

for education, and also come closer to meeting dietary guidelines (McKinnon, Giskes and Turrell 2014). Those in higher income groups treat food as a source of pleasure, a marker of cultural capital in social settings, and aspire to teach their children to approach food with a sense of adventure (Daniel 2016). Though they report disliking throwing away foods their children reject, they see feeding their children a variety of foods as a worthwhile investment they can afford with their higher income (Daniel 2016).

Gender provides another example of differing dietary behavior by sociodemographic category. Women are more likely than men to conscientiously engage in healthy eating behaviors, and are also more likely to shop for, prepare, and cook food (Beardsworth et al. 2002, Glanz et al. 1998, Nayga 1997, Wardle et al. 2004), while men find nutrition less important, eat more unhealthy foods, and are less likely to follow nutrition guidelines (Beardsworth et al. 2002, Nayga 1997, Wardle et al. 2004). Men are more likely to consider cost, taste, and food quality when defining preferences, while women are more likely than men to consider weight concerns (Boek et al. 2012). Men and women have also been shown to define “unhealthy” differently (Boek et al. 2012). While both men and women defined unhealthy in terms of high fat content, men were more likely to consider sodium an indicator of an unhealthy food (Boek et al. 2012). Some of these differences likely have structural origins that result in constrained priorities. Women are more likely to be primary caregivers for children and to shop for the family (Bianchi et al. 2012, Lake et al. 2006) meaning they are responsible for thinking beyond their own health. Women are also more likely to face pressure to diet from a variety of sources (Bordo and Heywood 2003) making them more concerned with food intake. Men, therefore, may be less likely to worry how their food choices affect others, and may feel less cultural pressure to choose foods that support a certain body image.

Other sociodemographic variation has been identified by racial category. Non-whites have been found to have less nutrition knowledge (Nayga 1997), to have less access to healthy food (Blaylock et al. 1999), and to rate convenience, taste, nutrition, and cost as more influential in choosing what to eat than

whites (Glanz et al. 1998). Non-whites are also more likely to shop primarily at discount supermarkets, while whites are more likely to shop for food at high-end stores (Cannuscio et al. 2014), and different store types offer a different array of items for purchase.

Age is also related to disparate food choices. Young people have been found to most highly prioritize taste when making food choices (Boek et al. 2012, Hebden et al. 2015), as well as prioritizing convenience, cost, and nutrition (Hebden et al. 2015). Young people are also more likely to choose processed foods, while older people are more likely to choose both healthier foods in general, and vegetables in particular (Kahma et al. 2016). Individuals tend to become more concerned with healthy foods as they look to them to cope with age-related health conditions or illnesses in general (Verbeke 2005) which may constrain their shopping choices.

#### *Familial Contextual Constraints*

Additionally, family considerations play a role in diet. Marital status and having children have also been proven to correlate with differing food choices. Being married is correlated with a slightly higher BMI than never being married, but also with healthier eating, preferring less-processed foods, and less reliance on convenience (Mata, Frank and Hertwig 2015). Having young children may also impact food purchases. Parents' food choices for their children are often guided by children's preferences in taste and texture of their food, and weekday dinners are full of compromise and negotiation (Alm, Olsen and Honkanen 2015). Moreover, parents may reward children for trying healthy foods with unhealthy foods, reducing the overall healthfulness of the meal (Alm, Olsen and Honkanen 2015). Other research shows parents may feed their children fewer healthier foods and more unhealthy foods like high fat dairy, cereals, and potatoes in spite of prioritizing healthier eating for their children (Alderson and Ogden 1999).

#### *Weight-related Associations*

Food priorities may also be related to weight status. Focusing on financial concerns has been associated with obesity (Dressler and Smith 2013). Further, food insecurity, which typically results from

financial constraints, has been linked with obesity, especially among non-whites (Adams, Grummer-Strawn and Chavez 2003). Other research has shown food insecurity is not correlated with BMI, but participating in a food stamp program, another marker of financial constraint, is associated with increased likelihood of obesity (Webb et al. 2008).

Thus when budget is a constraint, obesity may be a diet related outcome. While several studies have examined the relationship between taste preferences or taste perception on obesity, results have been inconclusive (Donaldson et al. 2009, Mela 2006). Obese individuals have been found to have higher taste thresholds for bitter and sour tastes and lower taste thresholds for salt and sweet (Donaldson et al. 2009), yet other research has found that obesity is not associated with a preference for certain tastes, but rather with increased motivation for food consumption for other reasons (Mela 2006). More research is needed on the association between prioritizing taste preferences and obesity. Finally, a diet that prioritizes meeting healthy eating recommendations has been associated with a decreased risk of abdominal obesity (Tande, Magel and Strand 2010).

It is important to note that groups may share similar priorities or choose the same foods, but for different reasons. For example, women may find convenience more important than men since they are more often responsible for fitting food preparation for the family into their schedules (Lake et al. 2006, Schafer and Schafer 1989), while minorities who are less likely to have a grocery store near their home may prioritize convenience to limit travel (Morland, Wing and Roux 2002). Contextual factors like these indicate that different sociodemographic groups may make food choices that reflect their distinct social contexts.

While previous research has explored the importance of nutrition in different sociodemographic groups (Nayga 1997), this project will go beyond nutrition to examine the importance of other competing and constraining priorities in grocery shopping while focusing specifically on families with children. This paper will utilize the Constrained Choice Theory (CCT) (Bird and Rieker 2008) framework for the first

time to identify and interpret sociodemographic variation in food priorities like budget, taste, and health among families with children. The unique application of the CCT framework allows for an analysis of sociodemographic trends in food shopping priorities, which will provide direction for public health planners seeking to reduce incidence of diseases with a dietary component. Based on existing literature, it is hypothesized that disadvantaged sociodemographic groups will be more likely to choose priorities that reflect contextual constraints than other groups.

## DATA AND METHODS

### *Data*

Data were derived from a 2011 survey of parents and primary caregivers with children age 2-18 living in the home that was undertaken to understand work/family level food choices. The survey requested that the member of the household most responsible for grocery shopping and childcare complete the survey. The self-administered paper survey took approximately 20 minutes to complete and was distributed to churches, daycares, and children's organizations selected to represent socioeconomically diverse areas in Lexington, KY. Participants had the option of returning the survey by mail in a pre-paid envelope or returning the survey to a locked box at the location from which it was received. When the initial sample proved skewed toward high socioeconomic status respondents, additional respondents were recruited via sites utilized by low income groups such as government subsidized daycares and housing facilities. All respondents were offered their choice of either a check for \$15 or a \$15 donation to the location from which they received the survey. This resulted in a total of 405 respondents. The survey asked respondents to identify "three most important factors *you* consider when choosing food and drink items at the grocery store." Items of interest for this study pertaining to contextual constraints include choices for budget, taste, and nutritional value and are operationalized below. Sociodemographic information was also collected including income, sex, race, age, marital status,

number of children and BMI category. All research procedures and materials were approved by the university's Institutional Review Board (IRB).

### *Methods*

The dependent variables were a measure of parent's priorities when making food purchases. They were budget, taste, and health and were constructed as a series of three dichotomous variables. Each variable indicated whether or not the priority was chosen as among the respondent's top three shopping priorities. The lexicographic decision rule states that people look first to their primary priority when making a decision and rely on their secondary or tertiary priorities to distinguish between similar choices (Bettman 1979), therefore examining top three priorities likely encompasses the major factors shoppers consider when making choices.

One variable indicated whether each respondent chose the financial constraint-reflective priority of "food budget or cost." One variable accounted for constraints imposed by personal preference "food preferences and taste," and one variable combined the health priorities "general health" or "nutritional value and/or information on the food label" to represent constraints imposed by health priorities. The "general health" and "nutritional value and/or information on the food label" categories were combined because they are conceptually similar but correlation test revealed a low level of correlation. It was hypothesized that it may have been difficult for survey participants to distinguish between the two choices leading respondents to choose one or the other as representative of their health concerns when both were applicable.

Independent variables included income, sex, race, age, marital status, number of children, and BMI category<sup>1</sup>. Household income categories were less than \$5,000; \$5,001-\$10,000; \$10,001-\$15,000; \$15,001-\$20,000; \$20,001-\$25,000; \$25,001-\$35,000; \$35,001-\$45,000; \$45,001-\$60,000; \$60,001-

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<sup>1</sup> To address intersectionality, interaction terms were included for race and income, race and sex, race and weight category, and sex and weight category but were ultimately excluded when none proved significant in the regression models.

\$75,000; \$75,001-\$100,000; \$100,001-\$125,000; \$125,001-\$150,000; greater than \$150,000 and have been coded to the midpoint. Sex was a dummy variable coded as 1=female 0=male. Race was also a dummy variable with 1=white and 0=non-white. Age was a continuous variable. Marital status was coded as 1=married or cohabitating, 0= single, widowed or divorce based on the assumption that one who is married or cohabitating likely shares food choices with an adult partner. Number of children was a continuous variable. World Health Organization standards (WHO 2012) were used to define BMI categories which were then coded to two dummy variables: 1= BMI >25-30 (overweight) and 0=other, and 1=BMI >30 (obese) and 0=other, with underweight and normal BMI categories excluded as reference categories.

### *Analytic Plan*

Demographic data were reported after using listwise deletion to drop missing values on relevant variables resulting in an N of 341. Chi-squared analysis revealed few significant differences in the pattern of missing data with two exceptions: missing and non-missing data differed by race, and marital status such that non-whites were more likely to have missing data than whites and people who were married were more likely to have missing data than those who were non-married.

A series of stepwise logistic regressions were conducted using STATA 13 (StataCorp 2014) with a different food shopping priority (budget, taste, health) as the dependent variable for each. First, general demographics were considered for race, sex, age, and income category (Model 1). Next, family considerations were added to the model for marital status and number of children (Model 2). Finally, BMI category was included as well (Model 3).

Predicted probabilities are provided for significant results from full models. No problematic variance inflation factors were uncovered when models were tested for multicollinearity.

## RESULTS

### *Sociodemographic Characteristics*

The mean income was \$65,697 (see Table 2.1). The respondents were primarily female (83.58%). Racial breakdown was 58.94% white and 41.06% non-white, which included African American or Black, American Indian or Alaskan Native, Asian, Hispanic or Latino, and two or more races. The average age of respondents was 38.46 years old. Marital status revealed 37.83% of respondents were single, divorced, or separated and 62.17% are married or cohabitating. Most respondents had 1 or 2 children (0=4.69%; 1=46.63%; 2=36.66%, 3=9.38%; 4=1.76%; 5=0.59%; 6=0.29%). By BMI, 3.81% of respondents are underweight, 36.95% were normal weight, 25.51% were overweight, and 33.72% were obese. Food budget or cost was a top priority for 57.18% of respondents, 49.85% chose food preference or taste, and 66.57% chose general health and nutrition value and/or information on the food label.

### *Multivariate Models*

Table 2.2 displays the results from the three multivariate logistic regression models identifying the significant correlates of prioritizing budget. Specifically, increasing income reduces the likelihood of prioritizing budget across all models (Model 1  $p<0.01$ ; Model 2  $p<0.001$ ; Model 3  $p<0.01$ ). The addition of familial characteristic reveals further categorical differences; however, income remains a significant correlate of prioritizing budget. Being married more than doubles the odds of prioritizing budget in both Model 2 ( $p<0.05$ ) and in Model 3 ( $p<0.05$ ). Finally, when also considering weight category, being obese is positively correlated with prioritizing budget (0.05). The fully specified model (Model 3) is the best fit for the data overall. Predicted probabilities for the full model reveal a decrease in likelihood of prioritizing income when making food purchases by 14%. Being married is correlated with a predicted probability increase of 19% in prioritizing budget, while being obese is correlated with a 13% increase.

Income is also a factor in prioritizing taste (see Table 2.3), with higher incomes being associated with an increase in likelihood of prioritizing taste across all three multivariate models (Model 1  $<0.001$ ; Model 2  $p<0.05$ ; Model 3  $p<0.05$ ). Income is the only significant sociodemographic category associated

with prioritizing taste in the fully specified model. A one standard deviation increase in income is associated with an increase in the predicted probability of prioritizing taste of 9%.

Finally, when considering prioritizing health as a dependent variable (see Table 2.4), income is significant in the base sociodemographic model ( $p < 0.001$ ), but is no longer significant in the familial or weight category models. In Model 2, both marital status and number of children are significant. Marital status is positively correlated with prioritizing health ( $p < 0.05$ ), while number of children is negatively correlated with prioritizing health ( $p < 0.05$ ). Both being married/cohabitating ( $p < 0.01$ ) and number of children ( $p < 0.05$ ) remain significant in the same direction in the full model (Model 2), which is the overall best fit for the data. Being married or cohabitating results in an increase of predicted probability of prioritizing health of 21% compared to those who are single, widowed, or divorced, while a one unit change centered on the mean for number of children results in a decrease in the predicted probability of prioritizing health of 7% in the full model.

## DISCUSSION

Constrained Choice Theory asserts that contextual factors influence the decisions individuals make regarding their health and can make the healthiest choice problematic (Bird and Rieker 2008). Unlike Bird and Rieker's original model for CCT that focuses on gender differences in constraint, this research uniquely contributes to extant literature by also examining other sociodemographic categories, familial constraints, and weight category. This study concludes that income, marital status, number of children, and weight category all contribute to the context in which food purchasing decisions are made, but belonging to a racial minority group is not correlated with any effect.

First, having a higher income can reduce the likelihood of listing budget as among one's top three priorities, which is consistent with research documenting budget as more important to lower income groups when shopping for food (Glanz et al. 1998). This finding is also aligned with Daniel's (2016)

conclusion that income is a factor in whether parents can afford to expose their children to a variety of healthy foods. With greater income there is less concern about the cost of purchasing new foods that may be rejected by one's children and ultimately go to waste. It is also consistent with higher income individuals being more likely to shop at high-end grocers where food is often both higher quality and more expensive (Cannuscio et al. 2014). To remove budget as a primary consideration in food purchasing, individual income must increase, or the cost of quality food items must decrease. On CCT's work/family level, this might mean more lucrative employment for the adult(s) working to support the family, or a reallocation of family funds. On CCT's community or policy level, this could mean adjusting or implementing social policies that increase a worker's take home pay such as raising the minimum wage or decreasing the cost of major family expenses like healthcare coverage or childcare.

Being married, on the other hand, is associated with an increased likelihood of prioritizing budget when shopping for food. Though being married is associated with healthier eating (Mata, Frank and Hertwig 2015), it may also be associated with increased family expenses. Married couples may be more interested in devoting income to home ownership or planning for and rearing children, which could reduce the amount of money couples are willing to devote to food purchases. Preferring less processed foods and relying less often on convenience foods (Mata, Frank and Hertwig 2015) could also lead to spending more money at the grocery for fresh items requiring more careful budgeting to meet dietary preferences alongside other financial obligations.

