Food Swamps, Obesity & Health Zoning Restrictions on Fast Food Restaurants

by

Kristen Cooksey Stowers

Department of Public Policy Studies
Duke University

Date:_____

Approved:

_____
William A. Darity, Co-Supervisor

_____
Kelly D. Brownell, Co-Supervisor

_____
Vincent Joseph Hotz

_____
Mary Story

_____
Jay Allen Pearson

Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
Public Policy Studies in the Graduate School
of Duke University

2016

ABSTRACT

Food Swamps, Obesity & Health Zoning Restrictions on Fast Food Restaurants

by

Kristen Cooksey Stowers

Department of Public Policy Studies
Duke University

Date:_____
Approved:

_____
William A. Darity, Co-Supervisor

_____
Kelly D. Brownell, Co-Supervisor

_____
Vincent Joseph Hotz

_____
Mary Story

_____
Jay Allen Pearson

An abstract of a dissertation submitted in partial
fulfillment of the requirements for the degree
of Doctor of Philosophy in the Department of
Public Policy Studies in the Graduate School of
Duke University

2016

Abstract

Protecting public health is the most legitimate use of zoning, and yet there is minimal progress in applying it to the obesity problem. Zoning could potentially be used to address both unhealthy and healthy food retailers, but lack of evidence regarding the impact of zoning and public opinion on zoning changes are barriers to implementing zoning restrictions on fast food on a larger scale. My dissertation addresses these gaps in our understanding of health zoning as a policy option for altering built, food environments.

Chapter 1 examines the relationship between food swamps and obesity and whether spatial mapping might be useful in identifying priority geographic areas for zoning interventions. I employ an instrumental variables (IV) strategy to correct for the endogeneity problems associated with food environments, namely that individuals may self-select into certain neighborhoods and may consider food availability in their decision process. I utilize highway exits as a source of exogenous variation .Using secondary data from the USDA Food Environment Atlas, ordinary least squares (OLS) and IV regression models were employed to analyze cross-sectional associations between local food environments and the prevalence of obesity. I find even after controlling for food desert effects, food swamps have a positive, statistically significant effect on adult obesity rates.

Chapter 2 applies theories of message framing and prospect theory to the emerging discussion around health zoning policies targeting food environments and to explore public opinion toward a list of potential zoning restrictions on fast-food restaurants (beyond moratoriums on new establishments). In order to explore causality, I employ an online survey experiment manipulating exposure to vignettes with different message frames about health zoning restrictions with two national samples of adult Americans age 18 and over (N_1=2,768 and N_2=3,236). The second sample oversamples Black Americans (N=1,000) and individuals with high school as their highest level of education. Respondents were randomly assigned to one of six conditions where they were primed with different message frames about the benefits of zoning restrictions on fast food retailers. Participants were then asked to indicate their support for six zoning policies on a Likert scale. Subjects also answered questions about their food store access, eating behaviors, health status and perceptions of food stores by type.

I find that a message frame about Nutrition and increasing Equity in the food system was particularly effective at increasing support for health zoning policies targeting fast food outlets across policy categories (Conditional, Youth-related, Performance and Incentive) and across racial groups. This finding is consistent with an influential environmental justice scholar's description of "injustice frames" as effective in mobilizing supporters around environmental issues (Taylor 2000). I extend this rationale to food environment obesity prevention efforts and identify Nutrition

combined with Equity frames as an arguably universal campaign strategy for bolstering public support of zoning restrictions on fast food retailers.

Bridging my findings from both Chapters 1 and 2, using food swamps as a spatial metaphor may work to identify priority areas for policy intervention, but only if there is an equitable distribution of resources and mobilization efforts to improve consumer food environments. If the structural forces which ration access to land-use planning persist (arguably including the media as gatekeepers to information and producers of message frames) disparities in obesity are likely to widen.

Dedication

I dedicate my dissertation to Daniel Stowers, Naomi Stowers, Phoebe Stowers (husband and daughters), Stacey and Marcus Cooksey (parents), Brenda J. Bell (grandmother), Cecelia L. Donald (great-grandmother), as well as Kristena Cooksey, Krista Cooksey and Kristalyn Cooksey (my sisters).

Contents

Abstract vi

List of Tables xv

List of Figures xvi

Acknowledgements xvii

Introduction 1

Background: The Obesity Problem 1

Environmental and Structural Considerations of Obesity 2

Institute of Medicine Systems Approach to Obesity Prevention: Zoning Out Fast Food on the Agenda 3

Land-Use & Zoning 4

Zoning and Health 5

Zoning to Address Obesity 6

More Scientific Evidence Needed About Zoning Restrictions on Fast Food 7

Overview of Dissertation 7

Chapter 1: Food Swamps? The Effect of Imbalanced Food Environments on Obesity: An Instrumental Variables Approach 9

Introduction 9

Background 11

Conceptual Framework 13

Literature Review 15

Food Environment Measures 18

Study Objectives 20
Measures 23
Dependent Variable Adult Obesity 23
Independent Variable: Food Swamps 24
Covariate 27
Empirical Test 32
Description of Data Sources 32
Statistical Approach 32
OLS 33
IV 35
Results 36
Descriptive Statistics 36
Bivariate Analysis 39
OLS Regression Results 41
IV Regression Results 44
Discussion and Conclusion 45
Food Swamps vs. Food Deserts 45
Food Swamp Measures 45
OLS vs. IV 46
Neighborhoods Characteristics 47
Chapter 2: Health Zoning: How Framing Influences Public Opinion of Land-Use Regulations Restricting Fast Food Restaurants 48

Introduction 48
Problem Statement 48
Significance 51
Background 53
Literature Review 58
Conceptual Framework 62
Purpose of the Study 67
Overview of Studies 73
Study 1 vs. Study 2 73
Independent Variable: Zoning Fast-food Frames 76
Dependent Variable: Support for Health Zoning Policies 77
Cognitive Interviews 81
Procedure 82
Study 1 84
Methods 85
Experimental Design 86
Results 89
Descriptive Statistics 90
Ordered Probit Results: Unadjusted 97
Ordered Probit Regression Results: Adjusted Estimates 102
Discussion 105
Study 2 109

Methods 111
Participants 111
Experimental Design 112
Results 114
Descriptive Statistics 114
Ordered Probit Results: Unadjusted 122
Ordered Probit Regression Results: Adjusted Estimates 128
Discussion 147
General Discussion 150
Overview of Key Findings and Policy Implications 150
Key Findings by Study Objectives 1, 2 & 3 151
Study 1 vs. Study 2 153
Study Limitations 156
Strengths & Contributions 157
Future Work 159
Chapter 3: Conclusions and Implications for Public Policy and Research 161
Evidence 162
Issues of Liberty and Equity in Designing Zoning Policies Targeting Fast Food Establishments 164
Appendix A: Chapter 1 169
Appendix B: Chapter 2 (Study 1) 177
Survey Instrument 177

Sample 1 Power Calculation 192
Ordered Probit Regression Results: Unadjusted Estimates 193
Ordered Probit: Adjusted Estimates (Control As Baseline Group) 194
Appendix C: Chapter 2 (Study 2) 200
Sample 2 Power Calculation 200
Ordered Probit: Adjusted Estimates (Control As Baseline Group) 201
References 207
Biography 226

List of Tables

Table 1. Food Swamp Measures for Sensitivity Analysis 25

Table 2. Descriptive Statistics (n=3,140) 36

Table 3. OLS Estimates of Food Swamps on Obesity (Controlling for Food Desert Effect), N=3,108 42

Table 4. IV Coefficient Estimates of Food Swamps on Obesity, N=3,108 43

Table 5. Municipalities with Zoning Restrictions on Fast Food Restaurants 56

Table 6. Characteristics of Survey Respondents Compared with National Rates, 2015 (N=2,768) 89

Table 7. Marginal Effects After Ordered Probit Regression Results w/ No Covariates 99

Table 8.Message Frames that Increased Likelihood of Support 102

Table 9. Characteristics of Survey Respondents Compared with National Rates, 2016 (N=3,389) 114

Table 10. Marginal Effects After Ordered Probit Regression Results w/ No Covariates 122

Table 11. Marginal Effects After Ordered Probit Regression Results w/ No Covariates, Full Sample 125

Table 12. Marginal Effects After Ordered Probit, Full Sample 128

Table 13. Marginal Effects After Ordered Probit, Full Sample 132

Table 14. Marginal Effects After Ordered Probit, Black Subsample 136

Table 15. Message Frames that Increased Likelihood of Support 140

Table 16. Marginal Effects After Ordered Probit, Full sample 144

Table 17. Message Frames that Increased Likelihood of Support 154

List of Figures

Figure 1. Relationship between Zoning, Food Environment, Diet & Obesity (Tanner 2013) 5

Figure 2. Adult Obesity Rate by County 24

Figure 3. Experimental Design (Randomized to 1 of 6 Conditions) 86

Figure 4. Party Affiliation (Convenience Sample) 90

Figure 5. Health Status (Convenience Sample) 91

Figure 6. Characteristics of Fast-Food Restaurants (Convenience Sample) 93

Figure 7. Culpability of Fast Food Retailers in the Obesity Epidemic (Convenience Sample) 94

Figure 8. Healthy' vs. 'Unhealthy' Food Stores (Convenience Sample) 95

Figure 9. Frequency of eating at a Fast Food Restaurant (Convenience Sample) 96

Figure 10. Experimental Design (Randomized to 1 of 7 Conditions) 112

Figure 11. Health Status (Proportional Sample) 116

Figure 12. Role of Government in Addressing Obesity (Study 2 Proportional Sample vs. Study 1 Convenience Sample) 117

Figure 13. Characteristics of Fast-Food Restaurants (Proportional Sample) 118

Figure 14. Culpability of Fast Food Retailers in the Obesity Epidemic (Proportionally Matched) 120

Figure 15. Healthy' vs. Unhealthy Food Stores (Convenience Sample) 120

Figure 16. Fast food Frequency (Proportional Sample) 121

Acknowledgements

I'd like to thank my chairs Kelly and Sandy and my other committee members – Jay, Joe and Mary-for their support as my dissertation evolved.

Introduction

Background: The Obesity Problem

The policy problem addressed here is the prevalence of obesity in the United States. According to the American Heart Association, the nation is in a full blown obesity epidemic where 35 percent of adults are obese (78.4 million people age 20 or older). In addition to the high costs associated with obesity that are born through social programs like Medicare and Medicaid, I contend that the obesity epidemic threatens American's happiness and well-being and should be considered a matter of injustice and inequity.

Through my dissertation, I use the terms "equity" and "inequity" specifically referring to *social equity*. Aligned with Rawls' Difference Principle and Theory of Justice, the concept of social equity involves proportional reallocation of resources and opportunity to the marginalized and social disadvantaged groups (Altham 1973, Hammond 1976). Here, "equity" also refers to the general spirit of justice, fairness, rights and equality across the social gradient (Hart 1974, Frederickson 2005). In regards to the obesity problem, as access to health-promoting resources are concentrated among privileged Americans, experts are now concerned with widening disparities in the prevalence of obesity among communities of color and other vulnerable populations (Glickman, Parker et al. 2012).

Obese individuals are highly stigmatized which adversely affects their well-being (Puhl and Heuer 2009). Also, obesity has been associated with adverse labor market outcomes like lower earnings and $208 billion in lost productivity secondary to premature morbidity and mortality (American Heart Association, 2013).

Environmental and Structural Considerations of Obesity

Structural rather than individual-level interventions appear more promising in deriving policy solutions for the obesity epidemic. Local food environments and food systems are key areas where structural interventions have been considered (Steeves, Martins et al. 2014). Work has been done on access to healthy foods, but much less attention has been paid to fast food and junk food access. The Obama administration has focused on the Healthy Food Financing Initiative to build grocery stores in food deserts that lack access to healthy foods. Such an approach does not recognize that other food sources or retailers promoting and selling less healthy foods may be just as important. The term "food swamp" is a spatial metaphor referring to neighborhoods where fast food and junk food inundate healthy alternatives (Rose, Bodor et al. 2009).

Institute of Medicine Systems Approach to Obesity Prevention: Zoning Out Fast Food on the Agenda

The Institute of Medicine (IOM) 2012 report on accelerating obesity prevention set a goal to "Create food and beverage environments that ensure that healthy food and beverage options are the routine, easy choice". The report emphasizes that governments and decision makers work toward reducing the availability of unhealthy foods in addition to increasing access to healthier choices (McGuire 2012). The committee includes zoning as one strategy to encourage health-promoting food and beverage retailing and to limit the density of unhealthy food retailers in underserved neighborhoods.

There are several examples of municipalities throughout the country that have introduced quotas, limited bans on formula restaurants (characterized as chains that have standardized menus and appearance), and wholesale prohibitions. Most of the communities where efforts to zone out fast food have been successful are predominantly white and affluent (Kwate, Yau et al. 2009, Rossen and Pollack 2012). Empirical research suggests that residential segregation, discriminatory planning, and exclusionary zoning play a major role in unequal development. The same is true of neighborhoods being undersupplied with "health-promoting resources" (like parks and gyms) and oversupplied with "health-restricting resources" (such as fast food and liquor stores)

(Wilson, Hutson et al. 2008). Thus, more equitable application of zoning as an obesity prevention tool for disenfranchised populations will be addressed in my dissertation.

Land-Use & Zoning

Zoning is the primary tool used by governments to control land use, and, consequently, shapes neighborhood built environments (Cannuscio, Tappe et al. 2013). Regulating land use is a legitimate use of government's police powers best described as "the authority of the state (and, through delegation, local governments) to enact laws and promulgate regulations to protect, preserve, and promote the health, safety, morals, and general welfare of the people" (Ashe, Jernigan et al. 2003). It is used to designate lots for specific purposes including residential, commercial, institutional or industrial. Thus, it has a direct impact on the health outcomes resulting from land use (Rossen and Pollack 2012). There is growing interest in how zoning can be employed to develop healthy communities across the United States. As a caveat, my dissertation focuses on health zoning strategies as they apply to improving food environments. However, this application of health zoning is one of many in terms of public health-related issues. Relating to obesity, previous studies on health zoning have focused on the relevance of neighborhood walkability and conduciveness to physical activity (Maantay 2002).

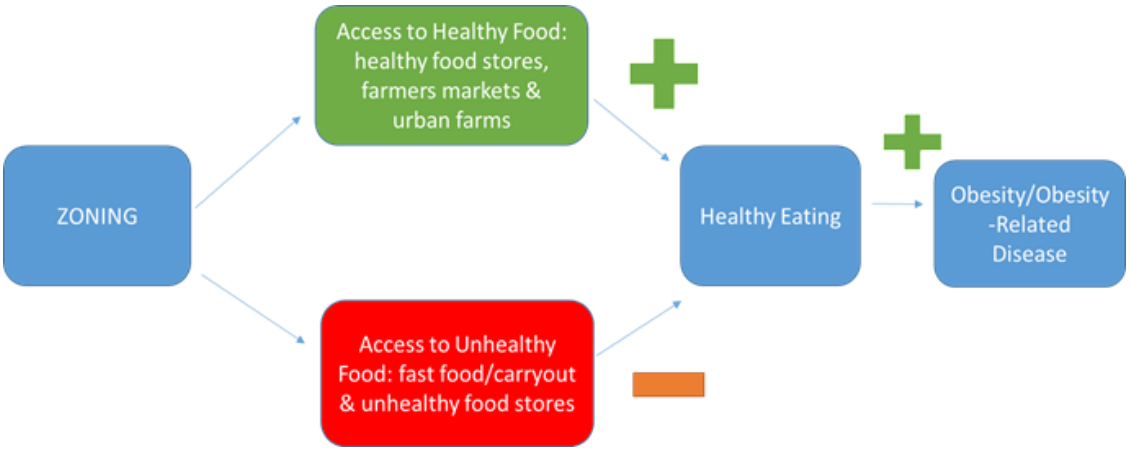


Figure 1. Relationship between Zoning, Food Environment, Diet & Obesity (Tanner 2013)

The model reflected in Figure 1 illustrates the underlying mechanisms that could link zoning changes to lower rates of obesity. Based on the scientific evidence, zoning may work to lowering the obesity prevalence by: 1) Simultaneously lowering the availability of less healthy food and increasing access to healthy food stores; 2) Improving diets (by altering environmental cues and therefore the neurological responses leading to liking, beliefs about consequences, ideas about food and diet etc.; and 3) Decreasing caloric intake.

Zoning and Health

While controversial today, using zoning to protect public health is not an unusual concept from a historical perspective. The fields of land use and zoning in fact developed as a way to respond to health crises in the 19th century (Ashe, Jernigan et al.

2003, Gostin 2007). It was first used to reduce transmission of communicable diseases and noxious industrial pollutants. The "Euclidean approach" to zoning (also described as the doctrine of separate uses) was both appropriate in the context of dirty, industrial practices, waste disposal issues and spontaneous fires and explosions. In the past, separating land used for home and work was a practical approach to protecting public health and welfare. Today, facing challenges like obesity as a risk factor for serious chronic diseases (Ding and Gebel 2012), a Euclidean (vs. mixed-used) approach can be regarded as more health-restricting than health-promoting (Hirschhorn 2004, Rossen and Pollack 2012). Zoning for health has been employed to reduce the public health impacts of alcohol, tobacco, and firearms (Wilson, Hutson et al. 2008). Critics of land use regulations assert that zoning is paternalistic, that government should not determine values for its citizens, and that food purchases should be part of a free marketplace (Hirschhorn 2004, Ashe, Graff et al. 2011).

Zoning to Address Obesity

Proponents argue that there is no better use of zoning than to protect public health. Opponents of 'health zoning' for food stores argue that it could potentially hurt communities that rely heavily on bodegas, corner stores, and fast food restaurants because there is limited access to major grocery retailers. They also contend that it fails to address other aspects of unhealthy behavior like physical inactivity (Gostin 2007).

More Scientific Evidence Needed About Zoning Restrictions on Fast Food

Currently, lack of scientific evidence undermines the following critical components for zoning in the context of nutrition and obesity: 1) Establishing standards (e.g., restrictions on locations of fast food restaurants, closing times, distances from public places); 2) Defining terms such as 'fast-food restaurant,' 'formula restaurant,' carryout to avoid enforcement challenges; 3) Prioritizing specific areas meeting the criteria of 'food deserts' or 'food swamps' so that developers in these neighborhoods are eligible for incentives (this approach will also cut down on costs); and) Mobilizing community members and leaders.

Overview of Dissertation

I aim to contribute new knowledge about health zoning restrictions on fast food as an obesity prevention strategy. My dissertation includes two empirical papers addressing two particular gaps in the literature, the potential effectiveness of these zoning policies and framing the issue in order to bolster public support for health zoning.

- Chapter 1 provides addresses the issue of whether the presence of food swamps or food deserts more strongly predicts county-level obesity rates.
- Chapter 2 presents results from an online survey experiment assessing framing effects on public support for zoning restrictions on fast food.

- Chapter 3 discusses implications for public policy and research using a previously published framework for evaluating obesity prevention in terms of the adequacy of available evidence, liberty and equity.

Chapter 1: Food Swamps? The Effect of Imbalanced Food Environments on Obesity: An Instrumental Variables Approach

Introduction

The American obesity epidemic is a major health crisis; two out of three people are either overweight or obese -- a proportion that nearly has doubled since the 1980s. The purpose of this study is to investigate the relationship between "food swamps" (defined as areas inundated with unhealthy food options) and the prevalence of obesity. Built environment considers "modifiable features of neighborhood environments" such as retail food outlets or areas conducive to physical activity and "walkability" (Zick 2009). In this paper, I will focus on local food availability as one aspect of a community's built environment (Booth 2005). This paper will focus primarily on retail food environments, including access to grocery stores, supercenters, farmers markets, produce markets, convenience stores, as well as fast food restaurants.

More specifically, this study will explore the phenomenon termed "food swamps"– "areas in which large amounts of energy-dense foods inundate healthy food options" (Rose, Bodor et al. 2009). Much of the food access literature has stressed the importance of "food deserts", locations with little or no access to grocery stores, to explain the rapid rise in obesity rates over the last few decades. However, the consensus is that the causal pathway between food access and BMI remain unclear and having

access to unhealthy food options may be more critical than access to healthy foods. In which case, "food swamps" where there is an overabundance of high-energy, high-calorie foods relative to more nutritious options would better explain disparities in the prevalence of obesity rates than food deserts (Ver Ploeg et al. 2009).

The purpose of this paper is to address the following question: What is the effect of food environments characterized as food swamps on adult obesity? Additional key objectives include:

- Operationalizing the definition of a food swamp, a spatial metaphor comparable to food deserts.
- Presenting multiple ways of categorizing food environments in order to identify county-level food swamps, and food deserts.
- Introducing more comprehensive versions of the Retail Food Environment Index (RFEI) to include food store types outside of grocery or convenience stores and fast food restaurants.
- Correcting for the endogeneity problems associated with food environments and where individuals choose to live by taking an Instrumental Variables (IV) approach in addition to OLS regressions
    - Examining causal links

Background

Obesity is best described as excess body weight and can be measured by calculating a person's body mass index (weight in kilograms divided by height in meters squared). Although this measure has some limitations as an indicator of obesity, including establishing accurate thresholds for women, it remains a respected screening tool with major implications for public health policy. Obesity is associated with major causes of death and disability (Glickman, Parker et al. 2012). It increases an individual's risk of heart disease, high blood pressure, high cholesterol, arthritis, diabetes, stroke, gallbladder disease and certain types of cancers. Obese adults may also experience social stigmatization, depression or other psychological problems as well as discrimination ("Healthy People 2020", 2012). As a result of adverse obesity-related health outcomes like Type II diabetes and 300,000 preventable deaths a year, the federal government is also burdened by substantial costs of the obesity epidemic through programs like Medicare and Medicaid. In America, the total annual cost of obesity is approximately $147 billion -an alarming figure that only became more critical within the context of a budget deficit and reform of the U.S. healthcare system (American Heart Association, 2013).

There has been substantial discussion in the media regarding the causes of the U.S. obesity epidemic including potential risk factors such as the recent economic

recession, lack of exercise and poor eating habits. Child obesity has become a major media topic and has served as a key political agenda item since the beginning of the Obama administration with the launch of initiatives like Michelle Obama's Let's Move Campaign. Although, in recent years, child obesity has received considerable media attention and rates are seemingly declining in the U.S., [1]adult obesity remains a concern (American Heart Association, 2012). At the population level, there is evidence to suggest that the prevalence of obesity is improving in some subpopulations, but without much improvement among low-income or minority groups (Glickman, Parker et al. 2012). This could have serious implications for public health as it would result in widening health disparities.

Momentum behind initiatives to fight the obesity epidemic and improve food environments has grown at the federal level. This outlook was officially recognized by the Department of Health and Human Service in 2001 when former Surgeon General David Satcher, M.D., Ph.D. issued a call to action for key stakeholders (including doctors, community organizations, educators and researchers) to work together to establish solutions for lowering obesity. To reiterate, key environmental determinants of obesity such as food access were stressed more than individual weight management. In

[1] A Vital Signs report released from the Center for Disease Control and Prevention (CDC) obesity rates among low-income preschoolers modestly declined in 19 U.S. states and territories between 2008 and 2011 http://www.letsmove.gov/blog/2013/08/06/evidence-progress-new-cdc-report-shows-declines-childhood-obesity-rates-among-low-in

2010, Surgeon General Regina M. Benjamin announced that she would expand the 2001 call to action by promoting the development of creative, grassroots interventions geared toward healthy eating, physical activity, and stress management across the country (Jackson, Dietz et al. 2002). In 2012, an Institute of Medicine committee was tasked with identifying strategies to accelerate obesity prevention efforts over the next ten years (Glickman, Parker et al. 2012).

Conceptual Framework

A simple ecological model of obesity depicts an individual or population obesity level as a "settling point", or the net result of multiple influences that impact fat mass. Including biological factors, this model reflects the role environments like neighborhoods play in shaping eating and exercise behaviors (Egger and Swinburn 1997). These behaviors in turn determine whether the inflows and outflows of energy are in equilibrium or whether the net value leads to weight loss or weight gain. Social Ecological Models (SEM) of Obesity represent a more nuanced, multilevel version of the societal factors which shape obesity. This model encompasses variation in individual characteristics (i.e. race, SES), access to recreational facilities and food retail establishments as a whole (environmental settings), the role of community design and industry (i.e. food and beverage) and the social environment (social norms, safety, body

image, etc.) (Ver Ploeg et al. 2009, Affenito, Franko et al. 2012, Glickman, Parker et al. 2012).

These ecological models are a sound starting point for understanding the interrelationships between individuals and their environment. The SEM aligns well with the Food Environment Hypothesis which stipulates people in "food deserts" lack access to grocery stores and, thus, produce at affordable prices. Under this hypothesis, "food swamps" dense with fast food restaurants and other quick service food outlets, do not perpetuate health-promoting food spending patterns. This is because people are overwhelmed by a marketing environment where unhealthy foods are cheap and more readily available relative to healthier food options (Wilde, Llobrera et al. 2012). This focus on the relative balance between unhealthy and healthy food options necessitates thinking about food stores more comprehensively including access to convenience stores, supercenters, farmers' markets, and produce markets, for instance.

These models do not fully reflect the interconnectedness or mutuality between domains in that the direction of influence may be more complex. For instance, Figure 1. reflects a link between demographic factors and their food environments, but the direction of the causal arrow is uncertain. A review of fast food access studies found 10 out of 12 studies providing evidence that fast food restaurants are more likely to locate

in areas where there are higher concentrations of ethnic minorities than Caucasians (Fleischhacker, Evenson et al. 2011).

This would imply that race and ethnicity shapes actions from key sectors of influence (i.e. the food industry's marketing practice or decisions made about community design), and thus, access in the food environment. It is unclear whether the SEM above can account for this empirical evidence. In addition, there is a reverse causality problem. Observational studies tend to assume a one-way arrow where the food environment shapes health behaviors and health outcomes. However, as some researchers have pointed out (Ver Ploeg et al. 2009, Dunn 2010, Anderson & Matsa 2011, Dunn et al. 2012), individuals self-select into neighborhoods. Also, considering the relationship between sectors of influence and the environment, food companies choose where to locate but this is most likely affected by other establishments that are already there. Studies aiming to assess causal links between food environments and health outcomes must adjust for individuals sorting into neighborhoods using experimental designs or advanced statistical methods.

Literature Review

Early studies established an association between obesity and individual-level factors such as genetics, demographics, and behavior. Although, genetic disorders like Bardet-Biedl and Prader-Willi syndromes both frequently cause obesity, the rapid

emergence of the obesity epidemic suggests dramatic changes in non-genetic factors (Hill 2000). A second wave of publications on adult obesity reached a consensus on the impacts of individual level, non-genetic factors like behaviors resulting in long-term energy imbalance (excessive caloric intake in comparison to expenditure). However, the emphasis on these determinants has proven insufficient to explain the rapid increase in U.S. obesity rates since the late 1970s. Over time, papers published on this topic increasingly call for further studies investigating the effects of environmental factors.

A growing body of literature focusing on food access and the impact of the food environment on obesity has evolved from the paradigm shift from a concentration on individual-level factors to environmental factors. Recent attention to the food environment stems theories that food access influences diet and, for this reason, weight (Neckerman et al. 2009). Research suggests that the food environment is associated with diet and health because people are more likely to consume fruits and vegetables and are less likely to be obese if they live near a grocery store (Morland et al. 2006). Alternatively, eating at fast food restaurants has been linked to increased caloric intake, higher consumption of sweetened beverages, lower intake of fruits and vegetables and increased risk of obesity (Babey et al. 2008).

The food access literature has concentrated on "food deserts", exploring how lack of access to grocery stores impacts weight. "Food deserts" were defined in the Food,

Conservation and Energy Act of 2008 as "areas with limited access to affordable and nutritious food" (Ver Ploeg et al. 2009). They were initially believed to be the primary driver of the national obesity epidemic where more localized studies of this phenomenon established a positive correlation between low access to healthy food outlets and obesity.

However, the Economic Research Service's 2009 report to Congress made this argument less convincing revealing that only a small percentage (2.2%) of Americans are limited in access to healthy food choices. Thus, the obesity problem may have less to do with access to healthy food options and more to do with access to non-healthy foods (Ver Ploeg et al. 2009). In exploring possible reasons for the rise in obesity, the literature now points to "food swamps" where the availability of fast food and energy-dense snack foods is high relative to healthier choices (Rose, Bodor et al. 2009). The food swamp phenomenon differs from the literature on food deserts in that it considers the relative balance in county-level food environments of all types rather than distance to supermarkets only among low-income neighborhoods. This distinction results in a different subset of relevant policy options.

Research has been conducted examining access to fast food restaurants, but it suffers from three main shortcomings: 1) mixed results on the effect of proximity to unhealthy food outlets on obesity (Jeffery et al. 2006), 2.) the lack of county-level studies

of food environments and on the relationship between access to unhealthy food options and weight, and 3.) a dearth of studies exploring the "food swamp" phenomenon as a key contributor to the rapid rise in obesity rates.

In the next few sections, I will discuss the existing gaps in the literature more in-depth as well as explain how the current study will attempt to address them.

Food Environment Measures

There are a variety of ways to conceptualize food environments including at the community level (resources within a community) versus the consumer level (resources within retail stores) (Glanz 2005). Caspi et al. conduct a systematic review of local food environments and diet using a conceptual model focusing on 5 key dimensions of food access including: Availability (adequacy of the supply of healthy food), Accessibility (location of the food supply), Affordability (food prices and perception of cost), Accommodation (adaptation to local needs) and Acceptability (people's attitudes about their local food environment) (Caspi 2012). Motivated by zoning strategies aimed at altering the built food environment, this study specifically focuses on the concept of Availability in community food environments as I include density measures in my statistical analyses. Also, it is important to note that in this study, I categorize food environments at the county-level. Some (community) food environment studies create individual-level (.5 mile) food environments based on home addresses. While there are

strengths associated with more micro-level food environments, increasingly, evidence suggests it may be important to broaden the scope to where people live, work and play. Additionally, land-use laws are implemented at the county and city-level. So, the results of this study might serve as the foundation of an identification strategy for municipalities that would most benefit from introducing health zoning laws.

Still, there are a variety of ways researchers have approached data collection in assessments of local food environments including: business lists/directories and census data, focus groups, food store assessments, food use inventories, GIS technology, interviews, inventory for measuring perceptions of food access, as well questionnaires/surveys (Walker et al. 2010). Using USDA Food Environment data (originally from U.S. Census Bureau, County Business Patterns and the USDA Agricultural Marketing Service), I aim to make a contribution to the literature by assessing aggregated food environments (and obesity rates).

Walker et al. conducted a systematic review of food desert literature concluding with a call for researchers to consider food outlets beyond grocery stores. They write: While it is important to identify places that offer healthy foods within a neighborhood, it is equally important to identify the places within a neighborhood that can offset these locations. These factors are important for developing and implementing individual and

community-level interventions that increase access to healthy foods, influence food buying practices, and facilitate healthy eating (Walker et al. 2010).

Study Objectives

This paper aims to complement this body of knowledge by 1.) investigating the applicability of the "food swamp" hypothesis to obesity in America, 2.) offering a more aggregated unit of analysis for state or federal level policy purposes, and 3.) making an attempt to operationalize Rose's food swamp definition in efforts to assess the quality of U.S. food environments (Rose, Bodor et al. 2009) and 4.) aiming to examine causality.

First, this paper will address existing gaps in the literature on food environment and health outcomes by exploring the "food swamp" phenomenon as it pertains to the U.S. and its impact on obesity rates. Second, in taking a county-level approach, my research contributes to the literature in its attempt to test the effect of food access on obesity more definitively than previous studies using a unit of analysis that is more aggregated than local communities (Chen et al. 2009, Spence et al. 2009, Currie et al. 2010), but less aggregated than state level (Chou 2004, Maddock 2004). The CDC data used here allows for a more disaggregated analysis of food environments nationwide than the state-level approach taken in the Chou paper. Furthermore, this study mimics the Blanchard paper in its county-level approach, but goes a step further to consider all

U.S. regions (rather than just those in the South) as well as impacts on obesity (Blanchard & Lyson 2006).

A third contribution this study will make is that it addresses the need for additional studies exploring the influence of the "food swamp" phenomenon. While some research has been done on "food swamps" abroad (Woodham 2009), this study is novel in its approach in that no previous papers have attempted to operationalize the concept of "food swamps" as it pertains to food environments in the United States and identify geographic areas as "food swamps" as the USDA Economic Research Service has done with "food deserts" in its Food Desert Locator. This study's approach of identifying counties that meet the criteria of a "food swamp" based on their RFEI, can potentially overcome limitations of previous studies by considering the relative balance between various types of outlets in a food environment rather than just distance to grocery stores or density of restaurants alone.

In a recent review of the literature on neighborhoods environments, food availability and obesity, Penny Gordon-Larsen (Gordon-Larsen 2014) identifies several limitations including a lack of statistical models that are comprehensive and account for individuals potentially migrating near certain facilities. As a fourth contribution, I aim to contribute to the literature by examining density measures of food outlets that can be used to identify "food swamps" and using statistical modeling to control for

individuals' choices about where they live. This current study is most similar to Richard Dunn's paper on the effect of fast-food availability by gender, race, and residential location in that it employs an instrumental variables strategy using the number of highway exits. His paper also examines county-level variation in weight outcomes. Previous papers have also attempted to make statistical adjustments to account for unobserved characteristics that may influence where individuals and food retailers choose to locate. However, they lack generalizability because their sample only includes one county (Chen & Florax 2010), a small subset of rural areas (Anderson & Matsa 2011; Dunn et al. 2012) or pregnant mothers (Currie et al. 2009). Like Dunn (2010), I investigate the relationship between food access and obesity adjusting for self-selection, but considering all counties in the U.S.

However, I build upon his paper in several important ways including using more recent CDC Behavioral Risk Factor Surveillance System data, and utilizing food store data from the USDA Food Environment Atlas which is a compilation of several government sources and classifies an array of food stores based on the North American Industry Classification System (NAICS). In his paper, Dunn uses self-collected data from internet search engines and only includes counts for a subset of fast-food retailers such as McDonalds, Burger King, and KFC. My analysis is broader in scope in that I aim to operationalize the concept of "food swamps" that more holistically considers the balance

between healthy and unhealthy food store types in an area, and I control for food deserts and conduciveness to physical activity. In contrast, Dunn does not incorporate access to healthy food stores, fitness centers or parks in his analysis. Finally, my study characterizes food environments comparing several different density measures in contrast to Dunn (2010) which primary categorizes food environments based on counts of fast food restaurants.

Measures

Dependent Variable Adult Obesity

The dependent variable in this study is adult obesity rate measured as the age-adjusted percentage of persons age 20 and older who are obese. People are considered obese if they have a body mass index (BMI) greater than or equal to equal to 30 kilograms per meters squared. BMI remains a respected screening tool for obesity despite its limitations. The original data source for this variable was the Centers for Disease Control and Prevention (CDC) public database called the Behavioral Risk Factor Surveillance Systems (BRFSS). CDC BRFSS calculates aggregate levels of BMI by asking more than 500,000 respondents (nationwide) the following questions: "How tall are you without shoes?" and "About how much do you weigh without shoes?"[2] CDC BRFSS is the largest telephone survey in the world. Figure 2. illustrates the prevalence of obesity

[2] CDC BRFSS Questionnaire: http://www.cdc.gov/brfss/annual_data/pdf-ques/2009brfss.pdf

by county. **The yellow, orange and red dots captures counties where about 29-47 percent of the adults are obese.**

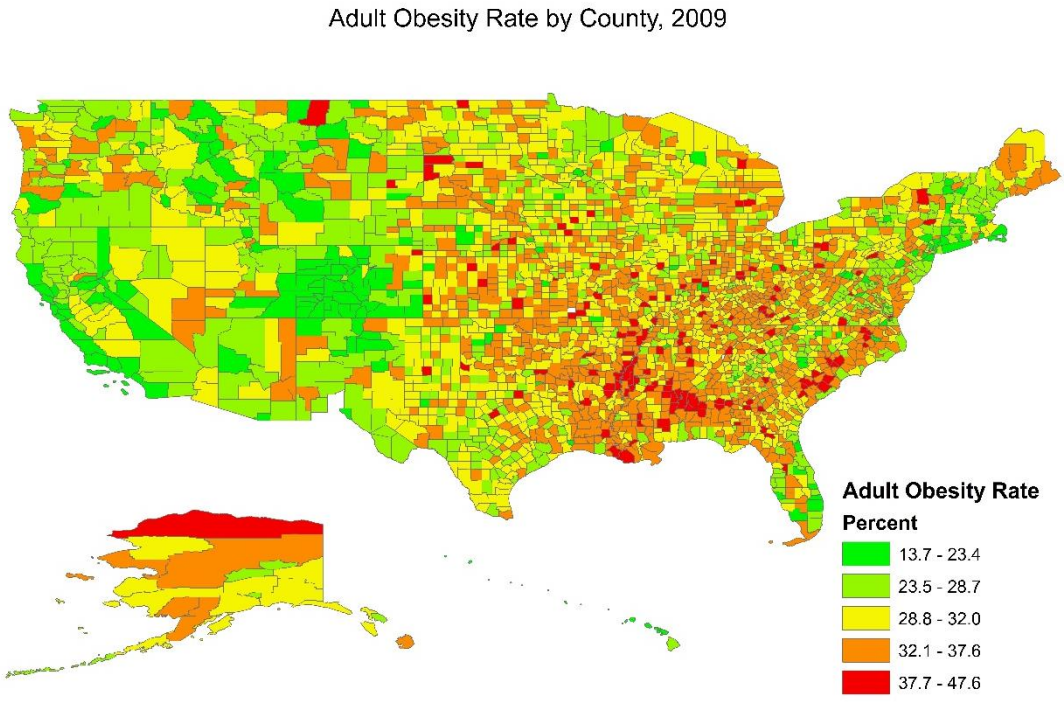


Figure 2. Adult Obesity Rate by County

Independent Variable: Food Swamps

The independent variable of interest is "food swamps" described as areas where unhealthy, energy-dense food options inundate healthy options. Given that the notion of "food swamps" is a relatively novel idea, it is important that the term be operationalized in order to form testable hypotheses.

I conducted a comparative analysis using several different measures of food swamps including the accepted Retail Food Environment Index (RFEI) to identify food swamps (Kelly et al. 2011). Refer to Table 1 for a full list of measures. RFEI is a useful measure indicating the importance of the relative density of food outlets. This study employs this "traditional RFEI" calculated as the ratio of fast food retailers and convenience stores to grocery stores (Kelly et al. 2011, Spence et al. 2009)

Table 1. Food Swamp Measures for Sensitivity Analysis

Measure	Description
Traditional RFEI (Spence et al)	$\frac{\text{Fast food restaurants + Convenience stores}}{\text{Grocery Stores}}$
Expanded RFEI #1	$\frac{\text{Fast food restaurants + Convenience stores + Supercenters}}{\text{Grocery Stores + Farmers markets + Specialized stores}}$
Expanded RFEI #2	$\frac{\text{Fast food restaurants + Convenience stores}}{\text{Grocery Stores + Farmers markets + Specialized stores + Supercenters}}$
Density Measure	Fast Food / 1,000 County Residents
Density measure 2	Fast Food / capita
Percentage	Number of Fast Food/ Total Food Stores

The RFEI measure assumes that fast food restaurants, full service restaurants and convenience stores are "unhealthy food outlets" and supermarkets, grocery stores and farmers markets are "healthy food outlets". Counties were considered food swamps if they were in the upper limits of the distribution for each food desert measure. I also propose two forms of "Expanded RFEI" in an effort to present a more holistic view of

food stores that might be present in a community beyond grocery stores, fast food restaurants and corner stores. Both Expanded RFEI also include supercenters, specialty stores (i.e. produce and meat markets) and farmers markets[3]. However, one measure includes supercenters in the numerator and the other in the denominator to account for the mixed evidence regarding the effect of establishments like Wal-Mart on obesity (studies show either positive or negative effects) (Jilcott et al. 2011). By comparing both forms of RFEI and their ability to explain variation in obesity, I can speak to whether the traditional RFEI (Spence et al. 2009) needs to be revised to include a broader selection of healthy food outlets so as not to understate or overstate the imbalance in food environments in U.S. counties.

Food swamps were determined based on four additional food access measures including: fast food restaurants per 1,000 residents as a density measure, a percentage measure (fast food retail of total food stores, a dummy variable equal to 1 if the RFEI is greater than 3.44 (the median) and a second dummy variable equal to 1 if the RFEI is greater than 4.75 (reflecting the upper quartile). The rationale for including two dummy variables is the idea that local decision makers or public health organizations are more likely to assess whether a neighborhood would benefit from a food environment intervention or not (rather than as a continuous measure).

---

[3] Spence et al. including the following in their RFEI: (Fast Food+ Convenience Store)/ Grocery Stores

Covariate

Food Deserts

I generated a county-level food desert dummy variable based on the same criteria USDA Economic Research Service used to identify food deserts at the census tract-level. Counties were considered a food desert if they were low income (poverty rate equal to 20 percent or more) and low access (more than 33 percent of the county was more than 1 mile from a supermarket/grocery store in an urban area or more than 10 miles in a rural area). The tables included within the paper examine the food swamp effect controlling for this continuous food desert measure.

Physical Activity

Ecological models of obesity illustrate energy balance (or levels of BMI) as a function of factors shaping 'energy in' (determined by the food environment), but also 'energy out' (determined by the calories expended during physical activity). The Food Environment Atlas includes the number of recreation and fitness facilities that feature exercise, physical fitness and recreational sports (NAICS code: 713940). The original dataset for this variable was the U.S. Census Bureau County Business Patterns. This compiled dataset also provides a Natural Amenities Index for each county originally from the ERS Natural Amenities Scale. The index is measured from 1 (low amenity) to 6 (high amenity), and is based on the premise that people are more inclined to be active

where there are lakes, ponds, or ocean fronts, warmers winters and summers with low-humidity [4].

Neighborhoods Characteristics

Matching on FIPS code, I merged data from the Food Environment Atlas with data from the 2010 U.S. Census and 2008-2013 American Community Survey to obtain more information pertaining to neighborhoods characteristics. Variables taken from the Census included: population, number of households, race (% white, % black and % Hispanic), gender (female), age groups (in four year intervals) and size (in square miles). Additional descriptive information about the counties including educational attainment, means of travel to work (car, public transportation, etc.) and level of equality (measured by the Gini Coefficient) was added from the American Community Survey.

Instrumental Variable: Highway Exits

I used ArcGIS data for my instrumental variable. This variable reflects the number of highway exits per county in 2009. About half of the sample of U.S. did not have highway exits. When the number of highway exits were mapped, there were fewer counties with exits moving toward the western region of the country.

---

[4] http://www.ers.usda.gov/datafiles/Food_Environment_Atlas/Data_Access_and_Documentation_Downloads/Current_Version/documentation.pdf

As a result of both individuals and food outlets sorting based on neighborhoods characteristics, food swamps are potentially endogenous. In other words, there may be a reverse causality problem where it is unclear whether access in the food environment determines BMI or if populations with higher BMI levels attract certain types of food retailers. Thus, one could not rely on the application of OLS to generate unbiased estimates since they are likely correlated with both observed and unobserved county characteristics. Alternatively, OLS estimates are biased if we suspect people decide where to live based on access to fast food and corner stores. If obese individuals simply move to areas where unhealthy food retailers inundate healthy options, we would overestimate the effect of food environments on obesity. A potential counterargument is that severely imbalanced food environments point to the food industry's predatory marketing practices. In this scenario, local governments may intervene on ethical grounds.

To derive an unbiased estimate of the effect of food environments characterized as food swamps, we must be convinced that they are independent of residuals (which would easily be the case if we could randomly assign every county to a certain category of food environment, but that would never happen!). Thus, I employ an instrumental variable strategy (IV) using the number of highway exits per county as an exogenous source of variation.

This IV approach requires that two conditions be met: 1.The chosen instrument be related to the potentially endogenous question predictor (X), and 2. *The exclusion restriction*-There is no direct path from instrument (Z) to outcome (Y) except through predictor (X).

Previous studies analyzing fast food access have found highways to be acceptable instruments (Anderson & Matsa 2011, Chen et al. 2009; Dunn 2010).The authors' underlying motivation for exploiting variation in highway exits stems from evidence of clustering of fast food retailers to take advantage of highway travelers (Alviola et al. 2014; Dunn 2010). Furthermore, considering historical evidence of the interstate highway exit system being created in the 1940s to link cities across the country[5] strengthens the case for highway exits as a legitimate instrument. Based on this information, they were built several decades before the rapid increase of obesity rates (so it is not likely that highway exits were simply built near more obese populations).

Despite several strengths, using highways as an instrument comes with some limitations. First, my regressions will yield LATE (Local Average Treatment) estimates vs. an ATE (Average Treatment Effect) estimates because they focus only on the part of the original variation in food environments that is sensitive to differences in the

[5] U.S. Department of Transportation Federal Highway Administration webpage: http://www.fhwa.dot.gov/programadmin/interstate.cfm

presence of highway exits per county. All other variation in food environments will no longer be used. In addition, this approach does not provide much information about counties whose food environment were not determined by highway exits. There were 1,672 counties with no highway exits. A previous study that used this instrument to examine the relationship between food environment and obesity also lost approximately half of their sample by taking this approach (Dunn 2010).