Individuals classified as obese by BMI are more likely to prioritize budget than those in lower weight categories. This is consistent with research that finds higher BMI is associated with placing greater importance on budget (Dressler and Smith 2013). Food insecurity and reliance on government assistance programs have also been associated with obesity, indicating a link between a limited food budget and weight related health outcomes (Adams, Grummer-Strawn and Chavez 2003, Webb et al. 2008). It is important to note that the direction of the relationship between obesity and prioritizing budget

cannot definitively be established with cross-sectional data. Obesity is associated with prioritizing budget but may be an outcome rather than an antecedent. Regardless, obese individuals may benefit from public health interventions targeting financial considerations.

Further, as income increases, shoppers are more likely to list taste as a priority indicating that increased income provides the freedom to prioritize taste above other considerations. Other research has established a correlation between income and a preference for luxurious foods (Chu-Ping and Tashiro 2011), and high end grocers (Cannuscio et al. 2014). According to Chun-Ping and colleagues (2011), shoppers with higher incomes choose foods that come with a sense of extravagance, often foods that have been prepared by others so that shoppers are consuming the service of professional preparation as part of the food item. It follows that professionally prepared foods would taste better than food prepared by the average home cook.

Prioritizing taste, however, is not necessarily a barrier to good health. On the individual level, families can prepare meals with healthier cooking methods or use healthy substitutions that retain flavor and increase healthfulness. Many grocery stores provide free recipes for the shoppers in their communities, and a variety of websites related to healthy, flavorful cooking are free and available to those with internet access. Local community organizations like senior centers, recreation centers, or scout troops could also provide recipes or cooking classes that facilitate family friendly, healthy, tasty alternatives to poor food choices and can enable families to explore new taste profiles regardless of income.

Being married increased the likelihood that one would consider health when shopping for food, reinforcing marriage as a predictor of healthy eating (Mata, Frank and Hertwig 2015). Other research has shown that being married means that it is easier to come up with flexible time to prepare food between two individuals (Fan et al. 2015), which could explain why couples are better able to prioritize health. Sharing the burden of food selection and preparation with a partner can help to alleviate time constraints

if one partner is shopping or cooking while the other partner is at work or completes additional household tasks.

An increasing number of children in the family, on the other hand, reduces the likelihood of prioritizing health when shopping for food. This may be because having young children limits the time one has to devote to shopping for and preparing food, or because young children can be quite picky about what they are willing to eat (Daniel 2016, Maubach, Hoek and McCreanor 2009). Parents want to shop quickly, choose familiar foods and brands they know the family will eat and that they know fit into their budget (Maubach, Hoek and McCreanor 2009). Parents may also compromise often and be guided by children's preferences to entice children to eat regular meals (Alm, Olsen and Honkanen 2015, Daniel 2016), or may reward children by purchasing less healthy foods (Alderson and Ogden 1999). On the CCT work/family level, encouraging families to prioritize health could mean helping families find more time to shop for and prepare food, or promoting strategies for rearing more adventurous eaters. Having more flexible work schedules or sharing responsibilities with a partner could be work/family level changes that positively impact prioritizing health/nutrition. On the community and policy level, schools and daycares can incorporate more healthy choices rather than relying on less healthy childhood staples that children may later demand parents purchase for consumption at home.

It is important to note that income was not associated with prioritizing health with all covariates present and therefore does not present a constraint distinct from other factors. This finding suggests that those in lower income categories are just as likely to prioritize health as those in higher income categories. Because low income groups may be less knowledgeable about nutrition (Nayga 1997) and may have less access to healthy choices (Blaylock et al. 1999), those barriers may prove more significant than income in bringing home healthy foods. Further research is needed to explore the relationship between income and prioritizing health.

Overall, however, income is an important consideration in how constrained a family feels by budget and how able they are to choose foods based on pleasurable taste. While it does not prevent prioritizing health, it may constrain the healthy purchases one can make. Income, therefore, is an important factor in the food choices a family makes, and a critical point of intervention. Being married/cohabitating and having kids are also contexts in which constraints on food shopping become apparent with partners wanting to prioritize nutrition, but finding that more difficult with children in the household. These results also indicate a critical juncture at which food constraints should be addressed.

### *Limitations*

As with any empirical research, limitations should be noted. Generalizability is one limitation of the data as the sample is comprised of more women and non-whites than the county in which the sample was collected. However, the sample is consistent with the target population for the survey. The instructions requested that primary caregivers complete the survey. Women are more likely to be primary caregivers and take a greater role in both food preparation and child rearing (Bianchi et al. 2012, Lake et al. 2006). Future research should intentionally oversample males for greater representative power. The survey also intentionally oversampled non-whites in the area, lending greater explanatory power to the model for non-whites. Because of the sample size, it was impractical to use more specific categories than “non-white.” Future research should utilize a larger sample which could provide an opportunity for greater differentiation. Self-report is also a concern when collecting height and weight data to calculate BMI. Though individuals tend to under report their weight (Gorber et al. 2007), studies have shown self-report accurately reflects BMI category and is an effective proxy for clinical data (Bowring et al. 2012). Finally, the data reflect what respondents have in mind while shopping rather than assessing food purchases. Future research could strengthen the link between perceived constraint and nutrition outcome.

## CONCLUSION

Constrained Choice Theory states that contextual factors provide barriers to prioritizing health (Bird et al. 2010). This paper expanded the contribution of CCT to literature by investigating a greater number of sociodemographic categories as well as applying CCT to a new aspect of health. The results of this study confirm that some sociodemographic groups are more likely to choose priorities that reflect contextual constraints in their lives than others. Further, some groups are better able to choose priorities that reflect preferences or health interests based on their social context. Having a higher income removes the barrier that results in prioritizing budget and allows for prioritizing taste. In addition, being married or cohabitating is correlated with choosing health or nutrition, but having more children changes the social context so that one is less likely to prioritize health or nutrition.

Public health officials, including the United States Department of Agriculture's MyPlate campaign, encourage us to prepare food at home and regularly eat meals with our families as tools for better dietary health (USDA 2016, Wolfson and Bleich 2015). This strategy will only be successful with equal access to information about healthy food and equal opportunities to purchase and prepare it. Amid ongoing concerns about obesity and correlated conditions it is important to identify and remove barriers to healthy eating. Removing income as a barrier to prioritizing health is an important step in ameliorating the health of the population, as is providing support for families with children that would allow them the time or flexibility they need to make healthy choices for their families.

Table 2.1. Descriptive Statistics (N=359)

Demographic Characteristic	Percentage	Mean	Standard Deviation	Range
<b>Income</b>				
Less than \$5,000	8.80			
\$5,001-\$10,000	4.99			
\$10,001-\$15,000	3.23			
\$15,001-\$20,000	2.93			
\$20,001-\$25,000	4.99			
\$25,001-\$35,000	7.04			
\$35,001-\$45,000	8.21			
\$45,001-\$60,000	6.45			
\$60,001-\$75,000	10.85			
\$75,001-\$100,000	18.77			
\$100,001-\$125,000	12.02			
\$125,001-\$150,000	6.45			
Greater than \$150,00	5.28			
<b>Gender</b>				
Female	83.58			
Male	16.42			
<b>Race</b>				
White	58.94			
Non-White	41.06			
Respondent Age		38.46	9.54	19-66
<b>Marital Status</b>				
Single, Divorced, Separated, Widowed	37.83			
Married or Cohabiting	62.17			
Number of Children		1.60	0.87	0-6
<b>BMI Category</b>				
Underweight*	3.81			
Normal*	36.95			
Overweight	25.51			
Obese	33.72			
<b>Choose as Top 3 Priority</b>				
Food Budget or Cost	57.18			
Food Preference or Taste	49.85			
General Health/Nutrition	66.57			

\*Omitted Category

Note: Percentages may not total 100 due to rounding.

Table 2.2. Logistic Regression of Prioritizing Budget by Sociodemographic, Family, and Weight Characteristics N=341<sup>+</sup>

	Model 1	Model 2	Model 3
Income	0.99 (0.99-1.00)**	0.99 (0.98-0.99)***	0.99 (0.98-1.00)**
Female	0.66 (0.36-1.23)	0.63 (0.34-1.17)	0.66 (0.35-1.24)
White	1.49 (0.92-2.39)	1.34 (0.23-0.83)	1.47 (0.90-2.42)
Age	1.01 (0.98-1.03)	1.01 (0.98-1.03)	1.01 (0.98-1.03)
Married/Cohabiting		2.29 (1.14-4.57)*	2.14 (1.07-4.30)*
Number Children		0.97 (0.75-1.25)	0.96 (0.74-1.25)
Overweight			1.56 (0.89-2.74)
Obese			1.74 (1.01-2.99)*
LR Chi <sup>2</sup>	9.11	14.81*	19.43*
Pseudo R <sup>2</sup>	0.02	0.03	0.04

<sup>+</sup>Odds Ratios Presented  
 95% Confidence Interval in Parenthesis  
 \* p<0.05  
 \*\*p<0.01  
 \*\*\*p<0.001

Table 2.3. Logistic Regression of Prioritizing Taste by Sociodemographic, Family, and Weight Characteristics N=341<sup>+</sup>

	Model 1	Model 2	Model 3
Income	1.01 (1.00-1.01)***	1.01 (1.00-1.01)*	1.01 (1.00-1.02)*
Female	1.04 (0.56-1.93)	1.03 (0.56-1.91)	1.00 (0.54-1.87)
White	1.51 (0.94-2.44)	1.48 (0.91-2.40)	1.42 (0.87-2.32)
Age	1.02 (0.99-1.05)	1.02 (0.99-1.05)	1.02 (1.00-1.05)
Married/Cohabiting		1.19 (0.61-2.33)	1.23 (0.63-2.42)
Number Children		1.00 (0.77-1.31)	1.01 (0.77-1.31)
Overweight			0.80 (0.45-1.41)
Obese			0.77 (0.44-1.33)
LR Chi <sup>2</sup>	31.56***	31.83***	32.91***
Pseudo R <sup>2</sup>	0.07	0.07	0.07

<sup>+</sup>Odds Ratios Presented  
 95% Confidence Interval in Parenthesis  
 \* p<0.05  
 \*\*p<0.01  
 \*\*\*p<0.001

Table 2.4. Logistic Regression of Prioritizing Health/Nutrition by Sociodemographic, Family, and Weight Characteristics N=341<sup>+</sup>

	Model 1	Model 2	Model 3
Income	1.01 (1.01-0.00)**	1.00 (1.00-1.01)	1.00 (0.99-1.01)
Female	1.25 (0.66-2.36)	1.25 (0.65-2.37)	1.20 (0.63-2.30)
White	1.18 (0.72-1.94)	1.06 (0.64-1.77)	1.01 (0.60-1.69)
Age	0.99 (0.96-1.01)	0.98 (0.96-1.01)	0.99 (0.96-1.01)
Married/Cohabiting		2.45 (1.21-4.97)*	2.59 (1.27-5.30)**
Number Children		0.74 (0.56-0.97)*	0.74 (0.56-0.98)*
Overweight			0.72 (0.39-1.32)
Obese			0.68 (0.39-2.21)
LR Chi <sup>2</sup>	15.21**	24.42***	26.40***
Pseudo r <sup>2</sup>	0.04	0.06	0.06

<sup>+</sup>Odds Ratios Presented  
95% Confidence Interval in Parenthesis  
\* p<0.05  
\*\*p<0.01  
\*\*\*p<0.001

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## Chapter 3

### Social Networks and Constrained Choices in Food Provisioning

Mounting evidence of the deleterious health effects of poor diet, obesity, and correlated conditions highlight the need to understand how social factors influence food choices. The scope of the problem lends urgency to the issue with more than one-third of U.S. adults and 17% of youth classified as obese (Flegal et al. 2016, Ogden et al. 2014). Using a Constrained Choice Theory framework (Bird and Rieker 2008), this study will investigate the prevalence of shared food provisioning priorities among partners, family members, and friends. Specifically, this study will address grocery purchasing constraints, personal preferences, and health priorities within social networks. Unlike prior research that measures health behaviors or categories of food consumed within social networks (Pachucki, Jacques and Christakis 2011), this paper will address grocery shopping priority congruence within social networks and investigate how deeply within networks priorities are shared. Food priority congruence within networks would reinforce a need for network level dietary intervention, like changing the food culture within a school or workplace, rather than individual programming.

## BACKGROUND

### *Constrained Choice Theory*

Bird and Rieker describe contextual factors that influence choices about health behaviors as “constraints” (Bird and Rieker 2008). In Constrained Choice Theory (CCT), three overlapping levels of constraint—social policy, community, and work/family—may interfere with making choices consistent with good health (Bird and Rieker 2008). Examples of constraints on social policy level are agricultural subsidies that encourage certain crops, which impact what is available in the grocery store, as well as food stamp eligibility regulations. On the community level, zoning laws that allow space for farmers’ markets or neighborhoods that lack grocery stores are examples of how aspects of one’s community may present constraints on health decisions. Finally, on the work/family level, individuals are constrained by the schedules they work, the division of labor within their own households, and the social norms that are reinforced by their colleagues and family members in everyday interactions. These colleagues and family

members are part of an individual's social network and can influence an individual's behavior. Bird and Rieker focus CCT on both identifying constraints and understanding how the impact of those constraints differ by gender (Bird and Rieker 2008).

Unlike previous theories of action that focus only on the choice as rational (Homans 1961) or locate the choice within a belief system (Boudon 2003), CCT takes the social context of the decision into account, providing a richer tool for analyzing health behavior choices. A relatively new theory, CCT has been applied to a limited number of empirical cases. The only known relevant study used CCT to examine gender differences in consuming fast food and engaging in physical activity as a function of differing work/family level constraints between men and women (Fan et al. 2015). This study found that the dominant constraint in making healthy choices for both men and women was lack of flexibility in work schedules, and those with more flexibility were able to prioritize healthy eating and physical fitness (Fan et al. 2015).

While Bird and Rieker focused primarily on gendered differences in constraints as in the study described above, this project will extend the theoretical paradigm by investigating broader patterns of constraint that intersect the work/family and community levels. This novel approach will explore constraint ubiquity within networks, and also address other priorities like personal preferences and health.

### *Food and Health*

Many of the primary health concerns of Americans, including obesity, have been directly connected to diet, yet a healthy diet proves elusive to many. Often, dietary advice from professionals includes eating more meals at home where one has more control over the foods and portions they choose (USDA 2016, Wolfson and Bleich 2015). Trying to eat well does not necessarily result in meeting dietary guidelines (Blaylock et al. 1999, Powell-Wiley et al. 2014) however, and limited time and budget have been shown to be significant constraints on food choice (Bava, Jaeger and Park 2008, Caraher et al. 1998, Shepherd et al. 1996). Cultural norms related to eating at home as well as in restaurants may mask the

necessity of changing one's diet and may make implementing changes quite difficult. A better understanding of food priorities within social networks may help remove barriers to healthy eating.

### *Social Networks and Health*

A respondent's social network is located along the boundary of Constrained Choice Theory's work/family constraints and community constraints (Bird and Rieker 2008). In essence, the home, the workplace, and the people in them make up an important part of the food environment. According to CCT, each of those settings as well as the friends and family members that populate these areas have an impact on a person's health (Bird and Rieker 2008).

An egocentric social network consists of a central person (ego) and the people to whom he or she is connected. The people associated with the central person's connections are also a part of the network and have been shown to influence the ego (Christakis and Fowler 2009). Research has shown that an individual's social network influences health in a variety of ways including health behaviors and health outcomes (Christakis and Fowler 2013, House 2002, Langlie 1977, Link and Phelan 1995, Pescosolido 1992, Umberson and Montez 2010).

Individuals often choose people like themselves as members of their social networks (McPherson, Smith-Lovin and Cook 2001). McPherson and colleagues homophily principle states that an individual's social network tends to be homogenous on a number of important dimensions including "sociodemographic, behavioral, and intrapersonal characteristics" (2001). It follows that individuals within a social network who already share many characteristics would also hold similar beliefs about eating. Moreover, network members are likely to be sociodemographically similar, and therefore face some of the same barriers choosing a healthy diet. Research has shown that close family and friends may monitor one another's health habits and reinforce positive behaviors (Umberson and Montez 2010), but also that when those individuals engage in negative behaviors, those behaviors can become normalized as well (Christakis and Fowler 2009). For example, Christakis and Fowler note that when one person in a

network quits smoking, the people who are close to that individual are more likely to do so as well (Christakis and Fowler 2009). However, if an individual becomes obese, others in the network are also likely to become obese (Christakis and Fowler 2009). Other research has shown that with whom one eats influences what one chooses to eat and how much one chooses to eat as individuals adjust their eating behavior to match their companions (Clendenen, Herman and Polivy 1994, Vartanian, Herman and Wansink 2008). Individuals who eat in the company of others have been found to eat more than those dining alone, and are also more likely to include dessert with their meal (Clendenen, Herman and Polivy 1994). In addition, the amount one chooses to eat has been shown to be strongly influenced by the eating behavior of those with whom they are eating, with individuals largely unaware of that influence (Vartanian, Herman and Wansink 2008). Other research has shown strong concordance among the types of food chosen by spouses, friends, and siblings, with particularly similar food choices between spouses in particular, and across all relationships for “alcohol and snack” foods that are often consumed in the company of others (Pachucki, Jacques and Christakis 2011). Network influences, therefore, are clearly an important part of the context in which one makes food decisions. They represent opportunities for positive behavior change, but also challenges for changing normative behaviors.

This study will examine whether participants perceive their partners, other adult family members, and friends as having priorities that reflect similar contextual constraints, personal preferences, and health priorities when shopping for food. The research above suggests that there is behavioral consistency between individuals and members of their network, and that engaging in behavior consistent with others is part of network membership. This study will investigate whether there is network congruence in food shopping priorities and, if so, how far that congruence extends among intimate partners, other adult family members, and friends. If network agreement is present, individual dietary intervention should be reconsidered as the standard for improving health. Instead, network level interventions that challenge social norms should be considered as a more targeted alternative.

This study will address the following question: do respondents perceive those in their social network as having priorities that reflect the same contextual constraints, personal preferences, or health priorities? Network agreement will be examined first among intimate partners, then among other adult family members, and finally, among friends. Based on the literature above, it is hypothesized that respondents will perceive that their partners', family members', and friends' priorities reflect similar contextual constraints, personal preferences and health priorities.

## DATA AND METHODS

### *Data*

In the spring of 2011 Lexington, Kentucky families with children were recruited to participate in an IRB approved study which was designed in part to understand constraints parents face when shopping for food for their families. The study collected information regarding the respondents' priorities when shopping for food, as well as asked for respondent's to rate their partner's, family members' and friends' priorities.

This 20-minute paper survey was distributed via churches, daycares, and children's organizations in socioeconomically diverse neighborhoods. Participants were offered either a check for \$15, or a \$15 donation was made to the organization where the survey was distributed if the completed survey was returned via mail or to a locked box. Initially, a larger number of high socioeconomic status respondents than desirable returned the survey. To remedy this, additional respondents were recruited from low income areas. This resulted in 410 total responses, of which 257 completed the full survey including reporting data on their partners, 237 on other adult family members, and 264 on their friends. Note that this portion of the survey could only be completed by those with a partner, those with other adult family members, and those who identified as having familiarity with friends' food priorities, reducing the total number of respondents to a subset of the overall population.

## *Methods*

The dependent variables central to this analysis were respondent ranking of food priority. For each regression the dependent variables were how the respondent rated each contextual constraint, personal preference, or health priority. The dependent variables representing contextual constraints were “food budget or cost” and “convenience of storing and preparing food.” The personal preference variable was “food preferences or taste,” and the health variables were “nutritional value and/or information on the food label,” and “general health.” Respondents rated each item as 1-5 on a Likert scale with 1 as not very important and 5 as very important.

The primary independent variables of interest were respondent’s perception of his/her partner’s, other adult family members’ (parents, adult siblings, etc) and friends’ food provisioning priorities. Matching independent variables were created with the respondent’s perception of the rating his/her partner, other adult family members, or friends would give for each item using the same 1-5 likert scale.

Other independent variables were sex, race, income, marital status, BMI category, and age. Sex was coded as a binary variable with female=1, male=0. Race was also binary with 1=white, 0=non-white. Income categories were less than \$5,000; \$5,001-\$10,000; \$10,001-\$15,000; \$15,001-\$20,000; \$20,001-\$25,000; \$25,001-\$35,000; \$35,001-\$45,000; \$45,001-\$60,000; \$60,001-\$75,000; \$75,001-\$100,000; \$100,001-\$125,000; \$125,001-\$150,000; greater than \$150,000 and were coded to the midpoint. Marital status was coded by grouping those likely to share daily food decisions with a partner and those likely to make daily food decisions alone with 1=married/cohabitating, 0=widowed, single/never married, divorced, or separated. Finally, age was operationalized as a continuous variable. Summary statistics are provided in Table 1 for all variables.

## *Analytic Plan*

STATA 13 (StataCorp 2014) was used to conduct all analyses. After examining descriptive statistics and bivariate analysis, a series of fifteen ordinal logistic regressions were conducted assessing

the correlation between the five respondent food priority variables and partner, family, or friend food priority. Models were examined for problematic variance inflation factors, but no multicollinearity was discovered.

Demographic data (Table 3.1) were reported after using listwise deletion to exclude respondents with missing data on key variables. Sample size is unique for those who reported data on each network level (partners, family members, and friends) such that if a respondent did not have a partner s/he could still be included in the other analyses. Analysis of variance reveals that in Model 1, missing and non-missing data varies by race, income, and marital status, such that those who identify their race as non-white, those whose income is below \$35,000 and the non-married were more likely to have missing data. In Model 2, missing data varies by marital status with non-married respondents being more likely to have missing data, and in Model 3 missing data varies by sex, race, and marital status, such that men, those who identify as non-white, and the non-married are more likely to have missing data. Together, these findings suggest that further research may be needed to confirm the estimate of the concordance of individual priorities within social networks among men, non-whites, and those who are not married.

## RESULTS

### *Sociodemographic Characteristics*

The sample is primarily female (Model 1 82.88%, Model 2 86.08%, Model 3 87.5%) and primarily white (Model 1 66.93%, Model 2 59.54%, and Model 3 62.50%). The mean income was \$79,533 in Model 1, \$66,476 in Model 2, and \$71,108 in Model 3. Across all models, most individuals were married or cohabitating (Model 1 82.49%, Model 2 70.46%, Model 3 70.45%) and overweight or obese (Model 1 56.81%, Model 2 61.60%, Model 3 58.33%). The average respondent age was late 30s (Model 1 38.26 years, Model 2 37.88 years, and Model 3 37.95 years). The percentage of respondents who ranked food budget or cost, food preference or taste, convenience of storing/preparing food, general

health, or nutrition value/information on food label as important is provided in Table 3.1, as are results for their perception of their partners', family's and friends' priorities.

### *Multivariate Models*

Tables 3.2-3.4 present the results of the ordinal logistic regressions for partner, family, and friend priorities, while Table 3.5 presents predicted probabilities for all three primary independent variables of interest. Table 3.2 presents the results of the ordinal logistic regressions assessing the relationship between respondent and partner priorities when shopping for food. Each model indicates a positive correlation between respondent priority and partner priority. Priorities were scored on a Likert scale of 1-5 with 1 being least important priority and 5 being most important priority. Model 1 addresses prioritizing budget. On average, the odds of being in a higher category of prioritizing budget increase by a factor of 3.38 for each one unit increase in respondent prioritizing budget ( $p < 0.001$ ). For each partner who is rated a 5 on budget, there is a 59.31% predicted probability that the respondent also rated budget a 5. Regarding convenience (Model 2), the average odds of being in a higher category for each one unit increase in partner priority increase by a factor of 4.61 ( $p < 0.001$ ). If the partner rated convenience a 5 for most important, there is a 67.41% predicted probability that the respondent did likewise. The average odds of being in a higher category for prioritizing taste are 5.10 times higher, all else constant, in Model 3 ( $p < 0.001$ ). When partners are rated a 5 on taste, there is a 74.57% predicted probability that the respondent is also rated a 5. In Model 4, the odds of being in a higher category for prioritizing nutrition increase by an average factor of 2.53 ( $p < 0.001$ ) indicating a predicted probability of 69.17% that partner and respondent both indicated nutrition was most important, while in Model 5 the average odds for being in a higher category for general health are 4.38 times higher ( $p < 0.001$ ), all else constant, which indicates a predicted probability of 83.18% that partner and respondent match.

The results of the ordinal logistic regressions regarding the relationship between respondent priorities and the priorities of other adult family members are presented in Table 3.3. All family priorities are positively correlated with respondent priorities. In Model 1, the odds of being in a higher category for prioritizing budget increase by a factor of 2.31 for each one unit increase in respondent prioritizing budget, all else equal ( $p < 0.001$ ). If family ranks budget as a 5, there is a 58.70% predicted probability that the respondent also ranked budget as a 5. In Model 2, the odds that a family member would be in a higher category of prioritizing taste increased by a factor of 3.25, on average, all else constant ( $p < 0.001$ ). Predicted probability reveals that if family is ranked a 5 on taste, respondent has a 64.10% chance of a matching rank. The odds of prioritizing taste are an average of 4.56 times higher for each one unit increase in respondent prioritizing taste (Model 3,  $p < 0.001$ ), which represents a 77.88% predicted probability that family and respondent rating for taste are both “very important.” Family members were an average of 2.57 ( $p < 0.001$ ), times more likely to be in a higher category of prioritizing nutrition and a higher category of prioritizing general health by an average factor of 4.37 ( $p < 0.001$ ) for each one unit increase in respondent priority (Models 4 and 5, respectively). A match between family and respondent for ranking nutrition as most important is 69.89% likely, which for general health a match is 85.89% likely.

Finally, Table 3.4 displays the results of the ordinal logistic regressions comparing respondent priorities with friend’s priorities. Once again, all priorities are positively correlated. The odds that a friend is in a higher category of prioritizing budget increase by an average factor of 1.88, all else equal, as respondent category increases one unit (Model 1,  $p < 0.001$ ). If friends are ranked a 5 on prioritizing budget, there is a predicted probability of 51.49% that the respondent also ranked budget as a 5. The odds of being in a higher category of prioritizing convenience (Model 2) increase by an average factor of 2.63 for each increase in respondent prioritizing convenience ( $p < 0.001$ ) with a 56.89% predicted probability that both friends and the respondent ranked convenience as “very important” with a score of 5. In Model

3, the odds of being in a higher category on prioritizing taste are an average of 4.10 times higher for each one unit increase in respondent prioritizing taste, all else constant ( $p < 0.001$ ). If friends are ranked 5 on taste, there is a 77.52% predicted probability that the respondent also ranked taste as a 5. In Models 4 and 5, respectively, the average odds of being in a higher category for nutrition increase by 2.69 ( $p < 0.001$ ), and for general health increase by 3.86 ( $p < 0.001$ ). If friends were ranked 5 on nutrition, there is a predicted probability of 71.87% that the respondent also ranked nutrition a 5. For general health, there is an 85% predicted probability that friends and respondents both ranked 5 for “very important.”

## DISCUSSION

Constrained Choice Theory states that the decisions people make about their health are influenced by contextual factors in their lives (Bird and Rieker 2008). The people with whom one associates are an integral part of the context in which decisions are made and are part of CCT’s community level and work/family level influences. Consequently, it is important to understand how the individuals with whom one interacts contribute to the context in which decisions are made about food. Given frequent advice to improve one’s diet by eating more meals at home (USDA 2016, Wolfson and Bleich 2015), understanding the reasons people choose items at the grocery store can play a crucial role in promoting effective dietary change. This study concludes that respondents and their partners, family, and friends display correlated priorities when shopping for food. They are likely to rank budget, taste, convenience, nutrition, and health as similarly important, indicating that an individual’s grocery choices are situated in a social network context in which those choices are largely reinforced.

First, respondents and their partners share similar beliefs about the importance of budget, taste, convenience, nutrition, and health when shopping for food. A partner is the person one is most likely to share food with within the home, and it follows that priorities would either begin as similar or adjust over time to accommodate one another’s preferences. These findings are consistent with previous research that

found spousal connections are the most likely to eat the same types of foods (Pachucki, Jacques and Christakis 2011) but in addition take into account why those foods are chosen—a commitment to shared food priorities. Interestingly, predicted probabilities reveal that respondents are more likely to feel that partners agree that general health is very important than agree that budget or convenience is very important, though the majority agree across those categories as well. Because the sample is heavily female and because women are more likely to have food preparation responsibilities (Bianchi et al. 2012, Lake et al. 2006), they may be more likely to feel that those items are not as important to their partner and they are more relevant to them personally. These findings suggest that dietary interventions may be more effective for couples than on the individual level if they address points of contention like budget and convenience, and reinforce strongly shared priorities like general health.

Respondents and their other adult family members are also likely to agree across all priority categories. Respondents may have originally learned food norms from other adult family members like parents and grandparents, and their preferences may have evolved alongside siblings who are now adults as well. These findings are consistent with Pachucki and colleagues' conclusions that siblings likely eat foods from the same categories as adults (2011). Further, respondents are more likely to report that family members agree that taste, a personal preference, is “very important” than to report budget as very important. Respondents may be more familiar with what other adult family members like to eat than with their adult family's financial situations. These findings also reflect the important role family members play in helping to establish food preference for taste as has been reported in other recent research (Daniel 2016). In addition, respondents are more likely to report that other adult family members agree that general health is very important than that budget, convenience, or nutrition are very important. These results may also reflect the role families play in defining what constitutes a “healthy” meal, which is an idea respondents could carry throughout life. Health interventions targeted at the family level could,

therefore, focus on expanding taste profiles, or teaching recipes that reflect family taste preferences in healthier preparations.