Dunn describes highways as an imperfect instrument since *a priori* we might imagine several scenarios where the density of highway exits potentially influences weight other than through "food swamp" environments. There are a few plausible threats to the exclusion restriction. First, gas stations selling snacks, quick meals and other high-calorie, convenience foods also cluster near highways. Second, more highways may influence the appeal of physical activity (i.e. walking or biking) due to more traffic congestion or pollution. Third, there is some evidence that the presence of interstates is associated with exercise for some subgroups. Drawing from the literature in order to adjust for a potentially weak instrument (Dunn 2010, Dunn et al. 2012, Anderson & Matsa 2011), I control for physical activity, median household income and race (threat 2 and 3). In the final stage of my analysis where I explore neighborhoods characteristics in depth, I stratify counties by their density of gas stations with convenience stores.

Empirical Test

Description of Data Sources

This paper uses 2009 data from the United States Department of Agriculture (USDA) Food Environment Atlas to assess the relationship between food environments considered "food swamps" and county obesity rates. This dataset is comprised of 211 food environment indicators for all 3,141 U.S. counties. The Food Environment Atlas is a compilation of many federal government sources including statistics on three important categories: 1. Food Choices. 2. Health and Well-being and 3. Community Characteristics. I used the following county-level measures in my analysis: obesity rates (% of the county that is obese), fitness centers, natural amenities (parks, ponds, etc.), grocery stores, supermarkets, farmers markets, specialized food stores, supercenters/club stores, fast food restaurants, convenience stores, gas stations with convenience stores, income/poverty, and metro vs. nonmetro status.

Statistical Approach

The primary outcome measure was the prevalence of adult obesity at the county-level. Statistical analyses were executed using STATA/SE version 14 software. Descriptive statistics were calculated for the sample for 3,141 U.S. counties. I compared mean values for the Food Store variables, the Food Environment Measures and key

demographics such as race, median household income, age, means of transport to work and Gini Index. The descriptive statistics are presented in Table 2.

The second phase of this study involved bivariate analysis. Pearson correlation coefficients were used to assess the relationship between obesity, highway exits and food swamp measures. Refer to Appendix Table 4. Correlational analysis was particularly used for exploring the association between food swamp and food desert variables to test the prediction that food swamps are a separate phenomenon than food deserts. See Appendix Table 3.

OLS

Also, I performed multivariate analysis to model county-level obesity rates as a function of the food swamp effect, the food desert effect, the interaction between a county being both a food swamp and a food desert (or neither), the number of recreation and physical fitness centers, the natural amenities index controlling for several neighborhood characteristics. I estimated an OLS regression model to test my predictions. See below for Equation 1

Equation 1 County Obesity rate=$ß_0 + ß_1$ *(food swamp)* $+ ß_2$ *(food desert)* $+ ß_3$ *(# of recreation and physical fitness centers)* $+ ß_4$ *(natural amenities)* $+ \Upsilon$ *(neighborhood characteristics)* $+ \epsilon$

This model builds upon one used by Chen et al. by incorporating food stores beyond fast food restaurants and grocery stores, and explicitly controlling for physical activity indicators but in the aggregate (rather than at the individual level) (Chen, Florax et al. 2009). Drawing from the existing literature on the relationship between built environment and obesity, it is expected that "food swamps" will have a stronger positive effect on obesity than food deserts even controlling for physical activity indicators and neighborhoods sociodemographics. This is inspired by evidence suggesting that access to grocery stores has less impact on diet (and therefore weight) than food outlets that make frequent consumption of energy-dense fast food more convenient (Fox & Horowitz 2013, Fleischhacker, Evenson et al. 2011). Furthermore, *a priori*, I expect counties categorized as both "food swamp" and "food desert" will have higher obesity rates than counties that are "food swamps" or "food deserts" only. Finally, I imagine food oases would have the lowest adult obesity rates because these areas should represent more "balanced" food environments.

I reran each model using each alternative measures of food swamps including 1.Traditional RFEI 2. Expanded RFEI w/ supercenters categorized as 'healthy' 3. 2. Expanded RFEI 2 w/ supercenters categorized as 'unhealthy'4. A food swamp dummy variable equal to 1 if RFEI > 3.44 (almost 4 times as many fast food retailers and convenience stores compared to other food stores types) 5. a food swamp dummy

variable equal to 1 if RFEI>4.75 (about 5 times as many fast food restaurants and convenience stores as other food stores types) 6. Fast food restaurants per 1,000 residents[6] and 7. Fast food retail as a percentage of all food stores.

To reiterate, we cannot rely on the naïve estimates resulting from Equation 1 because OLS assumes that food swamps (treatment X) are exogenous. This assumption may not hold in this case because individuals potentially self-select into their neighborhood because of the food environment. In this case, some might argue that counties with higher obesity rates result from obese people moving into "food swamps" because of their preference for close proximity to unhealthy food.

IV

I employ an instrumental variables strategy using 2SLS (two-stage least squares) with highway exits as an exogenous source of variation. One way to illustrate this IV approach is as the result of two separate regressions. As shown in Equation 2., the first stage reflects Z (highway exits) as a valid predictor of food swamps[7]. The second stage illustrates the predicted values of X (which were the output of the first stage) being inserted in the model of county-obesity rates (Equation 3).

Equations 2 & 3

---

[6] This measure adjusting for population was calculated using U.S. Census population data

[7] Food deserts are treated as an endogenous variable as no reliable instrument as been identified has been published in the literature.

1^{st} *Stage: Food swamps* $= \alpha_0 + \alpha_1$ *(highway exits)* $+ \alpha_2$ *(food desert)* $+ \alpha_3$ *(# of recreation and physical fitness centers)* $+ \alpha_5$ *(natural amenities)* $+ \phi$*(neighborhood characteristics)* $+ \delta_i$

2^{nd} *Stage: County Obesity Rate* $= ß_0 + ß_1$ *(food* $\widehat{swamps}$*)* $+ ß_2$ *(food desert)* $+ ß_3$ *(# of recreation and physical fitness centers)* $+ ß_4$ *(natural amenities)* $+ \Upsilon$ *(neighborhood characteristics)* $+ \epsilon$

Using the same models in Equations 1, 2, and 3 the final phase of my analysis involved stratification. As an attempt to isolate the food swamp effect on obesity from other county characteristics, counties included in the sampling frame were stratified by means of travel to work, and income equality. This allowed for an examination of the effect of "food swamps" on obesity rates based on comparisons between more homogenous counties and simultaneously address the potential threats to the exclusion previously outlined.

Results

Descriptive Statistics

Table 2. Descriptive Statistics (n=3,140)

Variable	Mean (Standard Deviation)
Health	
Adult Obesity Rate (2009)	30.3 (4.16)
Physical Activity Measures	
Fitness Center	10.01 (30.31)
Natural Amenities Index (1 to 6)	3.5 (1.04)
Food Stores	
Fast Food Restaurants	67.25 (228.60)
Grocery Stores	20.43 (76.80)
Supercenters	1.04 (2.64)
Convenience Stores	39.4 (87.50)
Specialized Food Stores	9.01 (37.95)

Variable	Mean (Standard Deviation)
Farmers Market	1.67 (4.00)
Food Environment Measures	
% Low Access to Grocery Store	23.6 (20.30)
Traditional RFEI	3.90 (1.86)
Expanded RFEI_1	3.8 (2.14)
Expanded RFEI_2	4.02(1.86)
Fast food retail per 1,000	.577(.29)
Fast food retail per capita	.0014(.00)
%Fast food retail of total food stores	.25 (.10)
Demographics	
% Black	8.74 (14.42)
% Hispanic	8.28 (13.20)
Median Household Income	43144.87 (10742.29)
%Female	50.01 (2.35)
Age over 65	12848.14 (36536.21)
Poverty Rate	16.8 (6.24)
Population	98462.68 (313819.30)
% Bachelor's degree	13.03 (5.35)
% Drives to work	78.70 (7.79)
%Public transportation to work	1.024 (3.07)
% Walked to work	3.35 (3.75)
Gini Index	.43(.04)
Other Key County Characteristics	
Highway exits	12.5818 (33.51)
Gas stations with food	30.28 (62.10)
Square Miles	950.8 (1314.10)

Source: USDA Food Environment Atlas, U.S. Census 2010, American Community Survey
Note: Expanded RFEI 1 and Expanded RFEI 2 include supercenters in the denominator and numerator, respectively.

Table 2 reflects descriptive statistics for the full sample of counties. On average, 30 percent of adults in a county are obese. However, this value ranges from 13.6 to 47.6 percent. Regarding the physical activity indicators, the mean values for the number of recreational facilities and the Natural Amenities Index were about 10 and 3.5,

respectively. Table 2 shows the relative density of all food types, and the trend reflected here did not change when I adjusted for county size in square miles. As shown, fast food restaurants and convenience stores outnumber all other food stores. On average, there are over three times as many fast food restaurants as grocery stores. This may be the product of the former having lower startup costs or requiring less land. However, there are also four times as many convenience stores as specialized food stores (i.e. produce markets) which are, arguably, more comparable in size, etc.

The food desert measure shows 23.6 percent of people have low access to a grocery store. 939 counties met the criteria for a county-level food desert. Based on the traditional measure (F+C/G), counties have about four times as many fast food retailers and convenience stores as grocery stores. Both Expanded RFEI show marginal differences from the traditional RFEI. Though, categorizing supercenters as unhealthy increases the relative balance of unhealthy to healthy outlets by .22. Based on the Expanded RFEI, there were 947 counties with about 5 times as many unhealthy food outlets as healthy options. See Table 2 in the Appendix.

On the whole, counties have a median household income of $43,144.87, 13 percent of the population with bachelor's degrees (min 2.57; max 40.75), and a Gini Index of .43. The Gini Index is a measure of income equality as it reflects the distribution of income on a scale of 0 (perfect equality) to 1 (perfect inequality). Evidence suggests

that inequality is an important factor to consider in the context of obesogenic environments and health disparities (Kwate, Yau et al. 2009).

The mean value of the instrument used in this analysis is 12 highway exits per county. In terms of transportation, 78 percent of people drive to work typically, about 1 percent take public transportation to work and 3.35 percent walk to work. This data is taken from the American Community Survey (2008-2013 estimates) and does not seem to account for individuals that are unemployed or out of the labor force. Finally, on average counties have 30 gas stations that also sell food.

Bivariate Analysis

See Appendix Table 3. The relationship between food deserts and food swamps at the county- level seems to depend on which measure of food desert is used. 'Low income & Low access' is a continuous measure included in the Food Environment Atlas which reflects the percentage of low income people in a county that also have low access to a grocery store. Overall, this measure shows a statistically significant negative correlation between food deserts and food swamps. By contrast, 'food desert' is a dummy variable which gives a county a value of 0 or 1 based on whether it met the poverty and access to store thresholds presented by the USDA (for census-tract level food deserts). Surprisingly, this measure indicates a statistically significant relationship positive relationship with all seven measures of food swamps. However, all of the

coefficients shown in Appendix Table 3 would be considered trivial suggesting these two types of are distinctly different.

Appendix Table 4 reflects correlations between obesity, highway exits, food environment measures, physical activity indicators and county demographics. With the exception of fast food retailers per 1,000 or the percent fast food retail of total food stores, the food swamp measures showed a small positive correlation with adult obesity rates. The percent low access to a grocery stores represents a proxy for county-level food deserts and, interestingly, denotes a negative association with obesity. The food swamp measures generally point to modest positive correlations with the number of highway exits in a county. Surprisingly, the traditional RFEI and the food swamp dummy (=1 if RFEI>4.75), both imply a negative association with the number of highway exits in a county. However, only the latter was statistically insignificant at α=.05. Finally, results from correlation analyses reveal strong correlations between highways exits and fitness centers as well as gas stations with food. Both represent potential threats to the exclusion restriction, and thus were incorporated in my regression analyses. Still, it should be noted that the physical activity indicators represent access or conduciveness to health-promoting activities rather than information about how frequently people normally exercise each week.

OLS Regression Results

See Table 3. For all specifications included for multivariate analysis, I used robust standard errors clustered by state. Controlling for food deserts (using % low income and low access as a proxy), fitness centers, natural amenities index, milk price: soda price ratios (as a proxy for relative affordability of healthier food products), county size in square miles and several sociodemographic indicators, the food swamp measures show a statistically positive effect on obesity overall. However, the coefficients were small where the highest was the fast food retail of total food share (indicates 1 percent increase in fast food restaurants increases obesity by approximately 3.4 percent). Unexpectedly, in specification 6, fast food retail per 1,000 has a statistically significant negative effect on obesity. This was also the only specification where the continuous food desert measure remained statistically significant after controlling for food swamps.

The magnitude of the food swamp effect on obesity varies across all seven measures. The coefficient on the food swamp dummy variable (equal to 1 if RFEI>4.75) is .578 ($p<.001$) suggesting a slightly stronger association than the food swamp dummy variable (equal to 1 if (RFEI>3.44). Here, the version of the Expanded RFEI with supercenter categorized as 'healthy' is a marginally stronger predictor of obesity than the other version. However, neither have a stronger effect on obesity than the Traditional RFEI. See Appendix for the full table of regression results.

Table 3. OLS Estimates of Food Swamps on Obesity (Controlling for Food Desert Effect), N=3,108

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food swamp	0.571***						
	(0.173)						
Food swamp 2		0.578**					
		(0.258)					
RFEI			0.113**				
			(0.0563)				
RFEI2				0.109**			
				(0.0488)			
Traditional RFEI					0.121***		
					(0.0441)		
Fast food retailers/1,000 people						-0.248	
						(0.181)	
Fast food retail/Total Food Store							3.442***
							(1.061)
% Low income and Low Access	0.0161	0.0131	0.0200	0.0200	0.0191	0.0125	0.0253*
	(0.0128)	(0.0126)	(0.0135)	(0.0135)	(0.0138)	(0.0121)	(0.0130)
Recreational Facilities	-0.0258***	-0.0257***	-0.0253***	-0.0252***	-0.0247***	-0.0263***	-0.0262***
	(0.00660)	(0.00651)	(0.00655)	(0.00652)	(0.00643)	(0.00675)	(0.00666)
Natural Amenities	-1.060***	-1.071***	-1.062***	-1.062***	-1.052***	-1.059***	-1.055***
	(0.201)	(0.201)	(0.195)	(0.194)	(0.197)	(0.202)	(0.196)
Milk: Soda Price	1.513	1.471	1.430	1.426	1.440	1.706	1.768
	(1.708)	(1.674)	(1.668)	(1.666)	(1.680)	(1.723)	(1.708)
Constant	32.72***	32.75***	32.50***	32.52***	32.47***	32.66***	32.17***
	(2.011)	(1.981)	(1.985)	(1.983)	(2.017)	(2.030)	(2.091)
R-squared	0.564	0.563	0.562	0.563	0.563	0.560	0.565

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. All specification control for # fitness centers, natural amenities, %black, %hispanic, number of people over 65, median household income, poverty rate and county size (in square miles)

Table 4. IV Coefficient Estimates of Food Swamps on Obesity, N=3,108

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food swamp	4.406***						
	(0.974)						
Food swamp2		6.372***					
		(2.107)					
RFEI			1.221***				
			(0.291)				
RFEI2				1.049***			
				(0.266)			
Traditional RFEI					2.090***		
					(0.691)		
Fast food retailers /1,000 people						19.81***	
						(5.813)	
Fast food retail /Total Food Store							28.02***
							(6.745)
% Low income and Low Access	0.0295*	0.00286	0.0497***	0.0461**	0.0523**	0.145***	0.104***
	(0.0161)	(0.0178)	(0.0185)	(0.0187)	(0.0216)	(0.0431)	(0.0251)
Recreational Facilities	-0.0211***	-0.0171***	-0.0158***	-0.0156***	-0.00525	-0.0493***	-0.0228***
	(0.00630)	(0.00658)	(0.00531)	(0.00540)	(0.00799)	(0.0110)	(0.00718)
Natural Amenities	-1.042***	-1.146***	-1.163***	-1.155***	-1.190***	-1.418***	-0.997***
	(0.222)	(0.213)	(0.226)	(0.219)	(0.260)	(0.332)	(0.187)
Milk: Soda Price	0.175	-0.946	-0.619	-0.415	-1.889	2.254	2.321
	(1.926)	(1.696)	(1.672)	(1.649)	(1.799)	(2.423)	(1.785)
	(9.99e-05)	(0.000106)	(0.000108)	(0.000104)	(0.000109)	(0.000172)	(9.86e-05)
Constant	34.08***	35.06***	32.88***	33.02***	29.70***	21.29***	30.16***
	(2.260)	(2.219)	(2.353)	(2.309)	(3.070)	(5.380)	(2.791)
Observations	3,108	3,108	3,069	3,069	3,055	3,108	3,102
R-squared	0.367	0.206	0.269	0.301			0.285

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1All specification control for # fitness centers, natural amenities, %black, %hispanic, number of people over 65, median household income, poverty rate and county size (in square miles)

IV Regression Results

To reiterate, the results from OLS regression are likely biased because individuals potentially self-select into neighborhoods categorized as food swamps. In order to address this endogeneity problem, I employed an instrumental-variables (IV strategy) using the number of highway exits per county as a source of exogenous variation. Appendix Table 6 shows second stage results from two-stage least squares (2SLS) regression analysis. I controlled for the same variables here as I did for the OLS regressions. Results from the first-stage showed highway exits were potentially a weak instrument since the coefficients were modest. However, they were statistically significant at the 5% level. Furthermore, for all but one specification, the F statistics were greater than 10 and ranged from 17.27 to 74. 73. See the Appendix Table 5 for more information on first-stage results and the full table of IV results (Table 6 in the Appendix).

As Table 4 and Table 6 in the Appendix reflect, controlling for food deserts, physical activity and key demographics, all food swamp measures indicate a positive effect on county-level obesity rates. For instance, $\beta_{fastfoodper1000}$ is 19.81. Notably, using highway exits as an instrument, the food swamp effect is stronger on obesity compared to the OLS coefficients shown in Table 3. In reference to the sensitivity analyses I performed, $\beta_{FastfoodofTotalFoodStore=}$ 28.02 and $\beta_{fastfoodper1000=}$ 19.81 are the strongest predictors of obesity. Both are statistically significant at $p<.01$.

In the last stage of this study, I use this same model using highway exits as an instrument and stratify by key neighborhood characteristics including: income inequality, and transportation. See Appendix Table 7. There was no statistically significant food swamp effect in counties where people drive less or after counties were grouped as having high or low-density of gas stations with food.

Discussion and Conclusion

Food Swamps vs. Food Deserts

The results of this study suggest that food swamps are a separate phenomenon from food deserts, and they may play an even larger role in the context of county-level obesity rates. Results from OLS regressions showed food desert measures became statistically insignificant after controlling for food swamps. In contrast, IV results indicated food deserts have a positive statistically significant effect on obesity. However, the coefficients for $\beta_{\text{Low access and Low income suggest}}$ the food desert effect is much smaller than the food swamp effect on obesity after adjusting for sorting effects. A limitation of this study relates to the validity issues accompanying secondary data sources including those that categorize food stores based on NAICS code (as the Food Environment Atlas does) (Fleischhacker, Evenson et al. 2011).

Food Swamp Measures

Overall, all food swamp measures indicate a positive effect on the prevalence of obesity at the county level. Though, the sensitivity analysis showed variation in the

magnitude of this effect across food swamp measures. The fast food retail of total food store measure, fast food retailers per 1,000 people as well as the food swamp dummy variable (equal to one if RFEI>4.75) were the strongest predictors of obesity. This implies that considering relative balance in the food environment is an important factor in the context of obesity and 5: 1 ratio of unhealthy to healthy outlets may warrant zoning interventions using quotas. As previously mentioned, I proposed two expanded versions of the RFEI index. However, the traditional RFEI had the strongest effects among the three in both OLS and IV regression analysis. This is an interesting finding because this suggests that balance between fast food restaurants, convenience stores and grocery stores is a more significant determinant of aggregate obesity levels than other food outlets including supercenters, Farmers Markets or specialized food stores.

OLS vs. IV

Estimates from simple OLS regressions were downwardly biased and would have underestimated the food swamp effect without the highway exit instrument because they do not adjust for endogeneity. In terms of policy implications, implementing changes to built environments can be costly in times of time and resource. The naïve OLS estimate shown in Table 6 (Appendix A) might deter some decision makers from making the effort to pass laws to alter local food environments. The coefficients suggest that mitigating food swamp effects would only lower obesity rates by about .1 to .58%. In contrast, IV coefficient estimates results shown in Appendix Table

7 imply policies like zoning laws could lower the prevalence of obesity as much as 19.81 or 28 percent. These results are consistent with previous studies that provide evidence supporting the notion that the built environment shapes health even after controlling for self-selection and individuals' preferences to live in certain neighborhoods (Frank et al., 2007, Rossen and Pollack 2012, Fleischhacker, Evenson et al. 2011).

Neighborhoods Characteristics

Also, the food swamp effect is higher and statistically significant in counties where there is more reliance on driving cars to work. The results of this analysis indicate zoning strategies to improve public health outcomes might target establishments that make frequent consumption of fast food and junk food more convenient the more people drive (i.e. gas stations with food and fast-food restaurants with drive-thrus). Additionally, stratifying by income inequality does not explain away the food swamp effect.

Chapter 2: Health Zoning: How Framing Influences Public Opinion of Land-Use Regulations Restricting Fast Food Restaurants

Introduction

Problem Statement

Zoning is "a fundamental regulatory tool that local governments use to shape land use, and to determine what can and cannot be built…on the parcels of land throughout a community" (Mair, Pierce et al. 2005a, Mair, Pierce et al. 2005b). Specifically, "health zoning" ordinances are meant to modify the built environment to protect public health within legal constraints (Maantay 2002). For instance, zoning laws can be used to increase access to healthy foods and limit access to unhealthy options (Mair, Pierce et al. 2005b). Legal experts argue that improving public health is the most legitimate use of zoning ordinances. Yet, there has been minimal progress in applying this tool to unhealthy food environments in the same way it was applied to tobacco and alcohol in the past (Mair, Pierce & Teret, 2005a).

Two-thirds of adults are overweight or obese in the U.S (McGuire, 2012). In part, the obesity epidemic is worthy of public action because of the immense financial burden imposed at levels of society. The total health care cost associated with obesity is

projected to reach $957 billion (18% of health care costs) by 2030 (Fleischhacker, Evenson et al. 2013; American Heart Association, 2013).