Finally, concordance was also established between respondent and friend priorities for budget, taste, convenience, nutrition, and health. While we are not able to choose our families, we are able to be more selective when choosing our friends. Agreement among respondents and friends could be a result of homophily (McPherson, Smith-Lovin and Cook 2001) related to a variety of characteristics, including food preferences. Predicted probabilities reveal that respondents are more likely to report their friends agree that taste, nutrition, and health are “very important” than to report friends agree that budget is “very important.” As mentioned above in regard to family, respondents may be less familiar with the details of a friend’s financial situation than less taboo topics like taste preference and ideas about health. Likewise, respondents are also more likely to report that friends agree taste and health are “very important” than convenience is “very important,” perhaps because they rarely witness friends preparing meals. Because of the continued correlation of shared priorities, dietary interventions that target social networks out to the level of friends continue to be justified and may offer benefits beyond individual level interventions.

### *Limitations*

This study has several limitations. The sample population for this study differs from the general population of Lexington, KY s reported in the U.S. Census by sex, race, and weight category which may impact the generalizability of the results (United States 2014). The sample over represents women, however this is likely a result of the survey’s request that primary caregivers complete the survey. Women are more likely to be primary caregivers than men and are more likely to do food shopping for the family (Bianchi et al. 2012, Lake et al. 2006). Non-whites were intentionally over-sampled to provide greater explanatory power in the models for non-whites. Respondents who are non-white, non-married,

and have an income less than \$35,000 were more likely to present missing data in some models. Future research could focus specifically on those populations to determine if patterns hold.

Because network membership often involves individuals who are alike in a variety of ways, and because many distinct cultural or religious groups have unique food traditions and dietary norms, future research should consider collecting data related to participant religion or cultural identity. This information could provide enhanced context for dietary choices.

Finally, data about partner, family, and friend priority were based on respondent perceptions rather than collected directly from partners, family members, and friends. Respondents are only able to speak to the priorities of others to the best of their knowledge and may not have fully discussed these issues with their partners, family members, or friends. For the purposes of this study, it is more important how respondents perceive the behavior of their network members than how those individuals actually behave, however, future studies should consider collecting data directly from these sources as well.

## CONCLUSION

Constrained Choice Theory states that individuals experience barriers to making the best choices for their health (Bird and Rieker 2008). Egocentric social networks encompassing partners, family members, and friends exist on both the community level and work/family level of CCT and consequently represent potential constraints on health choices. (Bird and Rieker 2008). This research extends the contributions of CCT literature by investigating a new area of health behavior, grocery shopping, and examining priorities that may constrain healthy choices such as budget, convenience, and taste preference, as well as constraints that may reinforce healthy choices like prioritizing nutrition and health. Further, this study focused on three levels of social network connection: partners, family, and friends. Social network membership is an important part of the context in which grocery shopping decisions are made and can serve to establish and reinforce food norms.

The results of this study confirm that there is a correlation between respondent food priorities when shopping for food and partner, family, and friend priorities. The relationships were correlated across budget, taste, convenience, nutrition and health. Correlation between respondent and partner were stronger for rating an item as “very important” than other relationships for budget and convenience, while correlation between respondent and family were notable for taste, and health, and friends were notable for nutrition. Though the relationships were highly significant between partner and friend priority as well, the probability that respondent and friend both rated an item as “very important” was lower than for partner or family.

Dietary advice from popular sources encourages us to prepare food at home rather than dining out (USDA 2016, Wolfson and Bleich 2015). This study makes a crucial contribution to understanding why individuals bring home the foods they choose and especially how those decisions are connected to network norms about food choice. In light of these findings, future policy targeting healthy eating should consider interventions on the community or family level rather than the individual level for maximum efficacy. These solutions may include healthy eating programs through community centers, churches, or school organizations rather than individual dietary consultations to improve the health of the community more generally.

Table 3.1. Descriptive Statistics

	Model 1 Partner (N=257)	Model 2 Other Adult Family (N=237)	Model 3 Friend Model (N=264)
<b>Gender</b>			
Female	82.88	86.08	87.50
Male*	17.12	13.92	12.50
<b>Race</b>			
White	66.93	59.49	62.50
Non-White*	33.07	40.51	37.50
<b>Income</b>			
Less than \$5,000	5.45	7.59	6.82
\$5,001-\$10,000	2.33	4.64	4.17
\$10,001-\$15,000	1.95	3.38	3.03
\$15,001-\$20,000	2.72	2.53	3.03
\$20,001-\$25,000	2.23	3.38	3.41
\$25,001-\$35,000	4.28	6.33	6.44
\$35,001-\$45,000	5.45	7.59	7.20
\$45,001-\$60,000	7.00	7.59	7.20
\$60,001-\$75,000	11.28	10.55	10.61
\$75,001-\$100,000	24.15	20.25	20.83
\$100,001-\$125,000	17.12	13.50	13.64
\$125,001-\$150,000	7.78	7.59	7.95
Greater than \$150,00	7.78	5.06	5.68
<b>Marital Status</b>			
Single, Divorced, Separated, Widowed*	17.51	29.54	29.55
Married or Cohabiting	82.49	70.46	70.45
<b>BMI Category</b>			
Underweight/Normal*	43.19	38.40	41.67
Overweight/Obese	56.81	61.60	58.33
<b>Age</b>			
Mean, SD, Range	38.26, 8.88, 19-66	37.88, 9.59, 19-66	37.95, 9.47, 19-66
<b>Choose as Important</b>			
Food Budget or Cost	64.20	66.24	65.91
Convenience Store/Prepare	56.81	62.03	59.09
Food Preference or Taste	87.16	86.08	85.98
Nutrition Value/Food Label	78.21	75.11	76.14
General Health	87.55	87.34	88.64
<b>Partner Choose as Important</b>			
Food Budget or Cost	58.75	-	-
Convenience Store/Prepare	52.14	-	-
Food Preference or Taste	84.82	-	-
Nutrition Value/Food Label	56.81	-	-
General Health	71.98	-	-
<b>Family Choose as Important</b>			
Food Budget or Cost	-	58.65	-
Convenience Store/Prepare	-	53.16	-

Food Preference or Taste	-	79.75	-
Nutrition Value/Food Label	-	48.52	-
General Health	-	67.51	-
Friends Choose as Important			
Food Budget or Cost	-	-	54.17
Convenience Store/Prepare	-	-	53.03
Food Preference or Taste	-	-	75.00
Nutrition Value/Food Label	-	-	46.59
General Health	-	-	64.02

\*Omitted Category

Table 3.2. Ordinal Logistic Regression Comparing Respondent Priorities with Perceived Partner Priorities <sup>+, \*\*</sup>  
(N=257)

	Contextual Constraints		Preference	Health Priorities	
	Model 1 Budget	Model 2 Convenience	Model 3 Taste	Model 4 Nutrition	Model 5 Gen. Health
Partner Priority	3.38*** (2.58-4.42)	4.61*** (3.49-6.08)	5.10*** (3.54-7.35)	2.53*** (1.98-3.23)	4.38*** (3.16-6.06)
Female	1.20 (0.63-2.31)	1.61 (0.85-3.05)	1.07 (0.53-2.15)	1.38 (0.69-2.75)	1.99 (0.97-4.07)
White	0.81 (0.46-1.43)	0.73 (0.42-1.29)	0.65 (0.35-1.18)	0.63 (0.35-1.13)	0.39** (0.20-0.77)
Income	0.99*** (0.98-0.99)	0.99* (0.98-1.00)	1.00 (1.00-1.01)	1.00 (0.99-1.01)	0.99 (0.98-1.00)
Overweight/Obese	1.35 (0.83-2.21)	1.28 (0.79-2.09)	1.19 (0.71-2.00)	0.64 (0.39-1.06)	0.47* (0.26-0.84)
Married/ Co-habiting	0.87 (0.36-2.13)	2.23 (0.97-5.14)	0.66 (0.28-1.57)	1.08 (0.45-2.58)	2.41 (0.90-6.42)
Age	1.02 (0.99-1.05)	1.00 (0.97-1.03)	1.03 (0.99-1.06)	1.00 (0.97-1.03)	1.00 0.97-1.04
LR chi <sup>2</sup>	155.10***	167.53***	98.21***	74.85***	130.04***
Pseudo r <sup>2</sup>	0.22	0.22	0.18	0.12	0.24

+Odds ratios presented, \*\* 95% Confidence Interval in Parentheses

\*p<0.05

\*\*p<0.01

\*\*\*p<0.001

Table 3.3. Ordinal Logistic Regression Comparing Respondent Priorities with Perceived Other Adult Family Member Priorities <sup>+,\*\*</sup> (N=237)

	Contextual Constraints		Preference	Health Priorities	
	Model 1 Budget	Model 2 Convenience	Model 3 Taste	Model 4 Nutrition	Model 5 Gen. Health
Family Priority	2.31*** (1.83-2.91)	3.25*** (2.51-4.22)	4.56*** (3.23-6.34)	2.57*** (1.10-3.31)	4.37*** (3.14-6.08)
Female	0.69 (0.32-1.47)	1.11 (0.54-2.27)	1.50 (0.66-3.43)	0.81 (0.37-1.77)	1.13 (0.13-2.64)
White	0.87 (0.50-1.52)	0.79 (0.46-1.37)	0.43** (0.23-0.79)	0.53* (0.30-0.93)	0.34** (0.18-0.66)
Income	0.98*** (0.97-0.99)	0.99* (0.98-1.00)	1.00 (0.99-1.01)	1.00 (0.99-1.01)	1.00 (0.99-1.00)
Overweight/Obese	1.61 (0.97-2.66)	1.34 (0.81-2.23)	0.96 (0.55-1.67)	0.58* (0.34-0.99)	0.50* (0.27-0.92)
Married/ Co-habiting	1.16 (0.53-2.52)	1.34 (0.62-2.87)	0.91 (0.40-2.05)	1.27 (0.59-2.75)	1.83 (0.74-4.49)
Age	1.03* (1.00-1.01)	1.01 (0.99-1.05)	1.01 (0.98-1.05)	1.00 (0.97-1.02)	1.01 (0.98-1.04)
LR chi <sup>2</sup>	99.66***	107.76***	107.72***	70.10***	118.64***
Pseudo r <sup>2</sup>	0.15	0.15	0.20	0.12	0.24

+Odds ratios presented, \*\* 95% Confidence Interval in Parentheses

\*p<0.05

\*\*p<0.01

\*\*\*p<0.001

Table 3.4. Ordinal Logistic Regression Comparing Respondent Priorities with Perceived Friend Priorities<sup>+,\*\*</sup> (N=264)

	Contextual Constraints		Preference	Health Priorities	
	Model 1 Budget	Model 2 Convenience	Model 3 Taste	Model 4 Nutrition	Model 5 Gen. Health
Friend Priority	1.88*** (1.49-2.38)	2.63*** (2.06-3.35)	4.10*** (3.03-5.55)	2.69*** (2.05-3.53)	3.86*** (2.83-5.26)
Female	0.69 (0.32-1.46)	0.66 (0.32-1.34)	1.73 (0.81-3.68)	1.08 (0.52-2.27)	2.21 (0.98-4.96)
White	0.76 (0.44-1.29)	0.57* (0.34-0.96)	0.44** (0.24-0.78)	0.58 (0.34-1.00)	0.41** (0.22-0.77)
Income	0.98*** (0.97-0.99)	0.99* (0.98-1.00)	1.00 (0.99-1.01)	1.00 (0.99-1.01)	0.99 (0.99-1.00)
Overweight/Obese	1.61* (1.00-2.58)	1.33 (0.83-2.12)	1.11 (0.66-1.85)	0.54* (0.33-0.89)	0.37** (0.21-0.66)
Married/ Co-habiting	1.37 (0.67-2.82)	1.48 (0.73-3.01)	1.20 (0.56-2.56)	1.10 (0.56-2.28)	2.39* (1.03-5.47)
Age	1.03 (1.00-1.06)	1.01 (0.98-1.03)	1.05** (1.05-1.08)	0.99 (0.96-1.02)	1.02 (0.99-1.06)
LR chi <sup>2</sup>	83.10***	83.48***	111.71***	65.60***	11.50***
Pseudo r <sup>2</sup>	0.11	0.11	0.19	0.09	0.21

+Odds ratios presented, \*\* 95% Confidence Interval in Parentheses

\*p<0.05

\*\*p<0.01

\*\*\*p<0.001

Table 3.5. Predicted Probability Partner, Family, or Friend Rate Each Priority as “Very Important” When Respondent has Rated Priority as “Very Important”<sup>+</sup>

	Partner %	Family %	Friend %
Budget	59.13 (49.42-69.19)	58.70 (48.66-68.75)	51.49 (40.97-62.01)
Convenience	67.41 (57.98-76.84)	64.10 (54.22-73.97)	56.89 (46.96-66.81)
Taste	74.57 (67.56-81.59)	77.88 (70.93-84.83)	77.52 (70.76-84.27)
Nutrition	69.17 (60.66-77.69)	69.89 (60.34-79.43)	71.87 (62.48-81.25)
Gen. Health	83.18 (77.14-89.22)	85.89 (80.06-91.72)	85.00 (79.04-90.96)

<sup>+</sup> 95% Confidence Interval in Parentheses

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## Chapter 4

### Constrained Choices in the Grocery Store: The Impact of Prioritizing Budget and Convenience on the Nutritional Quality of Purchases

Despite our best intentions, nutrition and health often lose out to competing factors like taste, convenience, low-priced processed food, and budget (Blaylock et al. 1999, Kirk and Gillespie 1990). Amid continued concern about the health outcomes of obesity and its correlated conditions, it is important to develop an understanding of the factors influencing a family's dietary choices, including the social context in which those choices are made. This paper will investigate the nutritional outcomes of several common priorities when grocery shopping for a family including budget, convenience, general health, and nutrition information.

Prior research has documented shopper priorities (Bava, Jaeger and Park 2008, Caraher et al. 1998, Glanz et al. 1998, Kirk and Gillespie 1990), or asked shoppers to report what they buy (Shepherd et al. 1996), while other research has suggested that more reliable data are collected through grocery receipts rather than interviews based on self-report or food journaling (Greenwood et al. 2006, Tin, Mhurchu and Bullen 2007). In light of this evidence, receipts have been collected to analyze fat and calorie content of purchases (Ransley et al. 2003) and to monitor changes in shopping behavior after nutrition instruction (Rigby and Tommis 2008). This study will utilize similar methodology to discover how priorities translate into purchases by examining grocery receipts for the relative nutritional quality of shoppers' choices when selecting food for their families. Utilizing an emerging theoretical paradigm, Constrained Choice Theory (CCT)(Bird and Rieker 2008), as a framework this paper will provide a unique contribution to the literature by quantifying the impact of priorities reflecting constraints using the NuVal scoring system, which considers about thirty dimensions of a product's nutritional profile. This is one of the first times CCT has been investigated empirically, and is a distinctive use of the NuVal scoring system.

This research will address the following question: how do food priorities resulting from contextual constraints like budget or time impact the healthfulness of a shopper's food choices? Based on the

existing literature, it is hypothesized that individuals whose priorities reflect contextual constraints like budget or time will make less healthful purchases than those who shop based health priorities.

## BACKGROUND

### *Constrained Choice Theory*

Constrained Choice Theory provides a theoretical framework for understanding the choices that individuals make regarding health (Bird and Rieker 2008). It states that social forces, or constraints, impact individual choices and biological predispositions, resulting in health outcomes. Constrained Choice Theory, therefore, accounts for factors that constrain dietary choices like time and money, which are explored in this paper, in explaining why individuals do not always make the best choices for their health (Bird and Rieker 2008). While theories of action like rational choice theory (Homans 1961) and Boudon's cognitive theory of action (Boudon 2003) seek to explain choices by outcome, or outcome within personal value systems, CCT locates those choices within social context, providing a richer tool for analyzing dietary choices (Bird and Rieker 2008).

According to Bird and Rieker, these constraints exist on three levels, which often overlap. On the macro level, social policy like food stamp eligibility and purchase restrictions has an impact on health. On the meso level, community factors like local zoning laws determine if a park or grocery can be built near a neighborhood. The work/family level represents micro level influences like the hours one works in a day or open spots in the neighborhood daycare. Constraints in budget and time are housed in Bird and Reiker's family/work level of constraint as they are often directly tied to employment situation and family priorities (2008). The work/family level of constraint will be the focus of this research. Bird and Rieker are particularly concerned about the ways in which constraints differentially impact men and women, and family grocery shopping is often a gendered behavior (Koch 2015, Lake et al. 2006). Expanding upon CCT, other sociodemographic characteristics will also be included in this analysis of constrained priorities.

Bird and Rieker have applied a CCT framework to investigate several contexts that influence health, particularly in gendered ways (2008). At the work/family level, Bird and Rieker discuss the many roles men and women have as employees, children, parents, and siblings and the impact of managing competing demands on health related decisions (2008). They call for policy level interventions that support a work/life balance, and also suggest a workplace and household distribution of responsibility less dependent on traditional gender norms.

Other researchers have used CCT to investigate fast food consumption and physical activity by examining work time commitments at the level of married couples (Fan et al. 2015). Fan and colleagues examined how many hours per week each spouse spends at work, how much flexibility each spouse has in his or her schedule, and how often each eats fast food or engages in physical activity (Fan et al. 2015). This study reinforces that constraints on the work/family level influence health decision making, but finds that the constraint is actually lack of flexibility rather than number of work hours.

CCT is relatively new with few empirical applications to date; thus, this research presents an opportunity to make a unique contribution to the literature through employing CCT as the guiding framework for this investigation. The focus of this research is constrained priorities in food choices, which can directly affect incidence of obesity and obesity correlated conditions. Further, this study will utilize the NuVal food nutrition scoring system (NuVal 2015) to determine how food shopping priorities impact the nutritional quality of purchases. This research is the first time such an inclusive dietary measure has been utilized to assess the healthfulness of purchases from consumer receipts and results could prove valuable to public health policies that target obesity and food behaviors.

### *Americans and Obesity*

It is widely accepted that there is a relationship between food and health. Many of the primary health concerns of Americans, like obesity and correlated conditions, have been directly connected to diet. With more than one-third of American adults and 17% of youth considered obese, obesity and related

conditions have become a significant health problem for U.S. families (Flegal et al. 2016, Ogden et al. 2014). Obesity is associated with a variety of negative health outcomes such as heart disease, diabetes, various cancers, high blood pressure and cholesterol, stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis, and gynecological problems (Winkles, 2009), though not all research supports obesity as problematic by itself (Berstein 2012). In addition, obesity has also been associated with increases in medical spending by individuals, private insurance companies, and government sponsored health care leading to concerns about the economic impact of obesity on individual Americans and on government spending (Allen, Thorpe and Joski 2015, Cawley and Meyerhoefer 2012). Thus the priorities individuals use to make food choices have a variety of both individual and societal consequences.

### *Food Priorities*

Public programs that encourage healthy eating often focus on preparing healthy meals at home to help individuals gain more control over the ingredients in their food and the portions they eat (USDA 2016, Wolfson and Bleich 2015). Programs like Michelle Obama's *Let's Move* campaign place much of the responsibility for a family's dietary health on parents (Koch 2015), and the person primarily responsible for grocery shopping and food preparation is most often female (Bianchi et al. 2012, Koch 2015, Lake et al. 2006). The priorities of a parent, most often the mother, shopping for her children, therefore, are of interest because they largely affect the health of the entire family.

Eating a balanced diet is not without challenges, even for those who are dedicated to trying. Research has shown that thinking one is eating well likely means one is eating more healthfully than those who are not trying to make healthy choices, but does not necessarily mean a person is meeting dietary guidelines (Powell-Wiley et al. 2014). Further, though the average consumer knows choosing taste or convenience over nutrition will likely have health consequences, the abstract nature of those consequences make it hard to make good choices (Blaylock et al. 1999). The eventual positive health

outcomes of a series of healthy choices may be too far off to seem relevant at the time a decision is made. Extensive food preparation may also seem more trouble than it is worth. While “food preparation” usually refers to cooking, which is a skill that must be learned, the relationship between time and nutrition encompasses much more (Blaylock et al. 1999). Preparing a nutritious meal begins with nutrition knowledge, which must be collected through research, discussions with family and friends, media, and doctors. Since some of that advice will be conflicting, it requires further time to determine what information is most reliable, and even more time in the grocery to operationalize that advice by reading nutrition labels. Blaylock and colleagues assert that even when a shopper thinks he or she is making good dietary choices, those choices are housed within the shopper’s belief system, which may not match reality (1999). Shoppers are constantly bombarded with new, often contradictory, nutrition information, and it can be hard for a shopper to stay current on whether an item is a health food or a health risk. Moreover, shoppers often fear the information they receive about health from media and other sources is unreliable (Lupton and Chapman 1995). Having a good handle on what a healthy diet looks like is only an asset if one also has the budget, time, and cooking skills to turn nutritious food into delicious meals. Assuming one has all of those things, multiplying that effort by three meals a day, seven days a week over the course of a lifetime is a considerable undertaking for even the most health conscious parent shopping for his or her family.

In addition to nutrition knowledge, financial considerations represent a potentially significant constraint in the grocery store. Income is an especially relevant obstacle to the relationship between food and health given the link between poverty and obesity (Drewnowski and Darmon 2005), and though not all research supports obesity as a result of limited financial resources (Hruschka 2012), correlation is well established. Lower socioeconomic status individuals have been shown to have poorer diets than higher SES individuals (Darmon and Drewnowski 2008), and lower income parents buy or prepare fewer food options for their children to try (Daniel 2016, Wright, Maher and Tanner 2015) Being in a low income

category not only impacts what one can afford to buy at the store, but also whether one can afford to live somewhere with a grocery store nearby, be able to afford a car to drive to the grocery store, and to live in a place with relatively few fast food temptations (Brunso, Scholderer and Grunert 2004). Moreover, low-income participants have been shown to seek out stores where they experience a sense of belonging among others of the same socioeconomic class who share the same priority for lower-priced options (Cannuscio et al. 2014).

A limited budget has been shown to impact food priorities making lower income shoppers less concerned with nutrition, and more concerned with finding foods that “fill you up” than higher income shoppers (Caraher et al. 1998). Low income shoppers are also more likely to gravitate toward calorically dense foods like whole milk and fatty meats, and pass on nutritious but less calorically dense items like skim milk, fruit, and whole grains, which are often more expensive (Shepherd et al. 1996). Choosing familiar foods that parents are certain their children will eat is another way parents maximize food budget by avoiding waste, even if that means choosing not to introduce healthy foods to their children (Daniel 2016). Further, in contrast to higher income shoppers, lower income shoppers are more likely to consider price and taste when shopping, while higher income shoppers report feeling less constrained by cost, and shop based on health and taste (Caraher et al. 1998).

Time and money often go hand in hand, and many families feel they have a limited amount of time to devote to preparing food. As Blaylock and colleagues assert, earning a higher income that will enable a family to afford healthier food often means more time spent at work and less time to worry about food preparation (1999). Devine and colleagues concur that working long hours or working stressful jobs can impact the amount of time and attention one has to devote to choosing and preparing food for one’s family (Devine et al. 2003). Time constraints result in dietary compromises like relying on convenient, easy to prepare foods or fast food even when one would prefer to make other choices (Bava, Jaeger and Park 2008, Devine et al. 2006). Individuals fall back on their internalized beliefs and values, often

reflective of their own childhoods, about what is “good” or “bad” to eat rather than making calculated decisions based on up to date information that take time and effort (Bava, Jaeger and Park 2008). When it becomes difficult to meet an individual’s standards for “good” food in the time available, people make tradeoffs to get as close to those values as possible. Homemade tomato sauce might become store bought tomato sauce with a few herbs stirred in, or making mashed potatoes from scratch might become reheating mashed potatoes from the freezer section. Parents in particular have been found to describe shopping for and preparing meals as both time consuming and expensive (Velardo and Drummond 2013). To make up for time sacrifices in meal preparation parents may add special treats to meals or in between meals to assuage guilt about poor or minimal meal preparation, further reducing the healthfulness of the family’s overall diet (Kirk and Gillespie 1990).

Shoppers who prioritize health and nutrition information, on the other hand, are likely to be focused on physical well-being and may be trying to maintain or achieve good health through their choices. Hollywood and colleagues (2013) found that shoppers define a healthy grocery trip in one of three ways: including healthy items, excluding unhealthy items, or achieving a balance between healthy and unhealthy items. Both including healthy items and excluding unhealthy items are likely to result in a healthier grocery trip, while achieving a balance between the two might come out as an average between healthy and unhealthy. Though these shoppers may choose to shop with “health constraints” in mind, those constraints may be of their own definition rather than based in scientific fact (Hollywood et al. 2013). These shoppers may also be engaging in “nutritional altruism” in which they try to purchase what they perceive as healthful for their loved ones out of a desire to care for them or belief that it is their duty (Crawford et al. 2010). Health oriented shoppers may prioritize health above contextual constraints or personal preferences, but do so based on their own definitions, may do so for themselves or for others, and may make lifestyle adjustments to accommodate their priorities.

The research above indicates that shoppers whose top priorities reflect contextual constraints like money and time are likely choosing low-cost items and items that are convenient to prepare, while those concerned with nutrition choose healthy items and exclude unhealthy items from their diets. Thus it is important to empirically examine the effects of constraint reflective priorities on food shopping to understand the nutritional impact of those priorities and the contributions they may make to obesity and diet related diseases.

## DATA AND METHODS

### *Data*

Data were derived from a survey of families with children in Lexington, Kentucky in the spring of 2011. One central goal of the survey was to understand the constraints parents face when shopping for food for their families. Because parents are likely to experience family level constraints in their food decisions, they serve as the perfect population for examining those constraints. This IRB approved survey, which took approximately 20 minutes to complete, was distributed via daycares, churches, and children's organization in socioeconomically diverse areas. Participants returned the survey via a postage-paid envelope, or returned it to a locked box at the location where they received the survey. IRB approval was obtained for this study. The study collected information about the top three purchasing priorities of shoppers by asking shoppers to choose the "three most important factors *you* consider when choosing food and drink items in the grocery store." Sociodemographic information including race, sex, income, marital status, number of children, and body mass index (BMI) were collected as well. Finally, the survey requested participants include two weekly or one large monthly grocery store receipt(s) when submitting the survey.

The initial sample resulted in a larger than desirable proportion of high socioeconomic status respondents. Flyers were posted in low-income areas to recruit additional respondents, and additional sites utilized by low income families were added for survey distribution and collection including

government subsidized daycares and housing facilities. This resulted in a total of 265 respondents who both completed the survey and submitted receipts, each of whom was offered their choice of a check for \$15 or a \$15 donation to the organization from which they were recruited.

The sample for the present study includes the 265 respondents who provided complete responses to the survey instrument. Listwise deletion was used to drop missing data for an N of 234. Though less than 10% of data are missing, analysis of variance reveals that African Americans are more likely to have missing data on income than whites, but no difference was found in missing data by sex, income category, or BMI category. Further research will be needed to verify that patterns hold for African Americans.

### *Methods*

The dependent variable central to this analysis is average NuVal score. Independent variables include shoppers' priorities, sex, race, income, marital status, BMI category, number of school aged children, and respondent age. Summary statistics are provided in Table 4.1.

The dependent variable, respondents' average NuVal score, was coded as a continuous variable. The NuVal scoring system was developed by a non-profit hospital affiliated with Yale University to assign a value to a food item indicative of its nutritional quality (NuVal 2015). The NuVal score provides a unique measure of the nutritional quality of a shopper's purchases, simultaneously considering a variety of dimensions of health and nutrition through its proprietary algorithm (NuVal 2015). For example, the algorithm produces a lower score for foods with lots of fat and salt and little nutrition, and a higher score for items with lots of vitamins and minerals relative to number of calories. Each food item is assigned NuVal score between 0 and 100, with a higher score indicating a better choice. Each item on each respondent's grocery receipt was coded to the NuVal score, and each receipt was assigned an average score that represents the overall nutritional quality of all respondent food and drink purchases. If respondents submitted more than one receipt, the receipts were averaged.

The decisions people make regarding food are multi-layered, but the lexicographic decision rule (Bettman 1979) suggests that people rarely need to move beyond their top 2-3 priorities when making choices, asking themselves which items meet their primary need and then using secondary and tertiary priorities to distinguish between similar products when necessary. It follows that shoppers whose top priorities reflect contextual constraints like budget, time, and taste preferences would make different food choices than shoppers whose top priorities reflect health. Priorities of interest for this study include food budget or cost; convenience of storing and preparing food; general health; and nutritional value and/or information on the food label. The general health and nutritional value categories were combined because they are likely conceptually indistinguishable for respondents.

Other independent variables included sex, race, income, BMI category, marital status, number of school-age children and respondent age. Sex was coded as a dummy variable with 1=female and 0=male. Race was included as a dummy variable with black=1, non-black=0. Income categories are as follows: less than \$5,000; \$5,001-\$10,000; \$10,001-\$15,000; \$15,001-\$20,000; \$20,001-\$25,000; \$25,001-\$35,000; \$35,001-\$45,000; \$45,001-\$60,000; \$60,001-\$75,000; \$75,001-\$100,000; \$100,001-\$125,000; \$125,001-\$150,000; greater than \$150,000. Sensitivity analyses were conducted to assess other options for coding income, including using the midpoint and a non-linear functional form. The original coding scheme, used here, and the nonlinear model performed similarly ( $p=.05$ ), both of which suggest diminishing returns of income. In the interest of parsimony, original income categories were maintained, as is supported by previous research (Rodgers 1979, Wagstaff and Van Doorslaer 2000). BMI categories were calculated based on respondent height and weight using World Health Organization standards (WHO 2012) and operationalized as a binary variable representing those at risk for negative health outcomes based on excess weight with a  $BMI \geq 25$ , and those at a normal weight or underweight with a  $BMI \leq 24.9$ . Marital status was coded as those likely to share daily food decisions with a partner and those likely to make decisions alone with 1=married or cohabitating and 0=widowed, single/never

married, divorced, or separated. Number of school-age children was treated as continuous variable as was respondent age, both of which reflect differing tastes and nutritional needs within the household.