In response to the urgent need to lower obesity rates population-wide, The Robert Wood Johnson Foundation supported the Institute of Medicine (IOM) to identify "catalysts that might speed progress in obesity prevention over the next ten years" (Glickman, Parker et al. 2012). The committee proposed a "systems approach" in thinking about the obesity problem. This approach led them to consider how to create greater synergies between prevention efforts already underway. Their recommendations included health zoning as a viable strategy. While their report features case studies of zoning rewrites to encourage the location of grocery stores, it does not contain much information on zoning restrictions used to limit the location of fast-food enterprises. It also lacks details about potential barriers to passing zoning ordinances and scientific evidence needed to evaluate the impacts of widespread implementation of zoning restrictions on fast-food.

More specifically, little is known about public attitudes toward zoning restrictions on fast-food restaurants. Qualitative evidence suggests that frames, or rhetoric presenting some facts more salient than others, play a critical role in how communities respond to proposals to alter the local food environment through land use

(Gagnon , Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011). In a recent review of media coverage and legislative histories, Nixon et al. find that frames related to nutrition and health decreased the likelihood of zoning restrictions of fast-food being passed. For instance, there was a moratorium on fast-food proposed for Prince George's County in 2010 using a Nutrition frame. Compared to the 2008 ban in Los Angeles, the Prince George's County ban was not passed while the moratorium initially passed in L.A. but was later overturned. In fact, as is the case for South L.A. and Prince George's county, when fast-food restrictions are framed as an effort to improve adult nutrition, it is less likely to pass. Yet, this is the primary frame used when the policy tool is proposed for improving nutrition and obesity in communities of color (Nixon, Mejia et al. 2015)

Public health is the best reason for zoning, but we see so little of it in regards to altering food environments as an obesity prevention strategy. Since most of the discussion around health zoning has focused on walkability and grocery store access, **the specific aim of the proposed study is to explore how frames impact public opinion of zoning restrictions on fast-food.** The "systems approach" to obesity prevention suggests that all aspects of the built environment will need to be approved to accelerate the decline of obesity.

Significance

To reiterate, health zoning has been endorsed at the federal level as part of the Institute of Medicine's "systems approach" to accelerate progress in obesity prevention (Glickman, Parker et al. 2012). It seems relevant based on the legality of zoning, its potential to make systemic changes in the built environment as a land use tool, and successes in the context of other public health threats such as tobacco and alcohol. As discussed above, the ecological model of obesity at the root of the "systems approach", encompasses what we know about community engagement and collective action. The model also concedes to structural changes that have shaped how neighborhoods in the U.S. look today and, at a more micro level, cues in the environment that influence what we eat and how much. Still, there is much to be learned about health zoning before it is widely accepted by states and local governments.

A critical aspect of the equation involves the scope of health zoning laws. There is controversy about which type of food stores should be targeted. Currently, more attention has been paid to the relationship between zoning legislation and healthy food retailers (i.e. grocery stores, farmers markets, urban farms, etc.). However, as the Food Environment Hypothesis suggests, there is growing consensus that food environment interventions targeting obesity must address fast-food establishments (Wilde, Llobrera et al. 2012). Still, zoning to curb the presence of fast-food outlets like in the case of

Bainbridge Island, WA, and Calistoga, California do not get as much attention as grocery store initiatives in New York and Pennsylvania. To date, the moratorium in South L.A. is the only case of zoning restrictions on fast-food outlets that explicitly mentions being inspired by obesity and other health disparities.

As part of their "systems approach to accelerating progress in obesity prevention", the 2012 IOM Committee on Accelerating Progress in Obesity Prevention stressed the importance of mobilizing key stakeholders through engagement and leadership at all levels and in all sectors (Glickman, Parker et al. 2012). Represented in the use of the term "epidemic" to describe high rates of obesity in the country, it is widely accepted as a public policy problem requiring collective action. There is even growing consensus around a core set of policy options to address this problem including zoning(Glickman, Parker et al. 2012, Roberto, Swinburn et al. 2015). Yet, a recent Lancet article still describes current prevention efforts as "patchy" (Roberto, Swinburn et al. 2015). This "patchy progress" might be attributed to a lack of attention paid to devising mobilization strategies in the context of obesity prevention.

Drawing upon Political Scientist John's Kingdon's theory of the public policy process, changes occur when the three policy streams - problem, policies and politics- align and a window of opportunity presents itself (Kingdon 1984). Thus, creating

political demand and mobilizing the public is a priority. In their article, "Mobilisation of public support for policy actions to prevent obesity", Huang et al. issue a call to action for public health research offering insights regarding how best to strategically align citizens with policy goals (Huang, Cawley et al. 2015). This chapter of my dissertation is motivated by this call to action and will draw upon literatures from political science, psychology as well as sociology in efforts to contribute new information about aligning the public with FE health zoning policy goals, specifically.

Background

A priori, public support and community engagement seem to be notable determinants of zoning laws. In 2004, 400 residents of Oakland, CA organized a protest at city hall to prevent a McDonalds from locating down the street from a farmers market (Gagnon and Freudenberg 2012). Bainbridge Island, Washington has successfully been able to preserve the small town feel of their community by organizing ever time there is a formula restaurant that wants to locate in their neighborhoods (starting with McDonalds in 1989). Fedelstein et al. describe the city of Berkeley as a case study for jurisdictions where community advocate groups were successful in getting their neighborhood zoning proposals passed (Feldstein 2006). In this particular case, rezoning efforts were geared toward bringing a new grocery store to the neighborhood. However,

these scenarios illustrate ways to mobilize community residents to speak out about food access and how powerful their personal stories are when shared at town halls meetings. For instance, it leaves a lasting impression for one resident to say: "We are forced to leave our neighborhoods to buy food" (Feldstein 2006). As reported in Table 5, there are several municipalities that have included restrictions on fast-food in their zoning ordinances. Though, instead of emphasizing health, the impacts of zoning was framed in terms of aesthetics, economics, tourism, safety or concerns about traffic and congestion (Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011, Gagnon and Freudenberg 2012).

The 2008 ban on fast-food restaurants in South L.A. was the first to declare explicitly public health as the key driver for the intervention (although it also made mention of aesthetics) (Sturm and Cohen 2009, Lydon, Rohmeier et al. 2011). The ban, described as a "new weapon against obesity", put a moratorium on the issuance of all permits to restaurants that had characteristics such as a limited menu, items prepared in advance or heated quickly with no table orders (Creighton 2009). It was introduced in response to public health records showing disparities in obesity rates in South L.A. compared to other parts of Los Angeles. In fact, 30% of adults were obese in South L.A. compared to only 19% in the metropolitan area or 14% in the white, affluent area

(Abdollah 2007, Creighton 2009). In addition, statistics showed a higher prevalence of obesity among African Americans and Latinos.

In their recent article, Nixon et al. review news media coverage and legislative histories to examine land-use policies targeting fast food restaurants since the Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity in 2001 (Nixon, Mejia et al. 2015). The primary objective of their study was to understand what type of zoning restrictions had been introduced, which localities have them and why. In regards to the types of policies proposed, they find 77 communities that proposed 100 different fast-food related zoning policies since 2001 (32 of them did not pass). These policies included 57 permanent bans, 16 temporary bans and 23 others (including conditional use/special permits, quotas, and distance/density requirements. In terms of demographics, the majority of neighborhoods that had successfully passed zoning restrictions on fast-food were small, predominantly white with average incomes above the national average. However, these restrictions were framed as efforts to improve aesthetics and local charm (rather than health or nutrition).

Table 5. Municipalities with Zoning Restrictions on Fast Food Restaurants[1]

Purpose	Type of Zoning	Where has it been implemented?[2]
Public Health (Obesity Rates)/ Make room for new dining and grocery store options	One-year moratorium on new fast food outlets	• (South) Los Angeles, California
Preserve historical area or character of downtown district /Tourist industry [3]	Banned formula restaurants/Must apply for Conditional Use Permit	• Solvang, California • Calistoga, California • Truckee, California • Cotati, California • Davis, California • Berkeley, California • Pacific Grove, California • San Francisco, California • Nantucket, Massachusetts • Ogunquit, Maine • Fredericksburg, TX • Bristol, Rhode Island • Port Townsend, Washington
Aesthetics/Traffic Congestion	Banned drive-thrus and fast food restaurants	• Concord, Massachusetts • Carlsbad, California • Newport, Rhode Island • Baldwin Park, California • Sea Side, California • Camel, California
Aesthetics/Traffic Congestion	Quotas to restrict formula restaurants	• Arcata, California • McCall, Idaho • Coronado, California

[1] Sources: (Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011, Gagnon and Freudenberg 2012

[2] For California, the original zoning ordinances can be found at: http://www.healcitiescampaign.org/healthy_zone.html

[3] Zoning Ordinance for Formula Restaurant Restrictions: http://ilsr.org/rule/formula-business restrictions/2315-2/

Purpose	Type of Zoning	Where has it been implemented?[2]
Aesthetics/Noise	Conditional Use Permits for Fast Food Retail, Convenience Stores & Liquor Stores	• Oakland, California
Aesthetics/Traffic Congestion	Prohibited Fast food restaurant within 400 feet of public areas (schools, church, recreational area or residentially zoned property)	• Arden Hills, Minnesota • Detroit, Michigan
Traffic Congestion/Preserve Open Space & Small Town Character[4]	Used design guidelines to regulate Fast Food retail placement and density of formula take-out restaurants	• Bainbridge Island, Washington\ • Port Townsend, Washington • Chesapeake, MD
Aesthetics[5]	Specific distances set between Fast Food restaurants in certain areas	• Warner, New Hampshire

By contrast, nutrition frames arose in communities that were larger, more urban with minority populations above 51 percent.[6] Yet, nutrition frames highlighting land-use policies' potential to improve diet and obesity risks only constituted 20 out of 100 policies. They conclude health and nutrition framed policies faced more criticism from residents and businesses than non-nutrition frames such as improved local aesthetics, traffic congestion, and local economy. There were more than four times as many non-nutrition frames as nutrition frames, but because columnists, bloggers, and editorial

[4] http://ilsr.org/rule/formula-business-restrictions/2315-2/
[5] http://www.warner.nh.us/downloads/zoning/2011%20Revised%20Zoning%20Ordinance.pdf
[6] Nixon et al. found nutrition frames targeted fast food restaurants and non-nutrition frames targeted formula restaurants and drive thrus.

boards were more likely to comment on these policies the amount of negative media attention paid to nutrition proposals was nearly equal. This is consistent with previous studies that prove negative information receives more attention (Stalans, 2012).

In their analysis, Nixon et al. found zoning policies focused on health and nutrition were subject to counterframes highlighting government intrusion, the potential ineffectiveness of land use interventions on obesity, adverse economic impact arguments, and (for communities of color only) unfair targeting of people based on race. Regarding nutrition interventions for communities of color, the authors found concerns of worthiness emerging in the media.[7]

Literature Review

Framing

The underlying premise of theories pertaining to framing is that issues can be considered from an array of perspectives and interpreted to have implications for multiple values or consideration. This is the general assumption of the expectancy value model of attitudes toward an issue as the weighted sum of a series of evaluative beliefs about it. Thus, different dimensions of the same policy can be assigned more weight

[7] Counterframes for non-nutrition zoning policies included negative impacts on the local economy, ineffectiveness and restricted business as beneficial to the community. Nixon et al. point out government intrusion counterframes rarely come up when the frame made aesthetic, traffic, etc. benefits more salient.

relative to others and, shape attitudes that underlie individual preferences (or how people rank ordering of a set of alternative options) (Druckman 2011).

By definition, framing means to: "To select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described". To relate this definition back to the expectancy value model, frames make certain dimension more salient by weighting them more heavily. Using purposeful frames of communication and rhetoric, the media is enabled to play an influential role in the formation of public opinions. When it has an impact on how individuals process blame or causality, it is called a framing effect.

The persuasiveness of a framing effect is determined by its ability to excite preexisting mental schemata, categories, scripts or stereotypes (Entman 1993, Druckman 2011). To provide an example from public opinion of obesity literature, the efficacy of the personal responsibility frame to define the problem, diagnose causes of obesity, make moral judgments, and suggest remedies might be attributed to metaphoric language evoking images of laziness, irresponsibility, greed in a land where hard work and individual freedom earns one the American Dream (Entman 1993, Barry, Brescoll et al. 2009). Thus, frames matter in political communication because they affect public

attitudes and even behaviors of their audiences (Chong and Druckman 2007a, Chong and Druckman 2007b). There are several different types of frames such as issue frames that reflect and evaluate positions and value frames that highlight a particular value in discussing an issue (Stalans 2012). Both types are particularly relevant to how public health advocates might consider framing fast-food zoning policies.

Regarding psychological mechanisms, for framing effects to occur mediational processes require that the information be available from memory and regular (or recent) exposure making the consideration more accessible. Moderator variables which condition framing effects include prior opinions, knowledge and the credibility of the source of information (Chong and Druckman 2007, Chong and Druckman 2007). In addition to the persuasiveness of a frame, Chong and Druckman assert the strength of a frame is determined by the characteristics of its recipients as well as the political context. In terms of the latter, the timing of exposure to counterframes relative to original frames as well as repetition shape how people process and evaluate opposing messages (Chong and Druckman 2013).

Race & Environmental Justice

Nixon et al. conclude that public health advocates should consider the role race plays in shaping the debate about zoning restrictions of fast-food and be prepared to address race arguments. In their content analysis, they found minority neighborhoods'

worthiness of health and well-being policies were being called into question in the media (Nixon, Mejia et al. 2015). However, their study does not provide any insights regarding which frames would be most effective in gaining support for zoning in black and Hispanic neighborhoods, specifically. In this paper, I intend to address this knowledge gap with causal evidence on the importance of race in designing zoning restrictions targeting fast food establishments.

Environmental justice scholars argue that health-restricting facilities like fast-food restaurants are deliberately located in low-income or minority neighborhoods because they are perceived to be the paths of least (political) resistance. Chriqui et al. demonstrate that zoning for healthy food access varies by median household income (Chriqui, Thrun et al. 2012). Rossen and Pollack contend that communities with wealth and power are better able to combat noxious land uses relative to segregated, low-income neighborhoods. To illustrate this point, they demonstrate that areas like Calistoga, California which were successful in banning fast-food are white, affluent areas compared to the predominantly black neighborhoods that failed in their attempt to ban the sitting of fast-food restaurants (Kwate, Yau et al. 2009, Rossen and Pollack 2012). Rossen declares that special efforts need to be made to involve underserved, disenfranchised populations and communities in the decision-making process.

Conceptual Framework

I conceptualize overexposure to fast-food restaurants as an environmental injustice and *access* to land use zoning policies shaping food environments as a fundamental cause of inequities in obesity prevalence. Before describing the conceptual framework demonstrating the relationship between framing and zoning restrictions targeting fast food establishments, it would be useful to describe terms such as *environment justice, fundamental cause, equity, structural inequality and race.*

Defining *Environmental justice*, Taylor (200) writes that "[It] has three components: autonomy or self-determination, land rights, and civil or human rights." In a broad sense, the "environmental justice paradigm" considers the distributional effects of environmental goods and services (Taylor 2000, Butts and Gasteyer 2011). The article entitled "The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses", also provides great detail on the Principles of Environmental Justice. Extracting from this list, use of the term *environmental justice* in this paper more narrowly refers to the following (Taylor 2000):

- Public Policy based on mutual respect and justice for all peoples, free from any form of discrimination or bias,
- The right to ethical, balanced and responsible uses of land

- Universal protection from exposure to toxic/hazardous food that threatens the fundamental right to clean food
- The right to participate as equal partners at every level of decision-making

The term *fundamental cause* denotes Link and Phelan's Fundamental Cause Theory of Disease which emphasizes the broader social context perpetuating poor quality of life and adverse health outcomes in place of *proximal risk factors* such as eating behaviors and exercise. The theory holds that access to more fundamental resources such as political, social and cultural influence puts socially advantaged individuals in a better position to successfully contend with exposure to negative health risks. Consistent with Rossen and Pollack's work (2012) described in the previous section, overexposure to fast food restaurants is categorized as noxious land use and, thus pose a threat to good health. The standards of fundamental cause are met in the case of zoning out fast food restaurants because the broader context involves social inclusion in the planning process and use of this public policy tool being disproportionately reserved for socially advantaged communities (Phelan, Link et al. 2010).

Terms such as *equity* and *equality* are inherent to the concepts of *environmental justice* and *fundamental cause theory*. This rhetoric is used with a particular focus on *social equity* (harmonious with Rawls' Difference Principle and Theory of Justice) and health

equity, relatedly. *Social equity* can be described as the proportional reallocation of resources and opportunity to the marginalized and socially disadvantaged groups (Altham 1973, Hammond 1976). Here, "equity" also refers to the general spirit of justice, fairness, rights and equality across the social gradient (Hart 1974, Frederickson 2005). In their article (2011), Ransom et al. define *health equity* as "disparities in public health that can be traced to unequal, system, economic and social conditional". Thus, the mechanisms maintaining poor food environments and racial disparities in obesity are structural (rather than interpersonal) in nature. Fox and Horowitz (2013) argue that obesity preventions efforts should be evaluated based on their consideration of equity. In their model, the authors reference *inverse equity theory* which claims that health disparities widen because the most advantaged are the first to take advantage of new knowledge about prevention or treatment.

This points to the relevance of the term *structural inequality* potentially described as the systematic and institutionalized spatial, social and economic polarization of groups labeled with worthiness and unworthiness in a hierarchical social order (Butts and Gasteyer 2011). In the context of the United States, *race* is a primary social construct that affords the nearly immediate identification of individuals as superior or inferior using physical traits as markers of status. From this perspective, observed racial

differences (including health disparities and obesity), should be considered the byproduct of historical and present-day social conditions or experiences rather than biological inheritance (Smedley and Smedley 2005).

For the purposes of this study, I regard mobilizing a community to support and participate in the planning process through effective, informative and culturally appropriate public health marketing strategies as a primary channel in which certain populations are granted "access" to zoning policies. However, the evidence points to the inequitable distribution of mobilization efforts as an "entry point" perpetuated by structural forces including the media as gatekeepers to information and producers of issue frames.

Historically, white, affluent areas have greater inclusion in the land use planning processes shaping their food retail environment. By contrast, empirical evidence demonstrates communities of color being inundated with fast food establishments while local efforts to introduce zoning restrictions are essentially undermined by key stakeholders such as media institutions (Block, Scribner et al. 2004, Kumanyika, Whitt-Glover et al. 2007, Boone-Heinonen, Gordon-Larsen et al. 2011).

Extrapolating from previous literature, I pinpoint the culpability of unfavorable media messaging tactics in the context of communities of color (including language

pertaining to unworthiness and government intrusion) which are simply absent when this tool is applied to white neighborhoods. These message tactics hinder mobilization and collective action around the cause. Previous research on Social Dominance Theory and Framing Effects documents the media's tendency to use objectionable rather than favorable framing in the context of individuals and communities of color in order to maintain the social hierarchy in the United States (Haley and Sidanius 2006). This is made possible by framing an issue as pertaining to the allocation of resources which prompts group competition or by legitimizing myths and stereotypes about a specific social group.

Evidence from a content analysis of media source on fast food restaurant restrictions in the United States revealed underlying assumptions about which communities were worthy of efforts to improve health and wellness (Nixon, Mejia et al. 2015). Considering social dominance theory in this context, discussions over worthiness suggest health zoning is in fact perceived by some as a resource or tool meant for some communities but not others. This sentiment is echoed in Wilson's earlier quote referring to access to land use planning as a tool or privilege that is important for health and justice.

Here, it is assumed that zoning is linked to the prevalence of obesity through the food retail environment shaping eating behaviors. Thus, suboptimal food environments stemming from a lack of inclusion in land use planning and ineffective, untailored public health campaigns would directly influence disparities in obesity prevalence. The Institute of Medicine has called for targeted action to alleviate the inequity distribution of health promoting resources perpetuating health disparities among low-income, racial minorities and other disadvantaged populations (Glickman, Parker et al. 2012). This warrants close consideration of how to achieve more inclusive land use planning processes sculpting the food environment including framing strategies employed to mobilize supporters.

Purpose of the Study

So far, we know land-use policies targeting fast-food are not often framed as health and nutrition interventions and, in general, they are not implemented when they are. Nixon et al. attribute this to the communities where they were proposed (urban, large, minority neighborhoods) and framing as a determinant of success in policymaking. Motivated by these findings, the emerging body of literature on the applicability of zoning on food environment obesity prevention efforts and environmental justice as well as theories of framing, the purpose of this paper is to

identify prevailing non-health-related messaging that can be "bundled" with nutrition frames to potentially bolster public support for zoning rewrites placing restrictions on fast-food restaurants. This chapter of my dissertation makes important substantive, methodological and theoretical contributions to the developing literature on health zoning as an obesity prevention strategy. For the remainder of this section, I provide a more detailed overview of this study's contributions.

To my knowledge, this study will be the first to examine framing effects shaping attitudes toward zoning restrictions on fast-food retailers using an experimental design. There is a lack of scientific evidence regarding public opinion of these zoning restrictions which health advocates could draw upon to design effective marketing campaigns. This has recently been highlighted as an important area for future research. However, the few papers published on the topic largely draw upon legal arguments or qualitative methods (Ashe, Jernigan et al. 2003, Ransom et al. 2011, Nixon, Mejia et al. 2015, Feldstein 2006, Mair, Pierce et al. 2005a, Mair, Pierce et al. 2005b, Born 2011, Lydon, Rohmeier et al. 2011). **In contrast, I employ a national, online survey experiment using vignettes (a novel methodological approach) and contribute causal evidence regarding which frames key stakeholders such as local officials, public health professionals, and city planners should consider in generating support for (FE)**

zoning policies. To increase policy relevance, previously cited frames to zoning for health/nutrition were incorporated as experimental treatment groups (Chong and Druckman 2010, Druckman 2011, Nixon, Mejia et al. 2015).

In addition to its experimental design, **this chapter of my dissertation is the first to contribute national survey data on the topic of zoning out fast-food establishments (including my use of a new, innovative service now offered by Amazon to specify inclusion criteria for respondents)**. I collected data from two national samples of U.S. adults given the same online survey instrument to assess how respondents' demographics, geography, and political ideology predict support for these zoning policies. The first dataset was constructed from a convenience sampling approach and the second dataset was derived using quotas for select demographics underrepresented in the first sample.

Finally, this chapter makes significant theoretical contributions by exploiting synergies between publications on Food Environment (FE) health zoning and the following literatures in order to both *formulate* and *address* the focal research questions guiding this study: 1. Socio-Ecological Model (SEM) of Community-Level Obesity/Obesity Prevention and Health Disparities (from public health) 2. Prospect

Theory & Framing (from public policy and political science) and 3. Environmental Justice (from sociology and law).