### *Analytic Plan*

All analyses were conducted using STATA 13 (StataCorp 2014). Following an examination of descriptive statistics and patterns of bivariate association (not shown) an Ordinary Least Squares regression was performed assessing the correlation between priority and NuVal score and sociodemographic category and NuVal score. Because income is typically an important factor in establishing a budget, Sobel-Goodman mediation tests were conducted to examine possible mediation by income of the effect of prioritizing budget on NuVal score using the `sgmediation` command in STATA 13. Models were examined for multicollinearity and no problematic variance inflation factors were found.

## RESULTS

### *Sociodemographic Characteristics*

The majority of respondents were women (85.90%) (see Table 4.1). Respondents were 64.1% White, 29.06% Black and 6.84% Other, which included American Indian or Alaskan Native, Asian, Hispanic or Latino, and two or more races. Income distribution reflected a mean of \$75,680. Married and cohabitating respondents represented 72.65% of respondents, while 27.35% were single, divorced, separated, or widowed.

By BMI category, 2.99% of the sample were underweight, 38.03% were normal weight, 24.36% were overweight, and 34.62% were obese. On average, participants had 1.22 school-aged children with a standard deviation of 1.07 and a range of 0-5. An average age of 39.30 was reported with a standard deviation of 8.97 and a range of 19-66. The average NuVal score was calculated at 33.72 with a standard deviation of 13.41 and a range of 3.83-90.50.

The percentage of respondents who chose food budget or cost as among their top three priorities was 58.55%, while 21.73% chose convenience of storing and preparing food, 39.32% chose general health, and 52.14% chose nutritional value and/or information on the food label.

### *Multivariate Models*

Table 4.2 presents the results of an Ordinary Least Squares regression model that assessed the relationships between shopping priority and average NuVal score as well as between sociodemographic category and NuVal score. The model reveals that prioritizing budget results in an average decrease in NuVal score of -4.93 points, all else constant ( $p < 0.01$ ). Prioritizing general health and nutrition, however, results in an increase in average NuVal score of 4.14 points ( $p < 0.05$ ). Several sociodemographic categories are correlated with an average decrease in NuVal score. Being overweight or obese was correlated with a -3.44 point decrease in average NuVal score, all else equal ( $p < 0.05$ ). A -4.98 point decrease was correlated with being female, holding all covariates constant ( $p < 0.05$ ). Individuals who identified as black reflected a NuVal score that was reduced by -3.84 points, all else constant. Conversely, increasing income was associated with an average increase in NuVal score of 0.78, all else constant ( $p < 0.05$ ).

Finally, because income represents a significant constraint when establishing a budget Sobel-Goodman tests were conducted to explore possible mediation by income in the relationship between prioritizing budget and average NuVal score. Table 4.3 presents the three-step model for establishing the mediating effect. The results supported mediation and revealed that 20% of the relationship between average NuVal score and prioritizing budget is mediated by income.

## DISCUSSION

Grocery shopping with priorities in mind has an effect on the healthfulness of the selections one makes in the store. Specifically, identifying budget or health as a top priority when shopping for food is correlated with the nutritional quality of one's purchases. Moreover, there is sociodemographic variation

in the overall nutritional quality of food purchases for one's family. This research identifies patterns in both shopping priority and sociodemographic characteristic that can be utilized by public health programs that promote healthy eating. Further, it advances the application of Constrained Choice Theory to empirical data by identifying constraint reflective priorities that may differentially impact health outcomes.

### *Food Priority*

Constrained Choice Theory states that there are contextual factors that prevent individuals from making the best choices for their health (Bird and Rieker 2008). This study concludes that choosing budget, a contextual constraint, as a top three priority, reduces the overall nutritional quality of one's grocery purchases when compared to those who do not consider budget to be among their top three priorities. This is consistent with previous research that states shoppers who are concerned about budget are less likely to be concerned with health (Caraher et al. 1998), or less able to be concerned with health (Hollywood et al. 2013) and more likely to purchase less nutritious foods (Shepherd et al. 1996), but for the first time utilizes NuVal scores' broadly inclusive algorithm for quantifying the nutrition outcome. These findings have implications on a number of levels. At CCT's policy level, steps should be taken to reduce the cost of healthy food and/or increase the income of consumers. Government sponsored crop subsidies could be targeted to reduce the cost of healthful items for shoppers. In addition to making food more affordable, increasing the income of families should also be considered, perhaps by raising the minimum wage. Greater income means more money to spend on nutritious food, which may ultimately improve health outcomes. At the CCT community level, public health planners can continue programs that provide families with advice on how to shop for healthy foods on a budget, and can help individuals tailor their family's budgets to allocate a sufficient amount for grocery shopping while still meeting other financial obligations. On the work/family level of CCT, individual families can choose to participate in free community programming about making healthy choices on a budget, or utilize free online resources

through a local library to access nutrition information. They may also try to allocate more free time to food preparation as schedules allow, and possibly spread food preparation responsibilities among more members of the family.

In contrast to previous research examining time constraints that found limited time resulted in reliance on unhealthy convenience items and incorporating unhealthy treats, (Bava, Jaeger and Park 2008, Blaylock et al. 1999, Kirk and Gillespie 1990), shoppers who prioritize convenience among their top three priorities do not differ in their nutrition outcomes from people who do not prioritize convenience.

Choosing food items based on convenience is not a significant contextual constraint under the Constrained Choice model. This suggests that relying on convenience to guide decisions in the grocery store does not necessarily result in a poor health outcome. Many grocery stores have recently begun to offer a number of convenience foods that go beyond the typical frozen TV dinner including fresh roasted chicken, cleaned and chopped vegetables, and frozen foods designed to have less fat and sodium and more whole grains and lean proteins which would have a higher NuVal score than traditional convenience items. These foods mimic the taste profile of foods prepared at home with significantly less time and effort, and offer a nutritionally reasonable alternative that falls between from-scratch home cooking and a fast food meal. Requiring convenience, therefore does not have to be a barrier to health. Further research is needed to confirm if the newer products in the grocery store are supporting a new trend built upon convenient, healthy eating.

Shoppers who prioritized general health or nutrition information made significantly healthier purchase than those who did not. Perhaps choosing more healthy items, avoiding unhealthy items, or seeking to balance healthy and unhealthy choices (Hollywood et al. 2013) all proved effective strategies for bringing home food for one's family that is nutritionally superior. It is important to note, however, as Powell-Wiley and colleagues assert that making healthier than average choices does not necessarily mean

meeting nutrition guidelines (2014). Public policy should continue to promote the importance of healthy eating so that families better understand the connections between food and health.

### *Structural Constraints*

Other interesting results emerged in sociodemographic data. Being overweight or obese was correlated with lower average NuVal scores, indicating less healthy purchases. This is consistent with prior research that indicates that overweight or obese individuals may make lower quality food purchases as a result of prioritizing cost (Dressler and Smith 2013), or because of a greater focus on taste than other groups (van Meer, Charbonnier and Smeets 2016). In addition, sex proved a significant factor in decreasing nutrition as measured by NuVal score, which supports Bird and Rieker's (2008) focus on contextual variance by sex. This is in direct contrast to previous research that found women are more likely to conscientiously engage in healthy eating behaviors (Beardsworth et al. 2002), but it is important to note women who are shopping for the entire family may not be eating everything they purchase themselves. Perhaps they consume healthier items themselves but purchase the less healthy foods their children and partners prefer as well (Alm, Olsen and Honkanen 2015). Further research is needed to assess gendered differences in contextual constraints in healthy grocery shopping and discrepancies in healthy eating between members of the same household.

Identifying as Black was also correlated with lower average NuVal scores, even when controlling for the effects of obesity and income. This is consistent with research that concluded non-whites have less nutrition knowledge (Nayga 1997) and less access to healthy food (Blaylock et al. 1999), and presents an impetus for increasing nutrition education programs directed toward minority communities and creating more opportunities to access healthy food in predominately Black areas.

In addition, increasing income is associated with an increase in average NuVal score. It is important to note that several studies have demonstrated a diminishing return on income when it comes to health (Rodgers 1979, Wagstaff and Van Doorslaer 2000) such that increases in earnings for those at low-

level incomes provide greater increases in health opportunities than for those in higher income categories. It is likely, therefore, that improving earnings or purchasing power for lower income groups would have a greater ameliorative effect on nutrition than for those in higher income categories.

Finally, mediation models indicate sociodemographic factors may mediate the effect of priority on NuVal score. Specifically, income was shown to mediate the relationship between prioritizing budget and average NuVal score. About a fifth of the effect of prioritizing budget on NuVal score may be a result of income category. Improving earnings, therefore, may not only ameliorate nutrition among low income groups, but also among those that prioritize budget.

### *Limitations*

There are some areas in which the sociodemographic characteristics of survey participants are not representative of the general population of the area which may affect the generalizability of the data. Though women were overrepresented in the sample, this is consistent with women's continued greater role in both food preparation (Lake et al. 2006) and child rearing (Bianchi et al. 2012), and with the survey's request that primary caregivers complete the survey. Non-whites were intentionally oversampled, resulting in a greater percentage of non-whites in the sample than in the most recent census data for the area (73% white) (United States 2014), but this allows for greater explanatory power in the model for non-whites. In comparison to the rest of the state of Kentucky, this sample has fewer overweight and obese respondents (58.96%) than reported by the CDC (67.2%)(CDC 2015a).

This study collected grocery receipts that documented a families' main monthly or two main weekly grocery trips, which may neglect items purchased in between trips, or from specialty shops (bakeries, butcher shops). However, because the receipts were gathered in early spring, it is unlikely shoppers were supplementing any meals with items grown at home or from a local farmer's market as it was very early in the growing season for the region.

While this study was primarily concerned with grocery shopping, grocery receipts likely do not represent the total number of foods consumed by the family. Future research may consider asking for all food related receipts from a given time period including grocery, convenience store, fast food, and restaurant receipts for a more complete picture of family food consumption that extends beyond a specific focus on grocery purchases.

Another limitation is reliance on self-reporting of height and weight for calculation of BMI. Most people tend to underreport their weight, which could cause a bias in BMI data (Gorber et al. 2007); however, studies have shown self-report accurately reflects overweight/obese status and is a suitable proxy for clinically measured data (Bowring et al. 2012). It should also be noted that this data is best interpreted as family level, as it is impossible to determine who consumed the food once it was home.

Finally, the data were cross-sectional, and causal relationships cannot be established. Future research could use longitudinal data to establish the directionality of the relationship between overweight/obese status and the quality of food purchases.

## CONCLUSION

Considering budget, a contextual constraint, among one's top three priorities when choosing food for one's family results in less nutritious shopping trips than prioritizing other items. Budget, therefore, represents a significant constraint in choosing healthy foods for one's family. Though dietary health is often approached as an individual challenge to be handled within the home (Koch 2015, USDA 2016, Wolfson and Bleich 2015), a variety of community level and policy level factors also contribute to dietary choices. Constrained Choice Theory (Bird and Rieker 2008) recognizes that barriers to good health often have social origins, are unequally distributed throughout society, and can be ameliorated by social actions. Taking into consideration current concerns about obesity and health, and the relationship between obesity and income, it is clear that access to healthy food for all income levels should be a public healthy priority.

It is important, therefore that steps be taken to remove budget as a constraint on healthy eating. The benefit of removing financial barriers to healthy eating will be reductions in morbidity and mortality associated with diet-related conditions. In addition, reductions in both personal and governmental healthcare spending may be realized through improvements in community health.

Table 4.1. Descriptive Statistics (N=234)

Demographic Characteristic	Percentage	Mean	Standard Deviation	Range
Gender				
Female	85.90			
Male*	14.10			
Race				
White*	64.10			
Black	29.06			
Other*	6.84			
Income				
Less than \$5,000	7.26			
\$5,001-\$10,000	1.71			
\$10,001-\$15,000	2.99			
\$15,001-\$20,000	1.71			
\$20,001-\$25,000	2.56			
\$25,001-\$35,000	5.56			
\$35,001-\$45,000	8.12			
\$45,001-\$60,000	7.26			
\$60,001-\$75,000	11.54			
\$75,001-\$100,000	20.09			
\$100,001-\$125,000	15.81			
\$125,001-\$150,000	8.12			
Greater than \$150,00	7.26			
Marital Status				
Single, Divorced, Separated, Widowed*	27.35			
Married or Cohabiting	72.65			
BMI Category				
Underweight*	2.99			
Normal*	38.03			
Overweight	24.36			
Obese	34.62			
Number School Age Children		1.22	1.07	0-5
Respondent Age		39.30	8.97	19-66
Average NuVal Score		33.72	13.41	3.83-90.50
Chosen as Top 3 Priority				
Food Budget or Cost	58.55			
Convenience Store/Prepare	21.73			
General Health	39.32			
Nutrition Value/Food Label	52.14			

\*Omitted Category

Note: Percentages may not total 100 due to rounding.

Table 4.2. Ordinary Least Squares Regression Model of Average NuVal Score by Priority N=234<sup>+</sup>

Priority Budget	-4.93(1.66)**
Priority Convenience	-2.01(2.01)
Priority General Health or Nutrition	4.14(1.83)*
Overweight or Obese	-3.44(1.72)*
Female	-4.98(2.39)*
Married or Co-habiting	1.28(2.68)
Black	-3.84(1.92)*
Income	0.78(0.39)*
Age	-0.09(0.10)
Number School Age Kids	-1.02(0.80)
F	6.68
R <sup>2</sup>	0.23

<sup>+</sup>Standard Errors in Parenthesis

\* p<0.05

\*\*p<0.01

\*\*\*p<0.001

Table 4.3. Sobel-Goodman Mediation Tests for Effect of Prioritizing Budget on NuVal Score as mediated by Income N=234<sup>+</sup>

	Step 1 Average NuVal	Step 2 Priority Budget	Step 3 Average NuVal
Priority Budget			-4.76(1.68)**
Overweight or Obese	-4.90(1.73)**	0.15(0.07)*	-4.18(1.71)*
Female	-5.00(0.388)*	-0.02(0.10)	-5.09(2.41)*
Married /Co-habiting	0.79(2.73)	0.19(0.11)	1.70(2.71)
Black	-2.94(1.94)	-0.15(0.08)*	-3.68(1.93)
Income	1.05(0.39)*	-0.43(0.02)**	0.84(0.39)*
Age	-0.12(0.10)	0.00(0.00)	-0.10(0.10)
# School Age Kids	-1.04(0.81)	0.03(0.03)	-0.90(0.80)
F	6.92***	2.70*	7.24***
R <sup>2</sup>	0.18	0.08	0.20
Proportion Mediated			0.20

<sup>+</sup>Standard Errors in Parenthesis

\* p<0.05

\*\*p<0.01

\*\*\*p<0.001

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Chapter 5

Conclusion

This dissertation approached dietary choices from the perspective of food brought into the home from a grocery store. Constrained Choice Theory (Bird and Rieker 2008), which states that contextual factors restrict the number of viable choices an individual has in health decisions, was used as the unifying framework to examine grocery shopping as a health behavior. This research engaged with two facets of Constrained Choice Theory by both identifying group differences in health belief and behaviors and quantifying those differences to better understand their effects on health (Bird and Rieker 2008). Because CCT has no known applications to food provisioning behavior, this work extended the reach of CCT by applying it to a novel area of health behavior. Further, it engaged with multiple levels of CCT constraint by examining both work/family level and community/network level barriers to health. In addition, this research moved beyond the focus on gender established by the original CCT framework by looking for health behavior disparities among a broader collection of sociodemographic categories and raised questions about the unique origins of health disparities among those groups.