More narrowly, I will explore the following research questions:

1. Which frames are most effective in improving individual perceptions of land-use policies aimed to improve the food environment?
2. Can race equity frames emphasizing gains (i.e. unfair targeting) mitigate the effects of race equity frames accentuating loss among blacks?
3. Does race moderate the effect of frames on public opinion of various types of zoning interventions targeting fast food?

In combination, Study 1 and Study 2 aimed to test the following predictions:

Hypothesis 1

Respondents assigned to "pure nutrition" frames will show weaker support for zoning policies targeting fast-food than "child nutrition frames" and those combined with other community benefits. Previous evidence suggests health and nutrition are cited the least as a rationale for placing restrictions on fast-food (Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011, Gagnon and Freudenberg 2012). Nixon et al. showed that land use regulations proposing to improve nutrition tended to be weaker because they were partial or temporary (i.e. a one-year ban on new fast food stores vs. a permanent quota-system). To date, the fast-food ban in South L.A.

is the only example where restrictions on fast-food were passed primarily using a "nutrition frame" (Sturm and Cohen 2009, Lydon, Rohmeier et al. 2011). Still, the ban was temporary and was coupled with aesthetics in order to be passed.

Hypothesis 2

Respondents assigned to a frame emphasizing the interaction of individual and environmental determinants of obesity and addictive properties of unhealthy foods will show stronger support for zoning policies targeting fast-food than other groups. Dardis argues that a new frame will be more successful than repetitive frames shaped in terms of gains and losses but on the same dimension (Dardis et al., 2008). In their recent article, Roberto et al. write: "Today's food environments exploit people's biological, psychological, social and economic vulnerabilities, making it easier for them to eat unhealthy food…reinforcing preferences and demands for foods of poor nutritional quality furthering unhealthy food environments" (Roberto, Swinburn et al. 2015). They argue the discussion around obesity prevention should be reframed to highlight this point.

Hypothesis 3

African American respondents will demonstrate more support for (FE) zoning policies when exposed to race frames focusing on gains. Nixon et al. found negative race equity counterframes *only* emerged when zoning restrictions were proposed using a

nutrition frame and for minority communities. One radio host in South LA wrote: " [City council member] Perry and her colleagues seem to believe that the only way to save people from themselves is to have government slap food from the hands of poor black and brown residents in their district" (Nixon, Mejia et al. 2015). Research on gain-loss framing suggests people would respond more positively to policies when exposed to advantages rather than its disadvantages, even though, the information is the same. The opposite scenario is based on previous studies that found gain frames are less effective than loss frames when respondents are asked to make ethical rather than effectiveness judgements (Stalans 2012).

Hypothesis 4

Racial identity will moderate the effect of message frames on public opinion of zoning restrictions. Therefore, treatment effects will vary by race. Chong and Druckman point to this question of *who* the intended audiences of issue frames are and how certain messages might resonate with certain groups differently than others. This notion is echoed in the literature on health disparities and obesity research in African American communities where Kumanyika et al. write: "What is seen, asked, and heard depends on who is looking and listening" (Kumanyika, Whitt-Glover et al. 2007). In their effort to expand the obesity research paradigm to reach African Americans, they allude to the importance of considering historical/social context and lived experience in

addition to physical environments in thinking about determinants of energy balance. We can extrapolate from their argument when thinking about policies and messages that influence energy balance as well.

Hypothesis 5

Individuals randomly assigned to a frame placing value on improved Local Aesthetics and lower Traffic Congestion will show stronger support for zoning policies targeting fast-food than other groups. Qualitative evidence suggests that Traffic & Aesthetics is the primary purpose cited for zoning interventions passed so far. Interestingly, this frame emerges as motivating several different types of zoning interventions in localities across the country (i.e. Conditional Use Permits, Bans on Drive –thrus, Quotas, and Distance Requirements from Schools) (Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011, Gagnon and Freudenberg 2012).

Overview of Studies

Study 1 vs. Study 2

This paper reports on results from two studies. Study 1 focused on Hypothesis 1 and therefore tests for "pure" treatments effects (compared to the control group) plus treatment effects relative to the Nutrition frame as well as Hypotheses 2, 3 and 4. Both studies employ experimental methods using a between-subjects design to examine the

impact of message frames on support for zoning restrictions on fast-food, and the same survey instrument to assess the dependent variable (favor, neutral or oppose for each zoning policy type). In both studies, vignettes were used to simulating a new zoning restriction in subjects' local area using the following phrase (held constant across conditions): **"You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live." Personalized vignettes like the ones used in this study have been identified as an effective approach to testing behaviors in survey experiments** (Mutz 2011).

The message frames I identified to test my hypotheses were extracted from previous publications and documents denoting their usage in implementing fast-food zoning restrictions thus far (Mair, Pierce et al. 2005, Born 2011, Lydon, Rohmeier et al. 2011, Gagnon and Freudenberg 2012). Using a convenience sample from Amazon Mechanical Turk, the effect of five message frames manipulating a particular value of zoning restrictions were compared to a control group in Study 1. Of the six total conditions, the Control group and Nutrition frame were treated as baseline groups relative to four treatment groups including Child Nutrition, Addictive Food Properties, an Equity-Gains frame as well as Local Economy "bundled" with the value of Nutrition. The zoning policies treated as dependent variables were gathered from publications

outlining types of zoning restrictions that have already been passed in localities across the country or legitimate policy options worth pursuing (Born, 2011; Gagnon & Freudenberg, 2012; Lydon, Rohmeier, Sophia, Mattaini, & Williams, 2011; Mair, Pierce, & Teret, 2005; Nixon et al., 2015).

Study 2 tests Hypotheses 1-5 motivated from previous literature and qualitative evidence. A sixth treatment group was added to the experimental design priming some respondents to a message frame about improved Local Aesthetics and Traffic Congestion "bundled" with positive implications for (adult) Nutrition. This study also oversamples African Americans to assess the potential mediating role of race (as a social construct) by testing for differential framing effects. Lastly, Study 2 replicates Study 1 using the same survey instrument and wording for all frames with the exception of the additional frame previously described. However, the Study 2 survey experiment was fielded through Amazon TurkPrime based on quotas that I provided for demographics underrepresented in Study 1 including males, Republicans, and people with lower levels of educational attainment. Results from Study 2 were considered more heavily in drawing final conclusions because it was proportionally matched on demographics previously identified as relevant to public opinion of obesity policy.

Independent Variable: Zoning Fast-food Frames

For the survey experiment, five of the frames were reflected in the Nixon et al. article that analyzed proposed policies featured in media sources and legislative histories. I introduce two of the frames created based on framing theory as well as publications on the contextual effects of food choice and food justice (Dardis, Baumgartner et al. 2008, Roberto, Swinburn et al. 2015). The total list of frames for Study 1 are: 1.No Frame 2. Nutrition-only frame 2. Child nutrition-only frame 3. Local Economy plus Nutrition Frame 4. Economy plus Nutrition Frame 5. Addictive Properties of Fast-food and Junk Frame and 6. Race Equity Frame. A Local Aesthetics/ Traffic Congestion frame was added to Study 2. The Race Equity frame was chosen in response to Nixon et al.'s finding that negative race frames emerged in minority neighborhoods where health and nutrition were cited as the rationale for zoning restrictions (Nixon, Mejia et al. 2015). To provide two examples of the vignettes included in the survey experiment, the nutrition frame, and addictive properties read:

Nutrition Frame

You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. **Consider that it would promote good diet and health for adult residents.**

Addictive Properties Frame

You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. **Consider that studies have shown foods with very high amounts of fat, sugar and salt make people addicted and the new restrictions would lower the availability of these addictive foods.**

Dependent Variable: Support for Health Zoning Policies

Respondents were asked to indicate their support for five zoning policies aiming to place restrictions on fast-food. Subjects were asked the following question: "To what extent do you favor or oppose the following zoning changes? Take into account that each option addresses the problem previously mentioned" and given the option of selecting **Strongly Oppose, Somewhat Oppose, Oppose, Neither favor nor oppose, Somewhat Support, Support or Strongly Support.**

Broadly speaking, there are three politically viable health zoning policy options that complement the scientific evidence on built environment, food environment, and obesity: 1.) Conditional Zoning, 2.) Incentive Zoning and 3.) Performance Zoning. Conditional zoning can be described as local governments rezoning and identifying admissible uses for the land (in some instances prohibit uses that were previously

allowed) on a site-specific basis. Zoning sorts land use into three classifications including permitted, prohibited and permitted subject to conditions (Mair, Pierce et al. 2005a, Mair, Pierce et al. 2005b).

Conditional use permits (CUPs), also referred to as special use permits, are used to grant or deny land use that is otherwise prohibited by zoning law. A business can receive a permit as long as the owner meets certain requirements outlined by the community. Conditional zoning may be utilized to prohibit the development of fast-food restaurants in a particular area or, inversely, only allow for the development of healthier food outlets such as grocery stores or farmers market (Lydon, Rohmeier et al. 2011). Incentive zoning consists of offering incentives for developers such as tax credits, tax exemptions, low-cost loans, or reductions in parking requirements to food establishments (Mair, Pierce et al. 2005a). Incentives could be offered to restaurants with majority healthy options on the menu (Hodge Jr, Orenstein et al. 2013). Performance zoning concentrates on the *outcomes* of land use rather than just *how* it is used. It involves setting standards that must be met in order to use the land. Adopting performance zoning as a regulatory policy would allow localities to set standards pertaining to smells, sights, and sounds to which fast-food restaurants must adhere (Lydon, Rohmeier et al. 2011). For instance, this type of zoning would include bans on trans-fats, foods

extremely high in fat, sugar and sodium (which are believed to prompt addictive responses in people) or require disclosure of nutritional information. [8]

This list of types of zoning intervention to test in the current study was compiled from several different sources discussing health zoning as an obesity prevention strategy I deliberately chose policies (beyond a moratorium on fast-food as seen in South LA) that have either been used in the 77 communities with zoning restrictions on fast-food or have been proposed as viable options by public health advocates and nonprofit organizations. (Mair, Pierce et al. 2005, Mair, Pierce et al. 2005, Born 2011, Gagnon and Freudenberg 2012). To find out whether there is variation in public opinion caused by zoning category, policies were grouped as 1. *Conditional Health Zoning Policies 2. Youth-Related Health Zoning Policies 3.Performance Zoning Policies 4. Youth-Related Zoning Policies or 5. Revenue Generating Policies.*

Conditional Health Zoning Policies

- Limit the total number or per capita number of fast-food outlets/ formula chain outlets in a community. This can be done using bans, quotas and density limits.

[8] For instance, this type of zoning would include bans on trans-fats, foods extremely high in fat, sugar and sodium (which are believed to prompt addictive responses in people) or require disclosure of nutritional information.

- Require conditional use permits for fast-food retailers, corner store, and other unhealthy food retailers. Their development would be "conditional" on whether or not they stock a certain proportion of shelf-space with healthy food products.

Youth-Related Health Zoning Policies

- Require fast-food outlets to locate a minimum distance from youth-oriented facilities such as schools and playgrounds
- Prohibit the distribution of toys and promotional games, the presence of play equipment, or the presence of video or other games at fast-food outlets.

Performance Zoning Policies

- Limit vehicle access and curb cuts into fast-food restaurant parking lots to decrease the convenience of fast-food to passersby and limiting chain restaurants with standardized site plans.

Incentive Zoning Policies

- Offer tax breaks and subsidies to incentivize fast-casual establishments (i.e. Panera Bread and Chipotle) to locate in certain neighborhood. Fast casual restaurants do not offer full table service and sell menu items with less processed ingredients.

Cognitive Interviews

The vignettes were a priority in cognitive interviews and pretesting during October-November of 2015 prior to the survey experiment being fielded to the full study sample online. In the first round of cognitive interviews, graduate students from Duke University (1 white male (age 42), 1 white female (age 32), 2 black females (ages 27 and 32) and 1 Asian female (age 27) were recruited to test the vignettes. Regarding the vignette treatments, pretesting subjects answered the following questions: 1. Tell me what you were thinking while reading this passage 2. Were there any words or phrases that are particularly hard to understand? 3. (Using the Local Economy frame as an example) In your own words, what do you think is meant by "[It] would improve the local economy as well as promote good diet and health for resident"? The language used in the vignettes were revised based on the information gathered.

To ensure the treatments and survey questions were appropriate for individuals with a lower level of educational attainment, a second round of cognitive individuals was conducted targeting individuals with high school as their highest level of educational attainment. Five women from the Durham, North Carolina community were recruited including 4 black females (ages 26, 31, 61), one Black, Hispanic woman (age 42) and one White, Hispanic woman (age 46). They responded to the previously described questions relevant to the vignette treatments, but they also were asked in-depth questions about the wording and terminology used in describing the six types of health zoning policy interventions and how they approached answering questions about their own food store access or perception about various types of food retailers. The survey instrument was modified per the responses collected during this final phase of pretesting.

Procedure

Study participants completed an on-line public opinion survey with a built-in survey framing experiment examining the role of six frames taken from published journal articles and reports. See Figure 3. for an illustration for Study 1's experimental design. A control condition was included in the study to test the absolute effectiveness of each frame and to simulate a common scenario where individuals are asked to vote

on a special issue without substantive background information. The language used for the Control group vignette did not include a frame and read as follows: "You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live." Refer to the full survey instrument in the Appendix for the language used for all message frames.

Using a between-subject design, each respondent was randomly assigned to one vignette simulating a scenario where zoning restrictions on fast-food were being introduced in their community. The allocation sequence was generated using the random number generator embedded in the Qualtrics software. The language used to describe this hypothetical situation was held constant across conditions. However, the study manipulates the value or benefit of the new zoning restriction that respondents were actually primed with.

Each respondent was asked to indicate their support for six different zoning policies on a Likert scale. People randomly assigned to the control group were not primed with a message frame and instead were only prompted to score their support for different zoning policies. A manipulation check was included in the survey instrument to check whether the manipulation "worked" and subjects actually noticed the initial intent of the zoning restrictions proposed for fast establishments in the local community.

Afterwards, subjects answered a series of questions about their access to food stores, perceptions of various types of food retailers as 'healthy' or 'unhealthy', opinions about the culpability of food retailers in the obesity problem, beliefs about the role of government in addressing the obesity epidemic, eating behaviors, health behaviors and their health status. The survey completion rate was 96 percent. See Appendix B for the survey instrument including a full description of the frames.

Study 1

In Study 1, I fielded a survey experiment on Amazon Mechanical Turk (Mturk) in November 2015 using vignettes to examine the effect of message frames on support for health zoning policies(N=2,768). This method is appropriate for employing an experiment on a national sample of the target U.S. adult population. Furthermore, a survey experimental design offers a unique opportunity to inform public policy discussions around health zoning restrictions on fast food retail. Also, as Mutz emphasizes in Population Based Survey Experiments, this "hybrid" methodology was particularly conducive to executing experiments with many conditions due to large-scale data collection (Mutz 2011). The sample size was determined based on a power analysis assuming a modest effect size of 20 percent and aiming to achieve 90 percent power. See Sample 1 Power Calculation in Appendix B justifying the total number of

sample members needed to detect treatment effects. Respondents were recruited to the study using a convenience sampling strategy.

Methods

Participants

Mechanical Turk is managed by Amazon.com and allows researchers to post tasks (also called "hits") to be completed by users (also called "Mturkers"). The target audience for this project is adult Americans age 18 and over, so one strength of recruiting a sample on Mturk is its national scale. However, it should be noted that the sample is not nationally representative of all adults as it was not a probability sample. Nevertheless, previous studies comparing Mechanical Turk to mail-ins, telephone interviews, and other internet panels credit it with being just as if not more representative of non-college populations with no evidence suggesting lower data quality.

Experimental Design

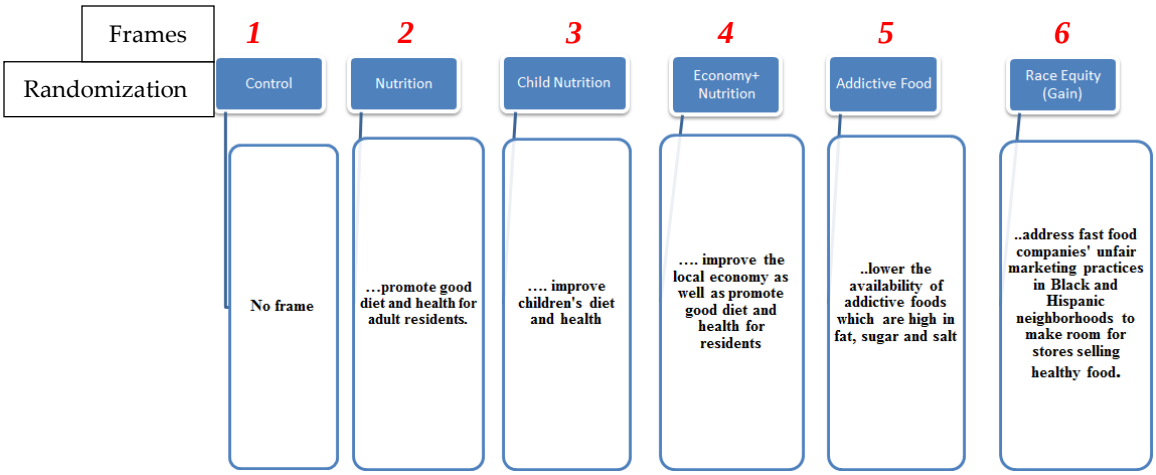


Figure 3. Experimental Design (Randomized to 1 of 6 Conditions)

Statistical Approach

The following Statistical Approach were used in both Study 1 and Study 2. Using Stata/SE 14.0 statistical software, ordered probit regression models were run to primarily explore how random assignment to a message frame predicts support for six different zoning policies. The dependent variable was recoded to Support (=1), Neutral(=0) and Oppose (-1) from the original Likert scale including Strong Support, Somewhat Support, Support, Neutral, Oppose, Somewhat Oppose and Strongly Oppose. Since these dependent variables have meaningful order, ordered probit regression analysis was most appropriate. Unadjusted and adjusted treatment effects were calculated running ordered probit regressions models with and without covariates, respectively. For the

former, support for each type of policy was modeled as a function of the message frames, annual income, age, female, urban and republican.

Attributable to the experimental design (including random assignment) employed for both Study 1 and Study 2, it was not obligatory to control for demographics in order to derive unbiased estimates of the impact of each message frame. Essentially, the underlying assumption is that random assignment would evenly distribute observables and unobservables across conditions. Nevertheless, covariates were added to the ordered probit regression models in efforts to increase the precision of the estimates.

In order to conduct an in-depth assessment of *support* for zoning restrictions specifically, I further restricted my analysis to model predictors of l support for each zoning policy as the outcome variable (equal to 1). This means, after being primed with a specific frame, the subject either Supported, Somewhat Supported or Strongly Supported Conditional Use Permits, Quotas, etc. This paper reports Marginal effects after ordered probit regressions which should be interpreted as the change in probability that a respondent in each experimental condition will support a policy when the rest of the variables are at their mean values.

As reflected in Figures 3 and 10 (which provide a visual of the experimental designs used in studies 1 and 2), there is a plethora of iterations of ordered probit regressions that might have been run in STATA replacing any message frame as a baseline group. For Study 1, I used both the control group and nutrition group as comparison groups to interpret overall effectiveness and effectiveness relative to a focus on nutritional advantages for adults. In theory, I had enough statistical power to make additional contrasts with the Local Economy frame used as the comparison group, for instance. However, the comparison groups I selected to highlight while analyzing the data are most relevant to the key objectives for Study 1. Relatedly, for Study 2, the omitted group for regression analyses was manipulated to more directly test Hypotheses 2, 3 and 5 pertaining to the relative effectiveness of the Addictive Properties, Equity and Local Aesthetics/Traffic message frames.

To examine differential treatment effects predicted by Hypothesis 4, I ran three different models with these covariates for each zoning policy. The first model includes the full sample (all races), the second model reflects unweighted estimates for whites only and the third sample includes unweighted estimates for blacks only. The marginal effects of each treatment on the probability of supporting a type of health zoning restriction were calculated after each ordered probit regression model.

Results

Table 6. Characteristics of Survey Respondents Compared with National Rates, 2015 (N=2,768)

	Population	Sample (unweighted)
Female	50.80%	58.37%
Male	49.20%	40.42%
High school graduate	29.63%	23.07%
Some college no degree	19.42%	22.22%
Associate's degree, occupational	9.00%	11.21%
Bachelor's degree	18.88%	25.91%
Master's degree or Professional degree	9.00%	8.70%
Doctoral degree	1.55%	1.83%
White	79.20%	65.09%
Black	12.90%	30.04%
Asian	4.40%	0.53%
American Indian and Alaska Native	1.00%	1.03%
Hispanic	15.10%	2.68%
Non-Hispanic	84.90%	97.32%
Below $25,000	23.52%	29.18%
$25,000 - $34,999	10.11%	16.47%
$35,000 - $49,999	13.12%	16.49%
$50,000 - $74,999	17.04%	17.00%
$75,000 - $99,999	11.54%	7.94%
$100,000 - $149,999	13.37%	5.61%
$150,000 or more	11.30%	2.18%
Midwest		
Northeast		
South		
West		

Source: National figures on the U.S. Population extracted from United States Census Bureau (2015), the Central Intelligence Agency (CIA) World Fact Book & 2016 Gallup Poll

Descriptive Statistics

Table 6 reflects the descriptive statistics of the study sample relative to the U.S. population age 18 and over. The sample is comparable in terms of income and geography, but is more female (60.04%) and educated than the general population. Participants of this study are highly diverse in terms of race but not ethnicity where the proportion of Hispanics is roughly half that of American adults.

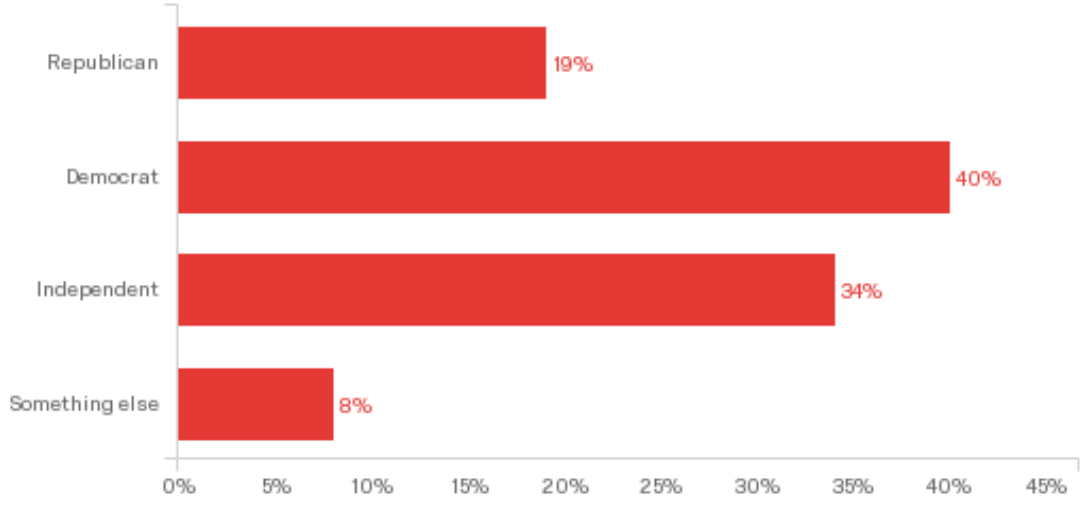


Figure 4. Party Affiliation (Convenience Sample)

Reference Figure 4. In terms of party affiliation, 40% of the sample reported they were affiliated with the Democrat party, 19% answered Republican and 34% identified as Independent. Therefore, the study sample includes a higher proportion of Democrats

than the Americans population based on estimates provided by the Gallup poll (Democrat 29%, Republican 26% and Independent 44%).[9]

The descriptive results outlined in the next sections were not compared to national data (due to availability in most instances).

Health Status

The majority of the sample reported being in Good and Very Good Health (63%). See Figure 5.

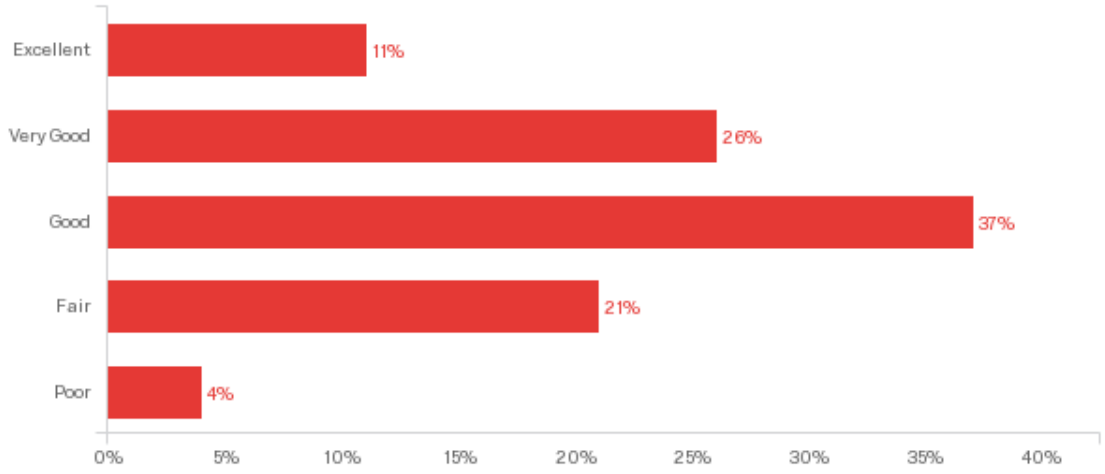


Figure 5. Health Status (Convenience Sample)

[9] http://www.gallup.com/poll/15370/party-affiliation.aspx

Role of government in the obesity epidemic

Respondents were asked to indicate whether they thought 'Government should do more to solve problems and help meet the needs of people' or 'Government is doing too many things better left to businesses and individuals. The majority of people (60%) said the former. However, the sample was evenly split on whether the government should be involved in addressing obesity where 50.7% said the government should intervene and 49.30% said the government should not intervene.

Description of Fast Food Restaurants

One of the debates in the implementation of these health zoning restrictions has been what constitutes a 'fast food restaurant'. The way food stores are classified as part of the North American Classification System diverges from perceptions among public health experts, community residents, etc. All respondents received this question regardless of the condition they were randomly assigned to. The answer choices for this question were collected from responses to an open-ended version of this question posed during both rounds of cognitive interviews. Restaurant characteristics that were selected by the vast majority of subjects included National brands (i.e. McDonalds) (80%), Has a drive-thru (79%), Sells cheap/low cost food (76%), Sells food "to go" (72%) and Sells Processed Food (72%). Subjects were also asked to categorize restaurants as 'healthy' or 'unhealthy'. See Figure 6 below.

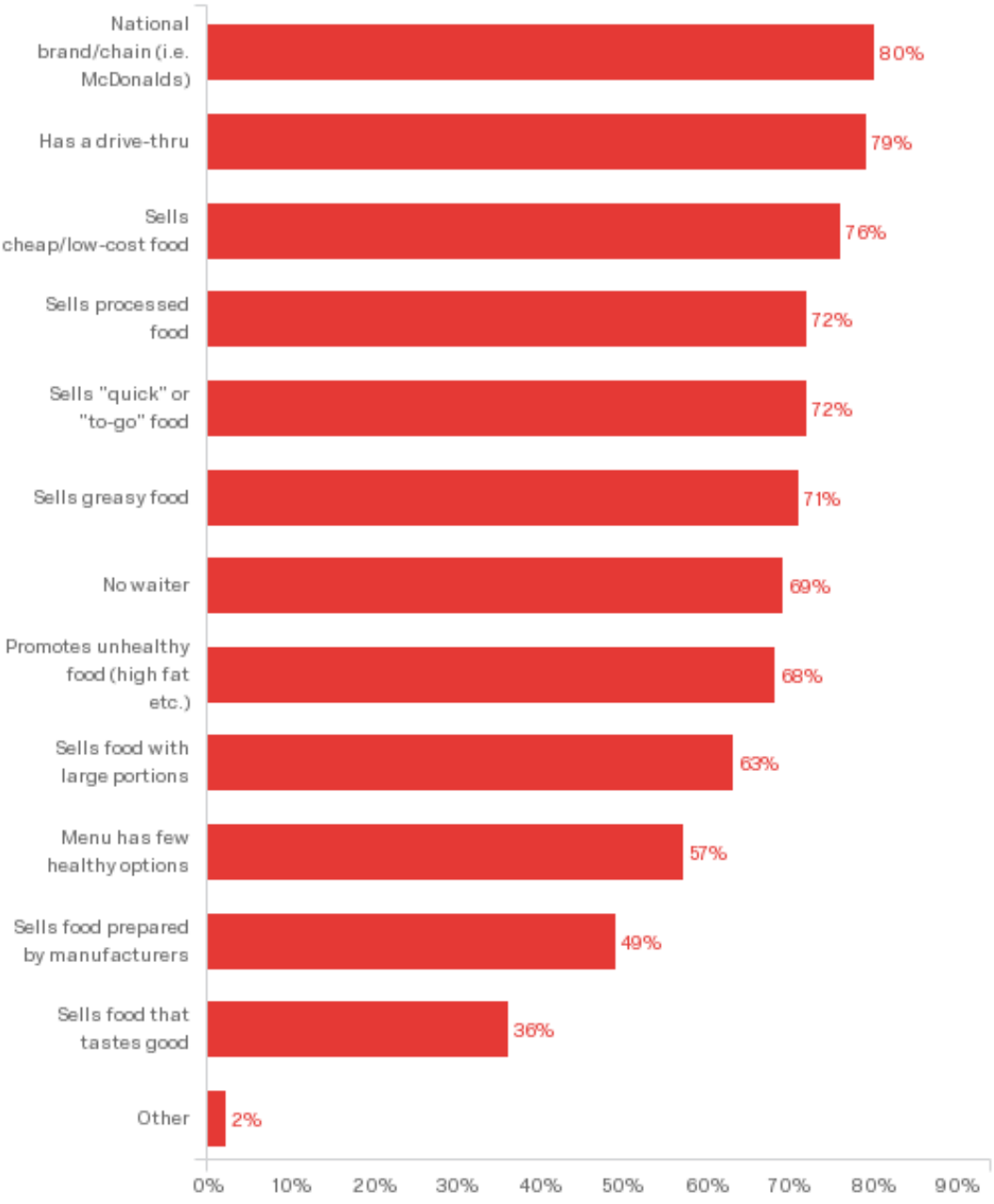


Figure 6. Characteristics of Fast-Food Restaurants (Convenience Sample)

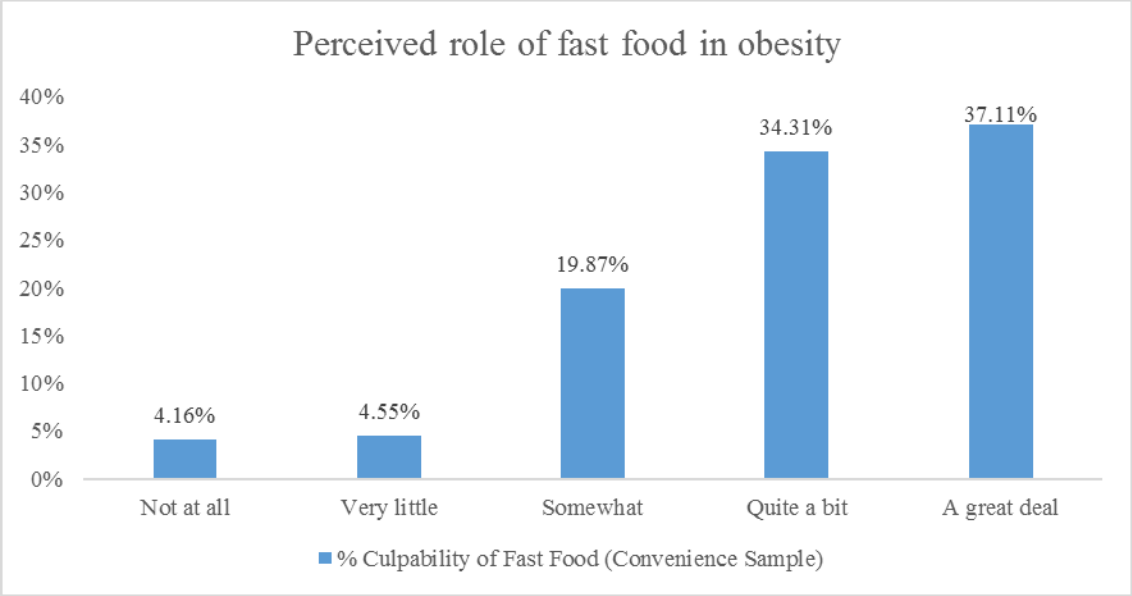


Figure 7. Culpability of Fast Food Retailers in the Obesity Epidemic (Convenience Sample)

Culpability of Fast Food Retail in the Obesity Epidemic

In order to explore public sentiments about the notion of certain types of food retailers perpetuating unhealthy diet and weight gain, study participants were given the following questions: **In your opinion, how much (if at all) does each food store type contribute to growing rates of obesity in the U.S. (Not at all Very little Somewhat Quite a bit A great deal**)? For grocery stores and supercenters, most people said Very little or Somewhat. Farmers markets had the largest number people answer 'Not at all' and the majority of people chose 'Very little' for Specialty stores. As Figure 7 reflects,

there appears to be more ambiguity around the relationship between full service restaurants and obesity where about 40 percent of people selected 'Somewhat'.

As shown in Figure 7, most study participants (71.42%) indicated fast food restaurants contributed a 'A great deal' or 'Quite a bit 'to the obesity epidemic.

Food Stores: Healthy vs. Unhealthy

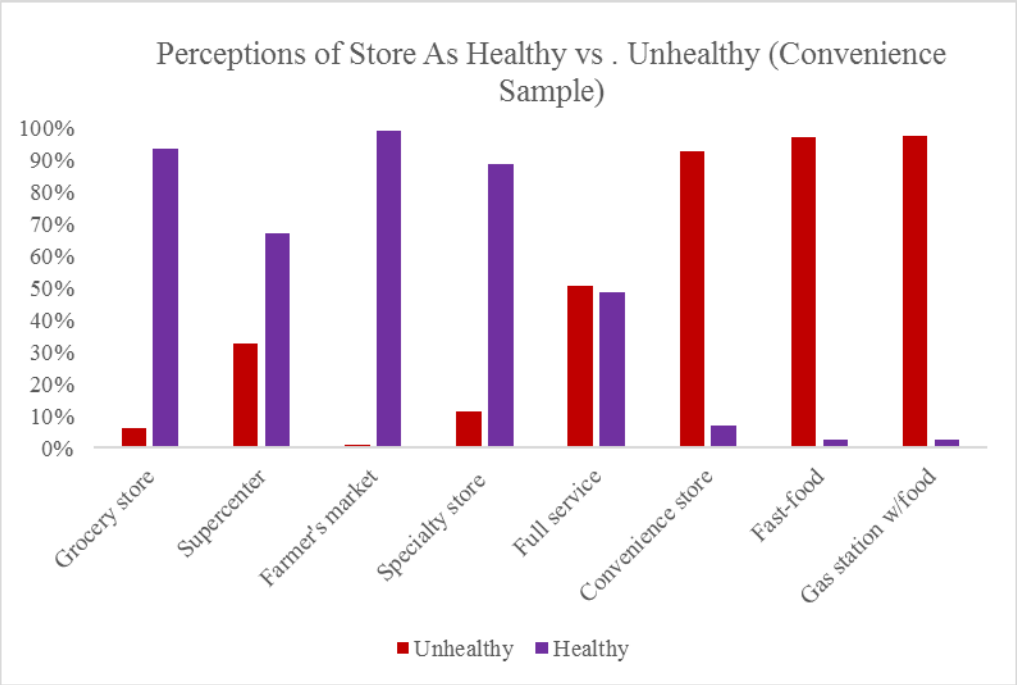


Figure 8. Healthy' vs. 'Unhealthy' Food Stores (Convenience Sample)

Refer to Figure 8. In general, grocery stores, supercenters, farmer's market were categorized as healthy food retailers. Respondents were close to evenly split between whether full-service restaurants were unhealthy or healthy food stores. By contrast, the

majority of people considered fast food retailers (97%), convenience stores (93%), and gas stations with food as unhealthy (98%).

Health Behaviors

Only 17 percent of the sample reported eating 5 servings of fruits and vegetables a day. 37 percent of people said they eat indulgent snacks Often, Most of the time or Always. Twenty-two percent of respondents answered eating at a fast food restaurant Often, Most of the Time and Always. See Figure 9.

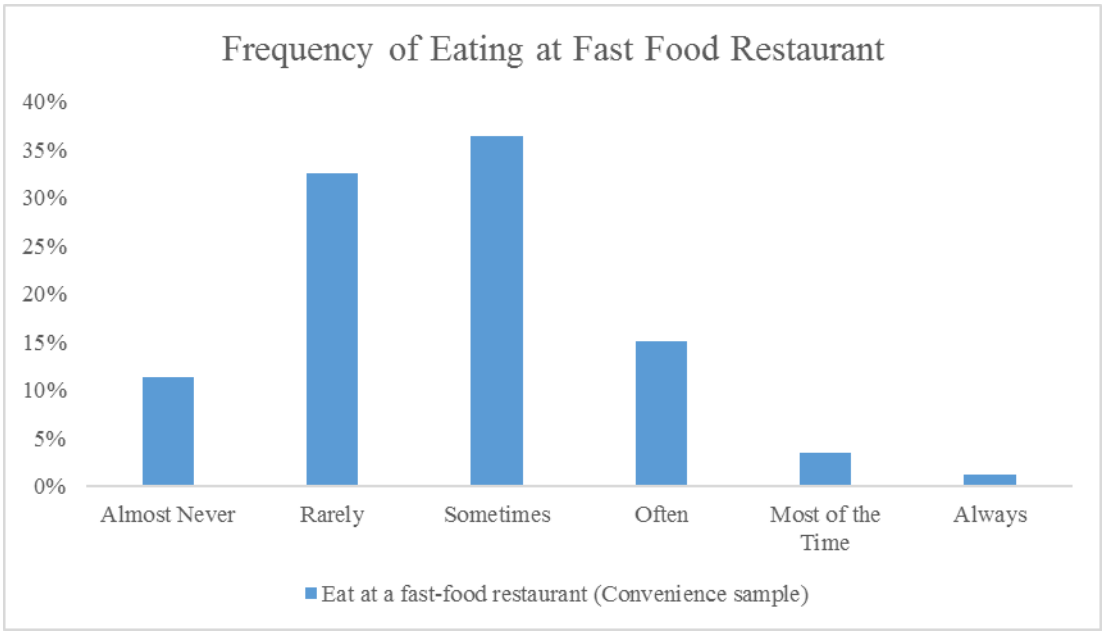


Figure 9. Frequency of eating at a Fast Food Restaurant (Convenience Sample)

Ordered Probit Results: Unadjusted

Control Condition as Reference Group

One component of the analysis involved calculating unadjusted treatment effects by running ordered probit regression models without covariates. The control group was omitted from the models as it was considered a baseline for comparison. The dependent variable should be interpreted as likelihood of support for each zoning policy type. Participants randomly assigned to the Control group did not read any information about the proposed value of the zoning law, just that it would introduce restrictions on fast food establishments. See Appendix B Table 8 for both statistically significant and insignificant results.

Based on the full sample of respondents, the Nutrition frame had no statistically significant impact on any type of health zoning policy. Though, there were some notable results in terms of the direction of the unadjusted treatment effects. It actually decreased the likelihood of support for Conditional Use Permits and Incentives (-3.1 percentage points), but increased support for Quotas and Bans by 4.6 percentage points. By contrast, the Nutrition frame had a positive effect on both Youth—related Health Zoning Policies (Minimum Distance from Youth-oriented facilities= +1.00 percentage points; Restrictions on Toys and Promotional Games=+4.16 percentage points). The Nutrition frame had a

positive impact on support for Vehicle Access Restrictions (+1.73 percentage points), but decreased support for Fast-casual incentives relative to the Control (no frame) condition. Similarly, the Child Nutrition condition had no statistically significant impact on support for the six types of zoning policies. However, results showed some unexpected negative associations relative to the Control group for Conditional Use Permits (-1.00 percentage point), Minimum Distance from Youth-Oriented Facilities (-1.1 percentage points) and Fast-Casual incentives (-.37 percentage points).

Treatment effects for the Economy and Addictive Food Properties group were in the expected, positive direction for all types of health zoning policies. However, in regards to the Local Economy condition, the treatment effect was statistically significant only for the Performance Zoning policy (Vehicle Access Restrictions= 4.96 percentage point increase) and the Incentive Zoning Policy (Fast casual incentives=7.72 percentage points). Similarly, the Addictive Properties frame only had a statistically significant impact on Toys and Promotional Games restrictions increasing support by 8.32 percentage points ($p<.01$).

Results for the Equity frame with the Control condition as the omitted group were not statistically significant with the exception of Fast-casual establishment incentives as the dependent variable (+10.8 percentage point increase, $p<0.01$).

Interestingly, the coefficient for the effect of the Equity treatment frame on Minimum Distance Requirements from Youth-oriented facilities was negative. Otherwise, the coefficients reflecting the effect of the Equity frame on all six types of zoning policies were in the expected, positive direction.

Nutrition Condition as Reference Group

Table 7. Marginal Effects After Ordered Probit Regression Results w/ No Covariates (Nutrition Group as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	0.0309	-0.0450	-0.00889	-0.0401	-0.0168	0.0175
	(0.0309)	(0.0291)	(0.0306)	(0.0265)	(0.0222)	(0.0303)
Child Nutrition	0.0213	-0.0431	-0.0199	0.00282	0.00423	0.0138
	(0.0309)	(0.0290)	(0.0306)	(0.0278)	(0.0233)	(0.0303)
Economy	**0.0563***	-0.00141	0.0124	-0.000207	0.0313	**0.0946*****
	(0.0308)	(0.0299)	(0.0308)	(0.0276)	(0.0244)	(0.0304)
Addictive Properties	0.0421	-0.0255	0.00872	0.0403	0.00369	0.0388
	(0.0308)	(0.0294)	(0.0307)	(0.0287)	(0.0232)	(0.0302)
Equity	0.0416	-0.0180	-0.0210	-0.0244	-0.00193	**0.126*****
	(0.0307)	(0.0295)	(0.0306)	(0.0269)	(0.0228)	(0.0302)
Observations	2,740	2,738	2,737	2,739	2,738	2,738

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In a second round of ordered probit regressions explicitly testing Hypothesis 1, support for all six zoning policies among the full sample of respondents was modeled with Nutrition as the omitted group. This analysis has practical implications as it takes into account preexisting qualitative evidence suggesting nutrition frames are ineffective in burgeoning supporting for health zoning initiatives targeting fast food restaurants. One primary goal of this study was to test whether nutrition messages can be "bundled" with other advantages to increase support. Refer to Table 7 for marginal effects after ordered probit regressions with nutrition as the comparison group.

Results showed no statistically significant marginal effects between the Nutrition frame and the Control group, the Child Nutrition condition or the Addictive Properties condition. Relative to the omitted group, the Control condition and other treatments resulted in less support for Quotas and Bans (ranging from -.14 percentage points for Economy to -4.5 percentage point decrease for the Control group). Unexpectedly, compared to the Nutrition frame, there was a negative effect of the Child Nutrition frame on support for Quotas and Bans (-4.31 percentage points) as well as Minimum Distance from Youth-oriented Facilities (-1.99 percentage points).

Notably, coefficients for the Equity frame decreased support for four out of the six zoning policies compared to the Nutrition condition. There was a positive framing

effect on support for Conditional Use Permits (4.16 percentage points) and a sizable statistically significant effect of the Equity frame on Fast-casual establishments (12.6 percentage points, $p<.001$).

The Local Economy frame had a positive, statistically significant marginal effect on support for Conditional Use Permits (+5.63 percentage points, $p<0.1$) and incentives for Fast-casual establishments (+9.46 percentage points, $p<.01$). The coefficients for Quotas and Bans as well as Toys and Promotional Games were in the unanticipated, negative direction (-.14 and -.02 percentage points, respectively). However, the Local Economy frame had a positive effect on the chance that respondents supported Minimum Distance requirements from Youth-oriented facilities (+1.24 percentage points) and Vehicle access restrictions (+3.13 percentage points).

Ordered Probit Regression Results: Adjusted Estimates

Table 8.Message Frames that Increased Likelihood of Support (by zoning policy category & by race)

	Full Sample	White Subsample	Black Subsample
Conditional Health Zoning Policies			
Permits Quotas & Bans	Nutrition		Nutrition
Youth-Related Health Zoning Policies			
Minimum Distance from Youth Facilities			
Toys & Promotional Games Restrictions	Nutrition, Child Nutrition, Addictive	Nutrition, Addictive	Child Nutrition, Addictive, Equity
Performance Zoning Policies			
Vehicle Access Limitations	Economy		Child Nutrition
Incentive Zoning Policies			
Fast casual Incentives	Economy, Equity	Equity	Child Nutrition, Economy, Equity

Refer to Table 8 for a summary of frames that had a significant, positive effect on support by policy type controlling for key demographics and stratified by race. Refer to Appendix Tables 9-14 for ordered probit regression models informing this table.