Food provisioning behavior was explored in several ways. Chapter 2 focused specifically on sociodemographic variation in constrained grocery shopping priorities. Chapter 3 addressed the prevalence of shared food priorities within social networks, and Chapter 4 quantified nutritional outcomes of shopping based on priorities reflective of contextual constraints. Taken together, the three papers paint a picture of constrained choices operating on various levels.

## KEY FINDINGS

### *Financial Factors Impact Dietary Choices*

Even when evaluating multiple competing priorities, financial considerations had the greatest impact on the nutritional quality of consumer purchases in the grocery store. This project confirmed these findings in several ways. First, those who chose budget as among their top three priorities were less likely to prioritize nutrition when shopping for food (see Chapter 4). These findings were consistent with prior research. Limited budget has been associated with reduced concern for nutritious purchases

(Caraher et al. 1998) and a greater likelihood of purchasing calorically dense but less healthful items (Shepherd et al. 1996). Second, increasing income reduced the likelihood that one would prioritize budget above other considerations (see Chapter 2). Other research specifically addressing income found those in lower income categories did have different priorities than other groups, choosing foods with cost and convenience in mind (Glanz et al. 1998)

Finally, this study concluded that having a higher income, and therefore facing fewer financial constraints, increased the overall quality of one's diet (see Chapter 4). This project utilized a novel measure of nutritional quality, the NuVal score, which considers multiple dimensions of a food product's healthfulness and creates a single composite score for each item, to evaluate average grocery trip quality. This is in contrast to prior research that evaluated an individual measure of dietary quality like protein or fat content (Powell-Wiley et al. 2014, Ransley et al. 2003). With a more thorough index to evaluate dietary quality, this study's findings were consistent with previous research that associates low income with poor dietary outcomes. Lower socioeconomic status individuals have been shown to have poorer diets overall (Darmon and Drewnowski 2008) and to be more likely to live in areas with barriers to healthy eating such as few or no grocery stores, poor public transportation, or many fast food outlets (Brunsø, Scholderer and Grunert 2004). It follows that higher income groups would have fewer financial barriers, fewer environmental barriers like access to grocery stores, and would experience more favorable nutrition outcomes.

### *Relationship Factors Influence Food Choices*

Members of social networks contribute to the context in which decisions are made and can reinforce dietary preferences. CCT has not been previously applied empirically with a social network approach, therefore this project represented a novel application of the theory. Other research, however, has addressed food as a network behavior from different perspectives. People often choose others like themselves as members of their network (McPherson, Smith-Lovin and Cook 2001) and those individuals

have been shown to influence health behavior in a variety of ways (Christakis and Fowler 2009, House 2002, Langlie 1977, Link and Phelan 1995, Pescosolido 1992, Umberson and Montez 2010). Prior research has established that individuals adjust their eating behavior to match their companions' eating behavior (Clendenen, Herman and Polivy 1994, Vartanian, Herman and Wansink 2008), and that people choose similar types of foods as their spouses, friends, and siblings (Pachucki, Jacques and Christakis 2011).

This study revealed concordance among network members within not only eating behavior, but also in shopping priority, as discussed in Chapter 3. Priorities were correlated among partners, who likely share at least one meal a day, but also extended to other adult family members and friends, with whom one likely eats less often. Specifically, preference for relying on constraint reflective priorities such as budget and convenience, personal preference priorities such as taste, and wellness priorities such as nutrition and health were congruent across all groups.

In addition, this study also found other specific social network locations, being married and/or having children, correlated with dietary choices. This project confirmed a preference for prioritizing healthy eating among married couples (see Chapter 2), which is consistent with prior research that associated marriage with healthier eating (Mata, Frank and Hertwig 2015) and it also revealed budget as a significant consideration in married individual's grocery shopping priorities. As discussed above, financial constraints have an important impact on diet. Further, this investigation revealed that having more children in a family reduces the likelihood of prioritizing health (see Chapter 2). This result aligned with other research that demonstrates parents choose foods that they are confident their children will eat (Daniel 2016), and choose foods that have a pleasing taste or texture that will limit mealtime negotiation (Alm, Olsen and Honkanen 2015). These findings reinforced that one's social network, including family members, plays an important role in constraining dietary choices and establishing social norms related to food provisioning and consumption.

### *Constraints are Unique Among Sociodemographic Groups*

This project also discovered several distinct patterns in dietary constraint in additional sociodemographic categories. Certain groups are more likely to choose priorities that reflect constraints than others. While Bird and Rieker's (2008) original approach to CCT focused primarily on gender, this project extended that application to make a unique contribution to the literature by including other sociodemographic categories as well and discovered additional patterns in constraint. Variation by income group, marital status, and number of children was discussed above. In addition, patterns were discovered by sex, race, and weight category. Participants who identify as female (see Chapter 4) had a lower overall NuVal score than those who identify as male, consistent with CCT's focus on gender variation (2008). These results are in contrast to research that found women are generally more healthful eaters (Beardsworth et al. 2002, Glanz et al. 1998, Nayga 1997, Wardle et al. 2004) however, it is important to note that this project addressed what women bought to bring into the home where the food could have been consumed by other members of the household. Other research supports this theory (Alm, Olsen and Honkanen 2015). Participants who identify as black also had a lower overall NuVal score (see Chapter 4) than white participants. Prior research provides context with non-whites found to have less nutrition knowledge (Nayga 1997), which could contribute to poor food choices. Further, non-whites have been found to have less access to healthy foods in their neighborhoods, which could also limit choices (Blaylock et al. 1999). Finally, individuals who self-report as overweight or obese were both more likely to prioritize budget (see Chapter 2) and have a lower overall NuVal score (see Chapter 4). Obese low income individuals have been shown to more highly prioritize budget than others (Dressler and Smith 2013), and financial constraints are often associated with food insecurity, which has been linked to obesity (Webb et al. 2008). These findings reinforced that differing sociodemographic groups choose priorities reflective of the unique constraints experienced by those groups.

## POLICY IMPLICATIONS

On a policy level, the conclusions above draw attention to the social nature of food provisioning behavior through identifying sociodemographic trends and network priority ubiquity. These findings challenge many popular nutritional policy recommendations that focus on the individual or even the family as the appropriate level of intervention for dietary change. For example, the USDA “MyPlate” in name alone implies that an individual’s plate is the unit of analysis without regard for the context in which that plate is prepared (USDA 2016). While eating on a budget is addressed as a side topic, the focus is on the fruits, vegetables, grains, protein, and dairy that an individual consumes in an individual sitting (USDA 2016) without regard for what that individual’s budget might be, whether that individual or someone else is responsible for grocery shopping and meal preparation, the social or cultural norms affecting their food decision, or any other aspect of food related decision making. Though Michelle Obama’s “Let’s Move” campaign does discuss diet at the level of the family, parents are responsible for making healthy choices, but are left to identify and remove barriers to healthy eating on their own. Thus many popular nutrition policies and programs fail to identify address the constraints relevant to specific groups.

Based on the results of this research, future dietary policy should consider a focus on helping specific groups address barriers to healthy eating rather than simply prescribing a healthy diet. This could take several forms. Instead of an individual focus, future policy could direct efforts toward family or community level intervention through schools, churches, daycares, recreation centers, or other popular community spaces that could work to change attitudes toward food on the community or network level rather than asking individuals to work against popular behavior on their own. One example of programing that takes this approach is the Center for Disease Control and Prevention (CDC) “Communities Putting Prevention to Work” initiative which has addressed issues like obesity and tobacco use (CDC 2015b). This program focuses on community level interventions that change the environment

in ways that encourage healthy behavior and has been successful in such initiatives as improving access to and affordability of healthy foods in vending machines and corner stores (CDC 2015b). Moreover, specific groups like low-income families, African Americans, and overweight or obese individuals could be offered tailored support to address the barriers they are most likely to experience. The CDC Racial and Ethnic Approaches to Community Health (REACH) program is designed to reduce racial and ethnic health disparities (CDC 2016). Utilizing a community based participatory research approach, CDC initiatives work with minority communities to discover which issues are most pertinent in the community and which solutions would be most culturally relevant and well-received (CDC 2016). Some example initiatives include increasing the average number of fruits and vegetables consumed among African Americans and Latinos within a community, or working with the Bureau of Agriculture to increase community garden sites (CDC 2016)

Policy can also work more broadly to address food systems level issues that affect the options communities have in the foods they choose. Federal agricultural subsidies have been linked to poor health outcomes as a result of oversupply and subsequent overconsumption of certain foods (Franck, Grandi and Eisenberg 2013, Siegel et al. 2016). One approach to addressing this food system level issue would be reevaluating which crops are eligible for food subsidies and therefore abundant in our food system. Another approach could be food policy that supports diversifying local and regional farms to produce a greater variety of foods at reasonable costs for local families.

Future research should further investigate the origins of the constraint reflective priorities that dominate specific communities and to locate their unique origins among specific populations. With more information about the origins of constraints, additional customized programming could be designed to address both the work/family level and community level constraints that influence individual food choices.

## LIMITATIONS

The studies above had a few limitations that should be noted and considered in future research. The sample is skewed toward more affluent respondents than the general population (United States 2014). Further, the sample was less obese than the national average (CDC 2015a), and more likely to be married, making it difficult to generalize the results to other populations. Collecting receipts from a major monthly grocery trip or two grocery trips in one month neglects food that may be purchased in between trips, or from other sources like farmers' markets. Because receipts were collected in early spring, it is unlikely respondents supplemented their grocery trips with farmers' markets or gardens as there is a very limited selection of produce that grows in central Kentucky at that time of year. Future research could address these issues by collecting a larger sample or collecting all food receipts rather than focusing on main grocery trips.

Other demographic information could also be useful in future research to paint a more complete picture of dietary considerations. For example, dietary decisions may also be made in a context that considers cultural or ethnic traditions or current health conditions. This information could provide enhanced context for understanding constraints on dietary choices.

## CONCLUSION

Though obesity rates have stabilized in recent years (Flegal et al. 2016, Ogden et al. 2014), they remain historically high, and other diseases with dietary components like diabetes and heart disease remain prevalent (Mozaffarian et al. 2015). As such, it is critical to understand the dietary choices Americans make and to work to remove the barriers between families and healthy diets. It is clear from the research above that food norms are pervasive within social networks and that certain sociodemographic groups, notably low-income families, face more barriers than other groups in choosing foods that align with current nutritional guidelines. As such, it is critical that these groups receive targeted, community based interventions to ameliorate issues related to access to and especially

affordability of healthy foods. Programs like the CDC's "Communities Putting Prevention to Work" (CDC 2015b) and REACH (CDC 2016) provide excellent models for the types of community based participatory research and initiatives that put the specific needs of individual communities in sharp focus when designing health interventions. Programs like these can reduce the number of constraints individuals face when making healthy choices and can ameliorate health outcomes through improved diet. Empowering individuals through removing community specific barriers to healthy behaviors will ultimately result in decreased morbidity and mortality from diet related conditions. Moreover, improving community health can reduce the financial burden on both individuals and the government from diet related disease.

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APPENDIX

Survey Instrument

Thank you for agreeing to participate in our research study. Please read each question carefully and choose the best possible answer from those provided.

1. How would you describe the condition of your mouth and teeth? Would you say they are...

- |   |           |   |      |
|---|-----------|---|------|
| 1 | Excellent | 4 | Fair |
| 2 | Very Good | 5 | Poor |
| 3 | Good      |   |      |

2. Currently, how much do you feel you need dental treatment?

- |   |          |   |            |
|---|----------|---|------------|
| 1 | A lot    | 3 | A Little   |
| 2 | Somewhat | 4 | Not at All |

3. How long has it been since you had your teeth cleaned by a dentist or dental hygienist?

- |   |                         |   |                       |
|---|-------------------------|---|-----------------------|
| 1 | In the past 6 months    | 4 | In the past 2-5 years |
| 2 | In the past 7-12 months | 5 | More than 5 years     |
| 3 | In the past 13-24 years | 6 | Never                 |

4. How long has it been since you had your children's teeth were cleaned by a dentist or dental hygienist?

- |   |                         |   |                       |
|---|-------------------------|---|-----------------------|
| 1 | In the past 6 months    | 4 | In the past 2-5 years |
| 2 | In the past 7-12 months | 5 | More than 5 years     |
| 3 | In the past 13-24 years | 6 | Never                 |

5. About how old were your children when they first saw someone for dental care? \_\_\_\_\_

6. Do you have insurance that pays for some or all of your dental care? Include health insurance obtained through employment or purchased directly, as well as government programs like Medicaid.

- |   |    |   |     |
|---|----|---|-----|
| 1 | No | 2 | Yes |
|---|----|---|-----|

7. Do you have insurance that pays for some or all of your child's dental care? Include health insurance obtained through employment or purchased directly, as well as government programs like Medicaid.

- |   |    |   |     |
|---|----|---|-----|
| 1 | No | 2 | Yes |
|---|----|---|-----|

8. If one or more children did not go to dentist in past year, why? Circle ALL that apply.

- 1 You didn't think it was important
- 2 The problem went away
- 3 You couldn't afford treatments or didn't have insurance
- 4 No transportation was available
- 5 Child was afraid to see the dentist



c. How much activity or exercise he/she gets	1 Very important	2 Somewhat important	3 Not too important	4 Not at all important
d. What he/she weighs	1 Very important	2 Somewhat important	3 Not too important	4 Not at all important
e. His/her self-esteem and body image	1 Very important	2 Somewhat important	3 Not too important	4 Not at all important

15. On a scale from 1 to 5, **with 1 being "least important" and 5 being "most important,"** how important are the following factors when choosing food and drink items at the grocery store? Please circle an answer in each column, rating the importance of these factors for yourself as well as your best estimation of their importance to other people you know.