Nutrition & Child Nutrition Frame (Hypothesis 1) & Moderating Effects of Race (Hypothesis 4)

The Nutrition frame had a positive marginal effect on increasing support for Quotas in the full sample (5.23 percentage points, p= .084). For blacks randomly assigned to the Nutrition, Child Nutrition or Equity + Nutrition conditions, the chance of indicating support for zoning restrictions increased considerably. When primed with the Nutrition frame, they were 19.9 percentage points (p=.028) more likely to support relative to blacks assigned to the control group. Within this subsample, the Child Nutrition and Equity frames resulted in an increased probability of supporting quotas by 15.8 (p=.078) and 20.6 percentage points (p=.03), respectively.

Based on the weighted full sample, the Child Nutrition frame increased the probability of support for toy restrictions (5.55 percentage points, p=.054). However, there was a much larger marginal effect of the Child Nutrition treatment when looking only at the black subsample where there were 27.7 percentage points (p=.002) more likely to support this form of zoning).The Nutrition frame had positive marginal effects on support for restrictions on toys and promotional games for the full sample (5.57 percentage points, p=.049) and the white subsample (7.10 percentage points, p=.024). There was no significant marginal effect of this frame in the black subsample.

Addictive Properties Frame (Hypothesis 2) & Moderating Effects of Race (Hypothesis 4)

Results from the ordered probit regression models of support for restrictions on toys and promotional games in fast food establishments reveal the Addictive Foods + Nutrition frame had statistically significant positive marginal effects for all three stratified samples. Marginal effect sizes in the full sample and white subsample were comparable (Full sample: 8.71 percentage points, p=.003) vs. (White subsample: 7.33 percentage points, p=. 021). When the analysis was restricted to black respondents randomly assigned to the Addictive Foods frame, there is a larger increase in the likelihood of supporting toy restrictions by 19.8 percentage points (p=.031).

Equity Gains Frame (Hypothesis 3) & Moderating Effects of Race (Hypothesis 4)

The Equity + Nutrition frame increased the chance of support for toy restrictions in the black subsample by 16.7 percentage points (p=.06), but did not have a statistically significant effect in the full sample or white subsample. Interestingly, Equity + Nutrition was the only condition with a positive marginal effect on Fast Casual incentives for the Full sample (11.4 percentage points,p=.001), the White subsample (11.4 percentage points,p=.00) and a higher effect among black participants (17.5 percentage points,p=.05). For the full sample and white subsample, the Local Economy+Nutrition increased the chance of supporting this policy by 6.53 (p=.03) and 6.22(p=.07) percentage points,

respectively. The Child Nutrition message frame increased policy support for Fast casual incentives among blacks by 20.5 percentage points (p=.017) compared to no statistically significant treatment effect in the other two samples.

Local Economy Frame & Moderating Effects of Race (Hypothesis 4)

Concerning Vehicle Access restrictions, the Local Economy+Nutrition message frame increased policy support for the Full Sample (4.9 percentage points, p=.04). For the White sample, there were no statistically significant marginal, treatment effects. In comparison, for black study participants, the Child Nutrition frame increased the probability of being in favor of this type of zoning restriction by 28.7 percentage points (p=.001).

None of the treatments had a statistically significant marginal effect on the likelihood of support for Conditional Use Permits or zoning restrictions targeting Youth Oriented Facilities.

Discussion

Results from Study 1 showed some consistent beliefs on characteristics of "Fast food restaurants" including the presence of a drive-thru, processed food, etc. Also, people generally viewed fast casual restaurants as "healthy". Lastly, the majority of

respondents (71.42 percent) considered fast food restaurants as contributing to the obesity epidemic.

Overall, **Hypothesis 1** which predicted non-nutrition frames would be more effective at increasing support for zoning policies was partially supported. Analyses of unadjusted framing effects showed, compared to the "pure" nutrition frame, the Local Economy and Equity were more likely to increase support for Conditional Use Permits and Fast-casual incentives. None of the message frames had statistically significant effects on the following zoning policies: Quotas/Bans, Minimum Distance requirements from Youth-oriented facilities, Toys & promotional games, or Vehicle access restrictions. However, the negative direction of the coefficients resulting from unadjusted ordered probit regression analyses, suggests the Nutrition frame may be more effective for increasing approval of Quotas & Bans, in particular.

For blacks, after controlling for age, gender, geography and political party, the Child nutrition message frame led to significant increases in support for Toy restrictions, Fast Casual Incentives and Vehicle Access Limitations whereas the Nutrition frame had no significant impact for this subsample. Notably, after controlling for aforementioned demographics, the Nutrition frame was the only treatment to have a significant effect on increasing support for Quotas and Bans in the full sample of respondents. And for black

respondents, the Nutrition frame had a slightly larger impact than the Child Nutrition message frame in terms of magnitude. This suggests that contrary to preexisting evidence there may be some specific types of zoning interventions where the pure Nutrition frame may be most effective, especially in predominantly African American communities.

Hypothesis 2 was partially supported. The Addictive Properties frame did not have a significant effect on all types of restrictions. It seems to have mattered for a zoning policy introducing restrictions on toys and promotional games in fast food establishments. Marginal effects after ordered probit regression analysis controlling for key demographics indicate the Addictive Properties frame increased support for restrictions on toys and promotional games by almost 9 percent for the full sample and approximately 20 percent for black study participants.

In regards to **Hypothesis 3** which highlights issues of race and equity, the equity frames primed more positive responses to health zoning policies, is supported in general. For African Americans in particular, the equity frame caused strong support for incentivizing fast casuals and conditional use permits relative to white subjects. After controlling for key demographics, the Equity frame increases support for fast casuals but

not permits. However, blacks were supportive of Quotas and bans and Restrictions on toys and promotional games compared to no significant effect on whites.

Table 8 demonstrate significant positive framing effects by race, therefore supporting **Hypothesis 4**. These are interesting findings because it supports the ideas for adaptive message around health zoning laws that considers the complexity of racial attitudes and land use policies.

In addition to its causal design, a key strength of this study involves the statistical approach which produced both unadjusted and adjusted marginal effects of each message frame. The results showed after controlling for key demographics, geography, and party affiliation, the Child Nutrition and Equity frames had a negative (rather than a positive) treatment effect for the sample of respondents. In other words, based on unadjusted marginal effects, one might have falsely assumed that the Child Nutrition frame increased support for Conditional Use Permits or Fast-casual incentives (relative to the Control group or "pure" Nutrition frame). Similarly, results from the adjusted ordered probit regressions indicated the Equity frame caused a relative decrease in support for Minimum Distance Requirements from Youth-oriented Facilities.

Limitations to this study include generalizability to the general U.S. population and sample size. The findings from Study 1 are based on data collected from a

convenience sample of respondents from Amazon Mechanical Turk. Although this is a national sample, it should not be interpreted as nationally representative because it was not collected through a random (probability) sampling scheme. In regards to sample size, there may be additional significant differences by frame and race that were not detectable with a sample size of approximately 2,800 respondents.

Also, this phase did not include a frame priming respondents with lower traffic congestion and local aesthetics as potential benefits of introducing zoning restrictions. This message frame is another commonly cited reason zoning restrictions on fast food restaurants were passed. Future work including Study 2, will attempt to address some of these limitations.

Study 2

Motivated by overcoming some of the limitations from Sample 1, the survey instrument was fielded to a second online sample of respondents in February and March of 2016. Also, in Study 2, I aimed to replicate the findings from Hypothesis 1-4 and then test the effectiveness of a Traffic/Local Aesthetics Frame (Hypothesis 5).

To ensure comparability, Study 2 was identical to Study 1 in terms of procedure. Study 2 diverges from Study 1 methodologically in two significant ways: 1.

Introduces a seventh condition to the experimental design 2. Collects data from a quota-based sample in place of a convenience sample.

The statistical analysis was comparable to Study 2 in terms of the application of ordered probit analysis predicting the likelihood of support for zoning policies as a function of message frames only (unadjusted estimates) and then separately as a function of frames and key demographics (adjusted estimates). However, there were important variations in order to test each hypothesis. To test **Hypothesis 1**, marginal effects were run after ordered probit regressions separately omitting the Control and Nutrition groups for comparison (including the full sample). For **Hypothesis 2,** the marginal effects after ordered probit analysis was done with the Addictive Properties frame as the omitted group controlling for key demographics. In order to test the predictions of **Hypothesis 3**, the sample was restricted to black study participants and the Equity frame was the omitted group. **Hypothesis 4** predicting differential treatment effects by race was explored statistically by including the full sample and omitting the Control group for comparison. To test **Hypothesis 5**, the ordered probit regressions modeled support for zoning policies among the full sample comparing the Control group and all treatment conditions to the Local Aesthetics +Traffic message frame.

Methods

Participants

This sample was recruited through Amazon TurkPrime using a proportional matching sampling approach rather than an opt-in, convenience sample of Amazon Mechanical Turkers. Amazon TurkPrime is a relatively new panel service that allows researchers to target specific demographic groups. Using TurkPrime, a second online sample of Mechanical Turk respondents and TurkPrime panels was collected proportionally matching the general U.S. adult population (age 18 and over). More specifically, target benchmarks for key demographics were provided to the organization including 50% male, 1000 African Americans, 29% high school as highest level of educational attainment, 15.1% Hispanic and 26% Republican. These characteristics were targeted because they were underrepresented in the Study 1 convenience sample.

Experimental Design

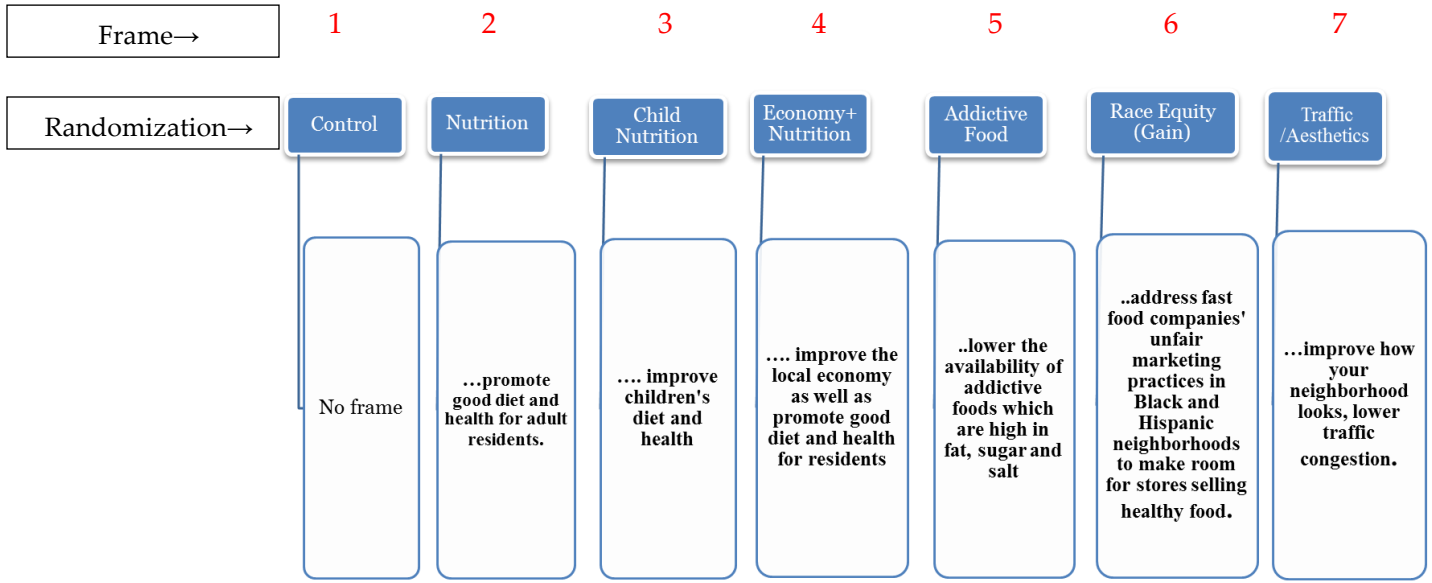


Figure 10. Experimental Design (Randomized to 1 of 7 Conditions)

In terms of experimental design, a seventh condition was added to prime some subjects with a message frame highlighting improved **neighborhood aesthetics** and **less traffic congestion** as key advantages of new fast food retail zoning restrictions above and beyond nutritional benefits (N=450). The Aesthetics+Traffic frame was alleviated from the Study 1 survey experiment due to sample size limitations and related concerns about statistical power. However, it is important to examine the effectiveness of this frame in bolstering public support for zoning interventions since it has actually been implemented in several localities. Refer back to Table 5. This frame is henceforth referred to as the Traffic+Aesthetics frame. See Figure 10 for the experimental design in Study 2. Again, a Control group was included in order to test absolute treatment effects and mimic circumstances where individuals must indicate their support for a policy with little information. This vignette simulated the scenario but did not include a value frame. It read as follows: "You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live." Refer to the survey instrument in the Appendix for the language used in all vignettes included in the experiment.

Results

Descriptive Statistics

Table 9. Characteristics of Survey Respondents Compared with National Rates, 2016 (N=3,389)

	Population	Sample (unweighted)
Female	50.80%	58.37%
Male	49.20%	40.42%
High school graduate	29.63%	23.07%
Some college no degree	19.42%	22.22%
Associate's degree, occupational	9.00%	11.21%
Bachelor's degree	18.88%	25.91%
Master's degree or Professional degree	9.00%	8.70%
Doctoral degree	1.55%	1.83%
White	79.20%	65.09%
Black	12.90%	30.04%
Asian	4.40%	0.53%
American Indian and Alaska Native	1.00%	1.03%
Hispanic	15.10%	2.68%
Non-Hispanic	84.90%	97.32%
Below $25,000	23.52%	29.18%
$25,000 - $34,999	10.11%	16.47%
$35,000 - $49,999	13.12%	16.49%
$50,000 - $74,999	17.04%	17.00%
$75,000 - $99,999	11.54%	7.94%
$100,000 - $149,999	13.37%	5.61%
Midwest	21.10%	22.92%
Northeast	17.50%	20.80%
South	37.70%	41.07%
West	23.70%	15.20%

Three thousand three hundred eighty-nine Americans over age 18 from all fifty states participated in the Study (See Table 9 for a comparison between the study sample and US benchmarks taken from publically available government data). The sample was 58.37% female, 30.04% black and 65.09% white. In terms of ethnicity, 2.68% of survey respondents self-identified as Hispanic. As Table 8 reports, summary statistics show the Study 2 sample is comparable to national rates of educational attainment and income levels and overall geography. Also, respondents specified their political party affiliation as Republican (29%), Democrat (41%) and Independent (24%). Compared to national rates provided by the Gallup Poll, Democrats are underrepresented and Independents are overrepresented in the current sample.

The descriptive results described in the following sections were not compared to national data.

Health Status

As in the case of Study 1, health status ranging from Poor to Excellent was normally distributed in the Study 2 TurkPrime sample. See Figure 11 below.

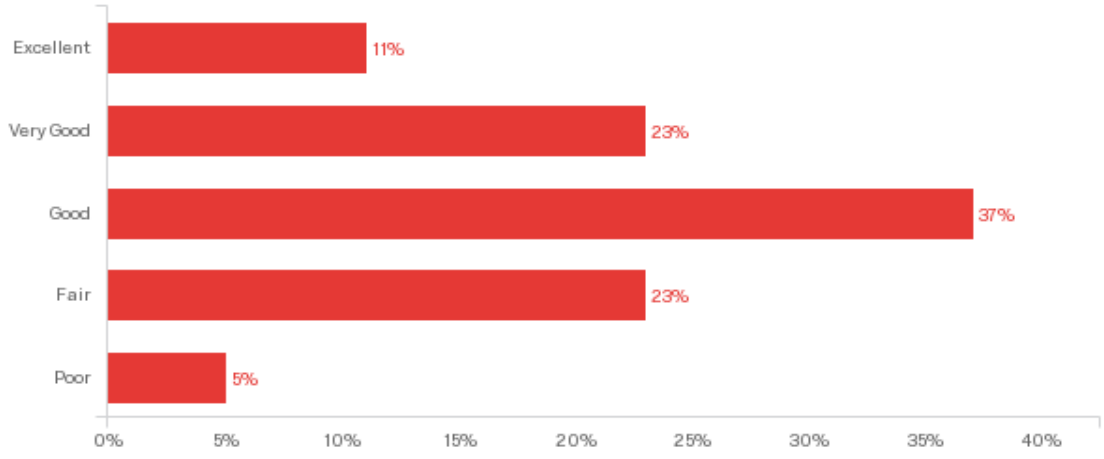


Figure 11. Health Status (Proportional Sample)

Role of Government

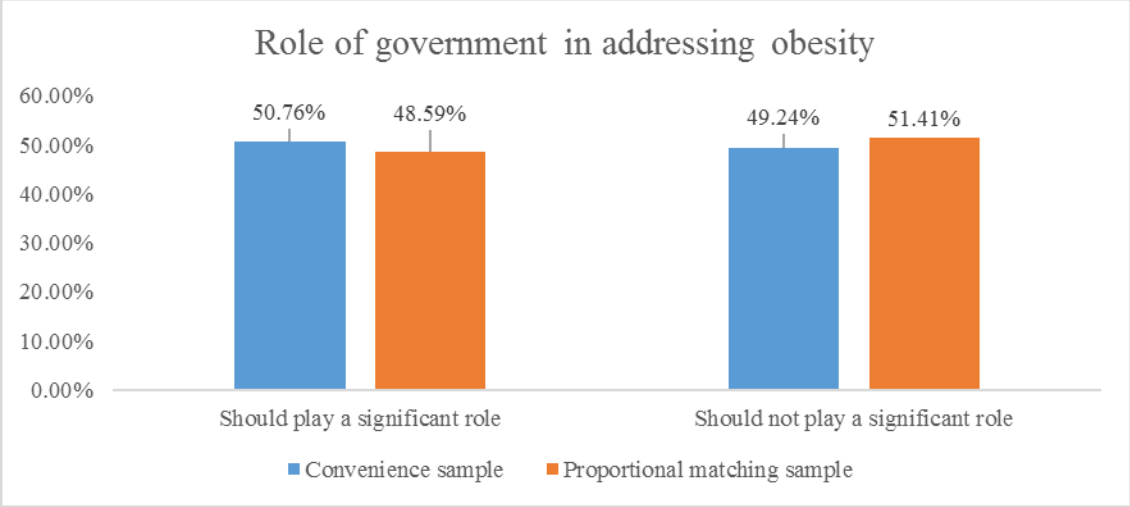


Figure 12. Role of Government in Addressing Obesity (Study 2 Proportional Sample vs. Study 1 Convenience Sample)

Study participants were asked 'Do you think government should or should not play a significant role in reducing obesity?' Shown in Figure 12, results from the proportional sample (right) were comparable to the convenience sample (left). In Study 2, Forty-nine percent respondents said government should play a significant role and Fifty-one percent expressed that the government should not play a significant role.

Description of Fast Food Restaurants

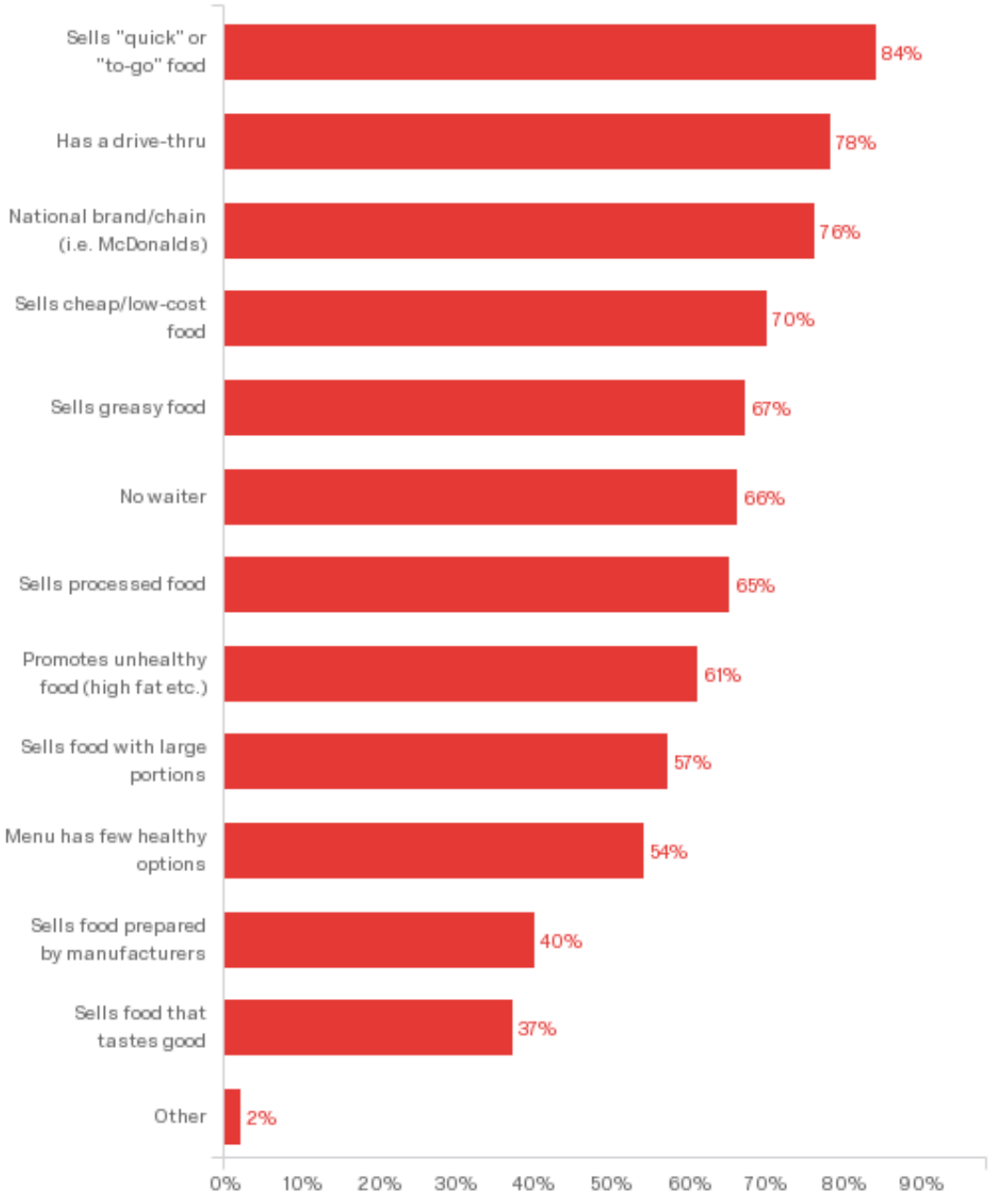


Figure 13. Characteristics of Fast-Food Restaurants (Proportional Sample)

All respondents were asked "How do you describe a fast food restaurant?" given a list of attributes that were collected during cognitive interviews and asked to select all they considered applicable. The vast majority of participants answered this questions as a food establishments that Sells quick/to-go food (84%), Has a drive-thru (78%), a National brand/chain (76%), and Sells cheap food (70%). These characteristics were also frequently selected in Study 1. See Figure 13 above.