	You	Your partner or spouse, if any	Other adult family members	Your friends
a. Food budget or cost	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
b. Food preferences and taste	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
c. Convenience of storing and preparing food	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
d. Nutritional value and/or information on the food label	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
e. Health of teeth or gums	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
f. Dieting or losing weight	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
g. General health	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
h. Whether the food is organic and/or produced locally	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
i. Recommendations from a doctor or other health professional	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
j. Recommendations from family or friends	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

k. Information from news sources (e.g., magazines, the internet)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
--	-----------	-----------	-----------	-----------

16. Choosing from the factors above, please circle the three letters below that correspond to the three most important factors that *you* consider when choosing food and drink items at the grocery store:

a      b      c      d      e      f      g      h      i      j      k

17. When grocery shopping, how many of your food purchases are located outside (perimeter) of the aisles?

- |   |            |   |      |
|---|------------|---|------|
| 1 | Nearly All | 4 | Some |
| 2 | Most       | 5 | None |
| 3 | A few      |   |      |

18. How often do your children ask for particular foods and drinks either at home or in the grocery store?

- |   |               |   |        |
|---|---------------|---|--------|
| 1 | Almost always | 4 | Rarely |
| 2 | Often         | 5 | Never  |
| 3 | Sometimes     |   |        |

19. How often are the foods and drinks your children request unhealthy or of low nutritional value?

- |   |               |   |        |
|---|---------------|---|--------|
| 1 | Almost always | 4 | Rarely |
| 2 | Often         | 5 | Never  |
| 3 | Sometimes     |   |        |

20. How do your children attempt to get you to buy foods and drinks they want? Please circle all that apply.

- 1 Cry
- 2 Temper tantrum
- 3 Refuse to eat/drink other items
- 4 Ask repeatedly
- 5 Ask other parent/adult if you say "no"
- 6 Body language or facial expressions (e.g., puppy dog face/smile/eyes)
- 7 Bargaining (e.g., promising to be good/quiet)
- 8 Persuasion (e.g., you should buy this because.....)
- 9 Guilt (e.g., I never get what I want, or you promised)
- 10 Other (Please Specify) \_\_\_\_\_

21. Typically, what is your response to your children's requests for foods/drinks?

- 1 I almost always purchase food or drink items when my children request them
- 2 I often purchase food or drink items when my children request them
- 3 I occasionally purchase requested food or drink items as a special treat
- 4 I never purchase food or drink items just because my children request them

22. If someone around you is overeating or eating unhealthy food, how likely are you to notice?

- |   |                 |   |                   |
|---|-----------------|---|-------------------|
| 1 | Very likely     | 4 | Not very likely   |
| 2 | Fairly likely   | 5 | Not at all likely |
| 3 | Somewhat likely |   |                   |

23. If someone around you is overeating or eating unhealthy food, how likely are you to think negatively about these behaviors if you notice them?

- |   |                 |   |                   |
|---|-----------------|---|-------------------|
| 1 | Very likely     | 4 | Not very likely   |
| 2 | Fairly likely   | 5 | Not at all likely |
| 3 | Somewhat likely |   |                   |

24. Among the groups of people you know listed below, please estimate the percent of each group that is overweight or obese.

a. Your adult extended family members and in-laws (e.g., parents, siblings, aunts, etc.)	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
b. Children/adolescents in your extended family (e.g., nieces/nephews, cousins, etc.)	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
c. Your adult friends	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
d. Your friends' children or adolescents	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
e. Your children's friends	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
f. Your children's classmates	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
g. Your adult coworkers, neighbors, acquaintances, etc.	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)
	4 About half (45-55%)	
h. Children or adolescents in your neighborhood or community	1 None (0%)	5 Most (60-75%)
	2 A few (5-20%)	6 Nearly all (80-95%)
	3 Some (25-40%)	7 All (100%)

	4 About half (45-55%)
--	-----------------------

25. About how often do you, your partner/spouse, and your children eat meals together as a family?

- |                       |                          |
|-----------------------|--------------------------|
| 1 Several times a day | 5 Once a week            |
| 2 Every day           | 6 2-3 times a month      |
| 3 Almost every day    | 7 Once a month           |
| 4 2-3 times a week    | 8 Less than once a month |

26. About how often do you eat meals or snacks with the following groups?

a. Extended family members or in-laws	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								
b. Friends	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								
c. Coworkers, neighbors, acquaintances, etc.	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								

27. About how often do your children eat meals or snacks with the following groups?

a. Their extended family members or in-laws	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								
b. Their friends (outside of school)	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								
c. Their classmates	<table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">1 Every day</td> <td style="width: 25%;">5 Every other month</td> </tr> <tr> <td>2 Several times a week</td> <td>6 Several times a</td> </tr> <tr> <td>3 Several times a month</td> <td>year</td> </tr> <tr> <td>4 Once a month</td> <td>7 Once a year or less</td> </tr> </table>	1 Every day	5 Every other month	2 Several times a week	6 Several times a	3 Several times a month	year	4 Once a month	7 Once a year or less
1 Every day	5 Every other month								
2 Several times a week	6 Several times a								
3 Several times a month	year								
4 Once a month	7 Once a year or less								

28. In your opinion, to what extent to you agree that obesity a significant problem in America today?

- |   |                |   |                   |
|---|----------------|---|-------------------|
| 1 | Strongly agree | 4 | Disagree somewhat |
| 2 | Agree          | 5 | Disagree          |
| 3 | Agree somewhat | 6 | Strongly Disagree |

29. In your opinion, to what extent to you agree that media accounts of an “obesity epidemic” and the negative effects of obesity on health have been exaggerated?

- |   |                |   |                   |
|---|----------------|---|-------------------|
| 1 | Strongly agree | 4 | Disagree somewhat |
| 2 | Agree          | 5 | Disagree          |
| 3 | Agree somewhat | 6 | Strongly Disagree |

	You	Partner or spouse	Child 1	Child 2	Child 3	Child 4	Child 5	Child 6
Age								
Height								
Weight								
Sex	M F	M F	M F	M F	M F	M F	M F	M F
On an average day, how many times does each eat fresh or canned fruit?								
On an average day, how many times does each eat vegetables, including salad?								
How many times a month does each eat fast food (e.g., McDonalds)?								
How many sodas per week do each drink?								
How many times per week does each play actively or exercise for 20 or more minutes?								
About how many hours does each person sit and watch television or play video games on an average day?								
How many times a day does each brush their teeth?								

How many cavities has this person had?								
	<b>You</b>	<b>Partner or spouse</b>	<b>Child 1</b>	<b>Child 2</b>	<b>Child 3</b>	<b>Child 4</b>	<b>Child 5</b>	<b>Child 6</b>
How would you rate each person's overall health? Circle one: 1=Poor 2=Fair 3=Good 4=Very good 5=Excellent	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
How would you describe each person's weight? Circle one: 1=Very underweight 2=Slightly underweight 3=About the right weight 4=Slightly overweight 5=Very overweight	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
To what extent do you worry that this person is or may become overweight? 1=Very much 2=A fair amount 3=Somewhat 4=Not very much 5=Not at all	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
To what extent does your partner/spouse worry that this person is or may become overweight? 1=Very much 2=A fair amount 3=Somewhat 4=Not very much	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

5=Not at all	5	5	5	5	5	5	5	5
--------------	---	---	---	---	---	---	---	---

	You	Partner or spouse	Child 1	Child 2	Child 3	Child 4	Child 5	Child 6
To what extent do you attempt to manage or control what or how much this person eats? 1=Very much 2=A fair amount 3=Somewhat 4=Not very much 5=Not at all	1 2 3 4 5							
To what extent does your partner or spouse attempt to manage or control what or how much this person eats? 1=Very much 2=A fair amount 3=Somewhat 4=Not very much 5=Not at all	1 2 3 4 5							
Looking at the images of adults or children on the following page, circle the number that most closely resembles each person's body shape now.	1 5 2 6 3 7 4							

Looking at the images of adults or children on the following page, circle the number that most closely resembles each person's ideal body shape, in your opinion.	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5
	2	6	2	6	2	6	2	6	2	6	2	6	2	6	2	6
	3	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7
	4		4		4		4		4		4		4		4	



1



2



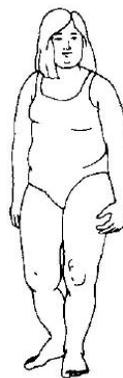
3



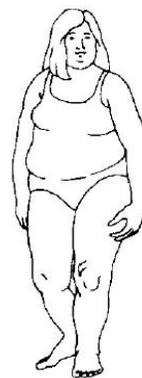
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5



6



7



1



2



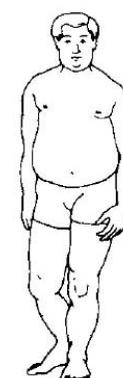
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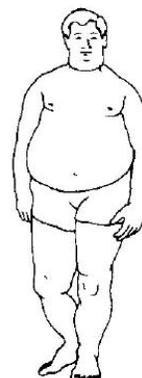
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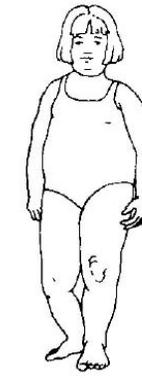
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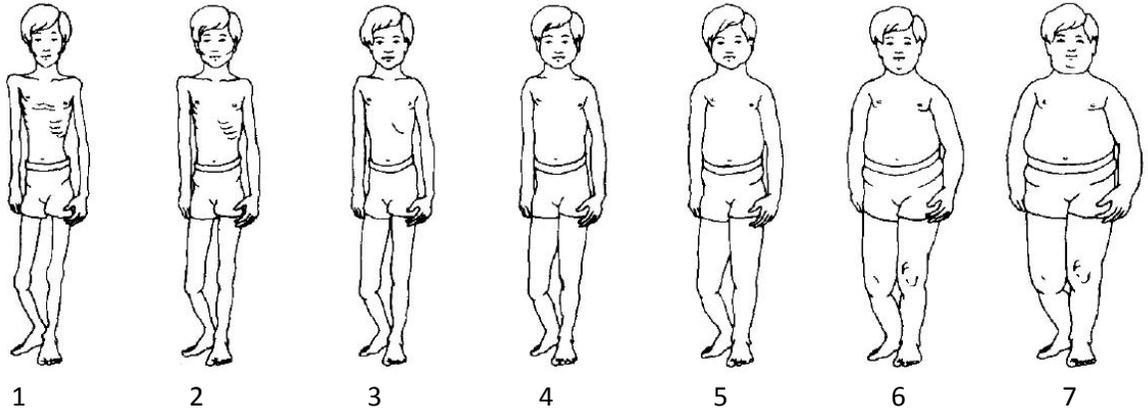
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6



7



30. Please think back to meals or snacks that you have eaten in the company of others in the past year. To what extent do you agree or disagree with the following statements?

31. How many adults 18 or older live in your household? \_\_\_\_\_

a. When I go out to lunch or dinner with someone who is overweight, I feel free to eat more	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
b. When I am eating in the company of family or friends, we often discuss our food choices	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
c. If I am eating with someone at a restaurant and they order dessert, I am more likely to do the same	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
d. I tend to talk about food more often with people who are overweight	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
e. The closer I am to someone, the more comfortable I feel eating what I want to in their presence	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
f. I am not more likely to make unhealthy choices when I eat with someone who is overweight	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
g. Thinking back to meals I've eaten with others, I tend to stop eating when others stop	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
h. I feel hesitant to overeat or eat unhealthy foods around people who are physically fit	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree
i. The less I know the person I am eating with, the more pressure I feel to imitate their eating behaviors	1 Strongly agree	2 Agree	3 Disagree	4 Strongly disagree

32. How many children under the age of 18 live in your household? \_\_\_\_\_

33. What is your race or ethnicity?

- |   |                                    |   |                               |
|---|------------------------------------|---|-------------------------------|
| 1 | Caucasian/White                    | 5 | Asian or Asian American       |
| 2 | American Indian or Alaska Native   | 6 | Hispanic or Latino            |
| 3 | Hawaiian or Other Pacific Islander | 7 | Two or more races/ethnicities |
| 4 | African American/Black             |   |                               |

34. What is your current marital status?

- |   |                           |   |            |
|---|---------------------------|---|------------|
| 1 | Married                   | 4 | Divorced   |
| 2 | Widowed                   | 5 | Separated  |
| 3 | Single/Never been married | 6 | Cohabiting |

35. What is your current employment status?

- |   |                                  |   |                                  |
|---|----------------------------------|---|----------------------------------|
| 1 | Employed full-time for wages     | 5 | Employed part-time for wages     |
| 2 | Out of work for more than 1 year | 6 | Out of work for less than 1 year |
| 3 | Homemaker                        | 7 | Student                          |
| 4 | Retired                          | 8 | Unable to work                   |

36. Circle the highest level of education you completed:

- 1 Grades 1 through 8 (Elementary or middle school)
- 2 Grades 9 through 11 (Some high school)
- 3 Grade 12 or GED (High school graduate)
- 4 College 1 year to 3 years (Some college or technical school)
- 5 College 4 years (College graduate)
- 6 Master's Degree
- 7 Doctoral / Professional Degree

37. Circle the highest level of education **your spouse/partner/significant other** completed:

- 1 Grades 1 through 8 (Elementary or middle school)
- 2 Grades 9 through 11 (Some high school)
- 3 Grade 12 or GED (High school graduate)
- 4 College 1 year to 3 years (Some college or technical school)
- 5 College 4 years (College graduate)
- 6 Master's Degree
- 7 Doctoral / Professional Degree

38. Please tell me your approximate family/household income before taxes in 2010.

- |   |                     |    |                        |
|---|---------------------|----|------------------------|
| 1 | Less than \$5,000   | 8  | \$45,001 - \$60,000    |
| 2 | \$5,001 - \$10,000  | 9  | \$60,001 - \$75,000    |
| 3 | \$10,001 - \$15,000 | 10 | \$75,001 - \$100,000   |
| 4 | \$15,001 - \$20,000 | 11 | \$100,001 - \$125,000  |
| 5 | \$20,001 - \$25,000 | 12 | \$125,001 - \$150,000  |
| 6 | \$25,001 - \$35,000 | 13 | Greater than \$150,000 |
| 7 | \$35,001 - \$45,000 |    |                        |

39. In the past 12 months, has your family received public assistance, including welfare benefits or food stamp

benefits (i.e., Supplemental Nutrition Assistance Program, or SNAP)?

1 No

2 Yes

40. Since your children were born, has there ever been a period of one month or more when you worried

whether your family would go hungry or would have enough food?

1 No

2 Yes

41. What is your zip code? \_\_\_\_\_

## VITAE

Christy Freadreacea Brady

### Education

University of Kentucky

Master of Arts, Sociology

Graduate Certificate, Gender and Women's Studies

Bachelor of Arts, Sociology and English

### Professional Positions

University of Kentucky

Lecturer, College of Public Health

Instructor, College of Arts & Sciences

Instructor, Undergraduate Education

Academic Advisor, Undergraduate Studies

Assistant Registrar, Enrollment Management

### Scholastic and Professional Honors

University of Kentucky

Wilkinson Award for Outstanding Paper in Work, Medical, and Social  
Inequalities

Graduate Student Teaching Award

### Professional Publications

Brady, C. (2016). Decreasing Obesity and Obesity Stigma: Socio-Demographic Differences in Beliefs about Causes of and Responsibility for Obesity. *Social Sciences*, 5(1), 12.