The proportion of the Study 2 sample that perceived fast food establishments as 'Quite a bit' (32.40%) or 'A great deal' (35.17%) versus 'Somewhat' (20.65%), 'Very little' (6.32%) or 'Not at all' (5.47%) culpable in the obesity epidemic was quite similar to those in Study 1. Refer to Figure 14.

Respondents were asked to categorize a list of food store types as 'Unhealthy' or 'Healthy'. As reported in Figure 15., approximately 90 percent of subjects considered fast food restaurants as 'Unhealthy' along with Convenience stores and Gas stations with food.

Forty percent of subjects answered that they ate at Fast-food restaurants 'Sometimes', fifteen percent indicated that they ate at fast food restaurants 'Often' and about six percent said 'Most of the Time' or 'Always'. See Figure 16.

Culpability of Fast Food Retail in the Obesity Epidemic

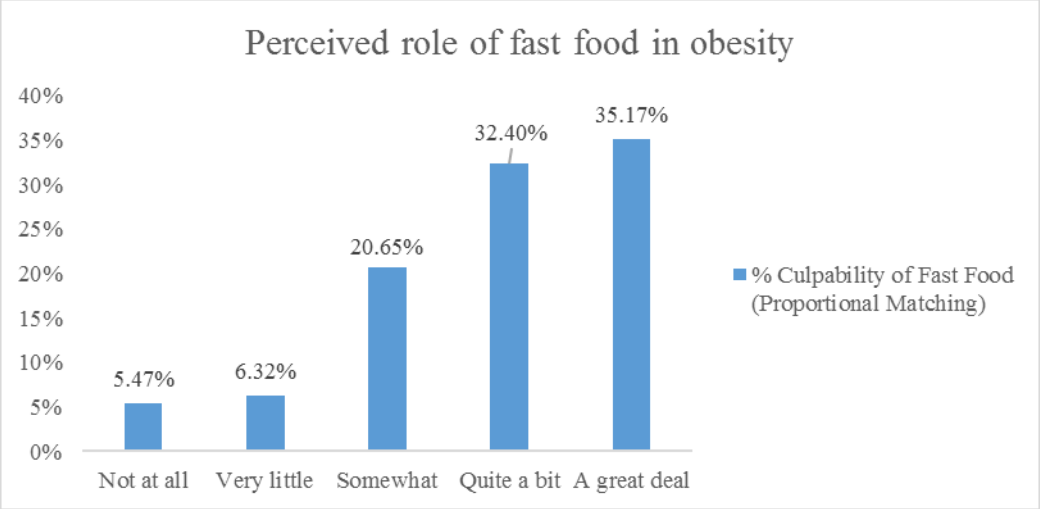


Figure 14. Culpability of Fast Food Retailers in the Obesity Epidemic (Proportionally Matched)

Food stores: Healthy vs. Unhealthy

Figure 15. Healthy' vs. Unhealthy Food Stores (Convenience Sample)

Health Behaviors

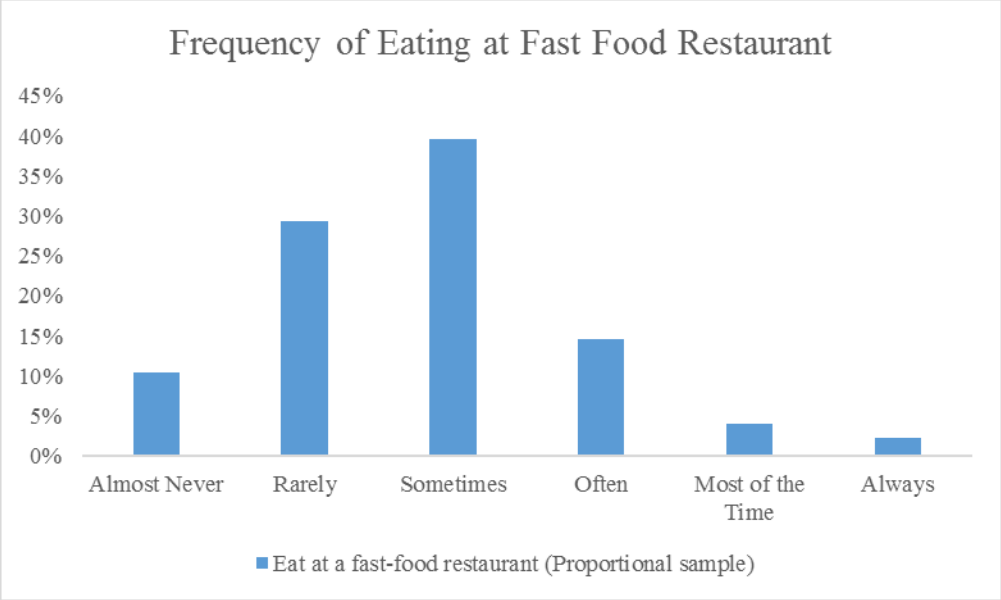


Figure 16. Fast food Frequency (Proportional Sample)

Ordered Probit Results: Unadjusted

Control Condition as Reference Group

Table 10. Marginal Effects After Ordered Probit Regression Results w/ No Covariates (Control as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Nutrition	0.0348	0.0272	0.0573*	0.0870***	0.00326	0.0587**
	(0.0303)	(0.0300)	(0.0301)	(0.0290)	(0.0242)	(0.0299)
Child Nutrition	0.0421	0.0519*	-0.00448	0.0780***	0.0307	0.0157
	(0.0302)	(0.0302)	(0.0299)	(0.0286)	(0.0252)	(0.0298)
Traffic	0.00428	0.0528*	-0.0186	0.0134	0.0307	0.0578*
	(0.0303)	(0.0304)	(0.0298)	(0.0270)	(0.0253)	(0.0299)
Economy	0.0427	0.0390	0.0315	0.0794***	-0.000559	0.0458
	(0.0303)	(0.0301)	(0.0300)	(0.0287)	(0.0239)	(0.0299)
Addictive	0.0153	0.00238	0.0299	0.0616**	0.0329	0.0148
	(0.0304)	(0.0299)	(0.0303)	(0.0285)	(0.0255)	(0.0300)
Equity	0.0687**	0.0786**	0.0532*	0.0204	0.0141	0.115***
	(0.0303)	(0.0305)	(0.0303)	(0.0272)	(0.0246)	(0.0297)
Observations	3,271	3,268	3,275	3,267	3,273	3,275

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Replicating the statistical approach taken in Study 1, I ran ordered probit regression models calculating the likelihood of support for each type of health zoning policies as a function of the treatments without controlling for respondent's characteristics. This step of the analysis included the full sample and omits the control group. Refer to Table 10 for marginal effects after ordered probit regression (by message frame and zoning policy) .

Overall, compared to the Control group, all message frames had a positive effect on support for Conditional Use Permits, Quotas & Bans, Toys & Promotional Games and Fast-Casual establishments. Several, but not all, of these effects were statistically significant. For example, the Nutrition Frame had a significant marginal effect on both Youth-oriented Health Zoning Policies (Minimum distance requirements from youth-oriented facilities= +5.73 percentage points, $p<0.1$; Toys and Promotional Games=+8.7 percentage points, $p<0.01$). This frame also had a positive, but statistically insignificant effect on both Conditional Health Zoning policies and support for Vehicle Access Restrictions. Similarly, the Equity message frame increased the chance that study participants supported both Conditional Health Zoning Policies (Permits= +6.87 percentage points, $p<.05$; Quotas & Bans = +7.86 percentage points, $p<.05$).

Unexpectedly, there were a few cases where the treatment actually decreased the chance that individuals would support certain health zoning policies compared to the

control group. For instance, considering the direction of the coefficient, the Child Nutrition frame slightly lowered the chance of support for Minimum Distance Requirement from Youth Facilities (-.4 percentage points). The Local Aesthetics+Traffic message also decreased support from this specific zoning policy, but with a larger magnitude of the effect (-1.86 percentage points). In terms of a zoning policy introducing Vehicle Access restrictions, the frame highlighting benefits to the Local Economy also had a small negative effect. While the negative framing effects described in this section were interested and unexpected, it should be noted that they were not statistically significant even at the α=.10 level.

Nutrition Condition as Reference Group

Table 11. Marginal Effects After Ordered Probit Regression Results w/ No Covariates, Full Sample (Nutrition Group as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	-0.0348	-0.0269	-0.0567*	-0.0794***	-0.00325	-0.0585**
	(0.0303)	(0.0291)	(0.0294)	(0.0232)	(0.0239)	(0.0296)
Child Nutrition	0.00734	0.0244	-0.0611**	-0.00830	0.0273	-0.0429
	(0.0303)	(0.0298)	(0.0293)	(0.0258)	(0.0250)	(0.0295)
Addictive	-0.0195	-0.0245	-0.0272	-0.0234	0.0295	-0.0438
	(0.0304)	(0.0293)	(0.0300)	(0.0255)	(0.0254)	(0.0297)
Economy	0.00791	0.0117	-0.0256	-0.00705	-0.00380	-0.0129
	(0.0304)	(0.0297)	(0.0297)	(0.0259)	(0.0238)	(0.0299)
Traffic	-0.0305	0.0253	-0.0750***	-0.0673***	0.0273	-0.000897
	(0.0303)	(0.0299)	(0.0291)	(0.0236)	(0.0251)	(0.0300)
Equity	0.0340	0.0510*	-0.00405	-0.0609**	0.0108	0.0567*
	(0.0305)	(0.0302)	(0.0302)	(0.0239)	(0.0245)	(0.0302)
Observations	3,271	3,268	3,275	3,267	3,273	3,275

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The Child Nutrition frame had no statistically significant impact on policies in the Conditional Health Zoning, Performance Health Zoning or Incentive Health Zoning categories. Surprisingly, in the full sample, this frame decreased the likelihood of support for Youth-related Health Zoning policies. Respondents primed with the Child Nutrition frame were 6.11 percentage points less likely to support Minimum Distance requirements from youth-oriented facilities ($p<.05$).

Based on results from ordered probit regression analyses with the Nutrition frame as the comparison, the Addictive and Local Economy message treatments did not have a statistically significant marginal effect (at the means) on any category of health zoning policies. In general, the coefficients were negative suggesting the Nutrition frame was more effective at increasing support for zoning policies. For instance, the Addictive frame decreased the likelihood of support of Fast-casual incentives by 4.38 percentage points.

The Local Aesthetics+Traffic message frame had a statistically significant, negative impact on the chance that respondents supported both Youth-related Health Zoning Facilities (Minimum Distance requirements from youth-oriented facilities= -7.5 percentage points, $p<.01$; Prohibitions on Toys and Promotional Games= -6.75 percentage points, $p<.01$). Based on this phase of the analysis, there was no statistically

significant impact of the Local Aesthetics/ Traffic message frame on the Conditional, Performance or Incentive Health Zoning policies.

Conversely, the Equity frame had a positive marginal effect on health zoning policies with the exception of both Youth-related health zoning policies. For the full sample, the Equity frame decreased support for introducing restrictions on Toys and Promotional games by 6.73 percentage points ($p<.05$). This frame had a small negative effect on Minimum distance requirements from Youth-oriented Facilities, but it was not statistically significant. (-.40 percentage points). Notably, the Equity frame resulted in a relative increase in approval for Quotas and Fast casual incentives by 5.1 ($p<.1$) and 5.67 ($p<.1$) percentage points, respectively. See Table 11 (Marginal Effects After Ordered Probit Regression Results w/ No Covariates).

Ordered Probit Regression Results: Adjusted Estimates

Nutrition Frame as Reference Group (Hypothesis 1)

Table 12. Marginal Effects After Ordered Probit, Full Sample (Nutrition Frame as Baseline)

VARIABLES	Permits	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	-0.0268	-0.0288	-0.0538*	-0.0772***	-0.000418	-0.0665**
	(0.0285)	(0.0276)	(0.0280)	(0.0221)	(0.0229)	(0.0281)
Child Nutrition	0.00982	0.0192	-0.0618**	-4.08e-05	0.0270	-0.0437
	(0.0283)	(0.0279)	(0.0276)	(0.0246)	(0.0237)	(0.0279)
Addictive	-0.0148	-0.0353	-0.0262	-0.0200	0.0227	-0.0429
	(0.0285)	(0.0275)	(0.0284)	(0.0243)	(0.0238)	(0.0282)
Economy	0.00806	0.00332	-0.0304	-0.0115	-0.00967	-0.0125
	(0.0285)	(0.0279)	(0.0281)	(0.0243)	(0.0223)	(0.0284)
Traffic	-0.0346	0.0209	-0.0741***	-0.0652***	0.0270	-0.00522
	(0.0282)	(0.0281)	(0.0276)	(0.0224)	(0.0238)	(0.0284)
Equity	0.0344	0.0498*	-0.00486	-0.0613***	0.0126	0.0609**
	(0.0287)	(0.0285)	(0.0287)	(0.0227)	(0.0234)	(0.0288)
Annual Income	-0.00157	0.0122***	0.000100	0.00903**	-0.000378	0.00778*
	(0.00465)	(0.00455)	(0.00466)	(0.00405)	(0.00371)	(0.00466)
Age	-0.00274***	-0.00308***	-0.000821	-0.000599	-0.000715*	-0.00236***
	(0.000515)	(0.000505)	(0.000519)	(0.000455)	(0.000414)	(0.000516)
Female	0.123***	0.0750***	0.0611***	0.00577	0.0182	0.0709***
	(0.0155)	(0.0155)	(0.0156)	(0.0136)	(0.0126)	(0.0155)

VARIABLES	Permits	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Urban	0.0185	0.0269	0.0287*	0.0371**	0.0374***	-0.00589
	(0.0170)	(0.0168)	(0.0170)	(0.0154)	(0.0142)	(0.0169)
Republican	-0.101***	-0.0871***	-0.100***	-0.0886***	-0.0160	0.00339
	(0.0174)	(0.0165)	(0.0171)	(0.0138)	(0.0137)	(0.0177)
Observations	3,145	3,144	3,148	3,141	3,147	3,149

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To reiterate, marginal effects after the ordered probit regression analyses were run with Nutrition as the omitted group. The unadjusted estimates described in the previous section were outputs from modeling without covariates. The adjusted treatment effects were produced modeling support for zoning policies as a function of the treatment frames, income, age, gender, geography and political party affiliation. As expected (because of the study's experimental design), the general trends for the adjusted estimates by frame and by policy outcome were identical to those revealed by the unadjusted estimates. Refer to Table 12 for marginal effects after ordered probit regression analyses including covariates with Nutrition as the omitted condition.

Essentially, controlling for key demographics, the Nutrition frame was still more effective than the Control group and treatment frames at increasing support for both Youth-related Health Zoning policies. Most of these coefficients were statistically significant at α=.01. The other types of health zoning policies were more consistent with Hypothesis 1. The Child Nutrition, Local Economy, and Equity frames had positive, marginal effects for both Conditional Health Zoning policies (Permits and Quotas/Bans) as well as Vehicle Access Restrictions. To highlight the only statistically significant result for those three dependent variables, the Equity frame increased the likelihood of support for Quotas and Bans by 5 percentage points ($p<.1$) relative to the Nutrition condition.

Separately, individuals primed with a message about gains in Equity were more likely to support incentives for Fast-casuals by 6.09 percentage points ($p<.05$).

Addictive Frame as Reference Group (Hypothesis 2)

Table 13. Marginal Effects After Ordered Probit, Full Sample (Addictive Properties Frame as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	-0.0120	0.00660	-0.0278	-0.0587**	-0.0223	-0.0238
	(0.0286)	(0.0284)	(0.0285)	(0.0231)	(0.0218)	(0.0285)
Nutrition	0.0148	0.0359	0.0263	0.0205	-0.0219	0.0430
	(0.0285)	(0.0285)	(0.0288)	(0.0257)	(0.0218)	(0.0284)
Child Nutrition	0.0246	0.0554*	-0.0359	0.0205	0.00417	-0.000767
	(0.0283)	(0.0285)	(0.0282)	(0.0254)	(0.0227)	(0.0282)
Economy	0.0228	0.0392	-0.00428	0.00872	-0.0312	0.0306
	(0.0285)	(0.0285)	(0.0285)	(0.0252)	(0.0212)	(0.0284)
Traffic	-0.0199	0.0570**	-0.0483*	-0.0463**	0.00417	0.0378
	(0.0283)	(0.0287)	(0.0281)	(0.0233)	(0.0228)	(0.0284)
Equity	0.0492*	0.0863***	0.0215	-0.0423*	-0.00977	0.104***
	(0.0286)	(0.0290)	(0.0290)	(0.0236)	(0.0223)	(0.0284)
Annual Income	-0.00157	0.0122***	0.000100	0.00903**	-0.000378	0.00778*
	(0.00465)	(0.00455)	(0.00466)	(0.00405)	(0.00371)	(0.00466)
Age	-0.00274***	-0.00308***	-0.000821	-0.000599	-0.000715*	-0.00236***
	(0.000515)	(0.000505)	(0.000519)	(0.000455)	(0.000414)	(0.000516)
Female	0.123***	0.0750***	0.0611***	0.00577	0.0182	0.0709***
	(0.0155)	(0.0155)	(0.0156)	(0.0136)	(0.0126)	(0.0155)
Urban	0.0185	0.0269	0.0287*	0.0371**	0.0374***	-0.00589

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
	(0.0170)	(0.0168)	(0.0170)	(0.0154)	(0.0142)	(0.0169)
Republican	-0.101***	-0.0871***	-0.100***	-0.0886***	-0.0160	0.00339
	(0.0174)	(0.0165)	(0.0171)	(0.0138)	(0.0137)	(0.0177)
Observations	3,145	3,144	3,148	3,141	3,147	3,149

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Overall, (controlling for key demographics) the Addictive Properties frame did not have a statistically significant marginal effect on support for zoning policies relative to the Control group, Nutrition, Child Nutrition or Local Economy/Aesthetics frame. One exception to this trend was zoning policies Prohibiting Toys and Promotional Games. Controlling for key demographics, individuals randomly assigned to the no frame condition were 5.87 percentage points ($p<.05$) less likely to support this policy option than the Addictive frame condition.

The coefficients reflecting the marginal effect of the Nutrition versus the Addictive Properties Frame (considering all zoning policies as the dependent variable) were not statistically significant, but the positive signs suggest the Nutrition may actually increase support more. However, based on the sign of the coefficient, the Nutrition frame had a relative decrease in support for Vehicle Access restrictions of 2.19 percentage points.

A second exception to the general trend of statistical insignificant marginal effects for the Child Nutrition frame pertains to the Conditional Health Zoning policy category. This treatment frame was more effective at increasing support for Quotas and Bans on fast-food establishments by 5.54 percentage points ($p<.1$).

There were more statistically significant differences in marginal effects between the Addictive Properties condition and the Traffic as well as Equity frames. The Local

Aesthetics + Traffic frame was less effective in bolstering support for both Youth-related Health Zoning policies than the Addictive frame by about 5 percentage points (Minimum Distance requirement= -4.83 percentage points, $p<.1$; Toys & Promotional Games = 4.63 percentage points, $p<.05$). However, individuals randomly assigned to the Traffic condition had a higher chance of supporting Quotas and Bans by 5.7 percentage points ($p<.05$).

In general, the Equity frame increased support for zoning policies more than the Addictive Food frame. Respondents primed with information about the potential for a more equitable food system had a higher chance of supporting Conditional Use Permits and Quotas by 4.92 ($p<.1$) and 8.63 percentage points ($p<0.01$), respectively. The Equity treatment frame also had a considerably higher marginal effect on the likelihood of support for Fast-casual incentives by 10.4 percentage points ($p<.01$). Conversely, the Equity frame had a negative, marginal effect on the chance that respondents were in favor of Toy & Promotional Games restrictions of 4.23 percentage points ($p<.1$). Lastly, compared to the Addictive Properties frame, participants exposed to an Equity message were slightly less likely to support Vehicle Access restrictions (1.00 percentage pts). However, this result was not statistically significant. Refer to Table 13 for marginal effects after ordered probit regression analysis with the Addictive Properties condition as the omitted group.

Race Equity Frame (Hypothesis 3)

Table 14. Marginal Effects After Ordered Probit, Black Subsample (Equity Frame as Baseline)

VARIABLES	Permits	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	0.00436	-0.0948**	-0.0514	-0.0190	-0.0780**	-0.132***
	(0.0520)	(0.0476)	(0.0513)	(0.0436)	(0.0346)	(0.0500)
Nutrition	0.0281	-0.0622	-0.0204	-0.0243	-0.106***	-0.0715
	(0.0513)	(0.0494)	(0.0524)	(0.0442)	(0.0328)	(0.0520)
Child Nutrition	-0.0331	0.0168	-0.0814	0.0758	-0.0253	-0.132***
	(0.0515)	(0.0508)	(0.0511)	(0.0480)	(0.0388)	(0.0501)
Economy	-0.000149	-0.0212	-0.0232	0.0622	-0.0501	-0.125**
	(0.0522)	(0.0507)	(0.0524)	(0.0479)	(0.0373)	(0.0508)
Traffic	0.000846	-0.0180	-0.0784	-0.0517	-0.0255	-0.105**
	(0.0522)	(0.0503)	(0.0514)	(0.0421)	(0.0392)	(0.0512)
Addictive	-0.0779	-0.0637	-0.0237	0.0549	-0.00663	-0.0956*
	(0.0526)	(0.0500)	(0.0531)	(0.0484)	(0.0410)	(0.0521)
Annual income	0.000340	0.0264***	0.00955	0.0120	-0.00141	0.0340***
	(0.00936)	(0.00920)	(0.00940)	(0.00821)	(0.00755)	(0.00916)
Age	-0.00245**	-0.00365***	-0.00190*	-0.00208**	-0.000460	-0.000680
	(0.00107)	(0.00102)	(0.00106)	(0.000919)	(0.000851)	(0.00106)
Female	0.119***	0.0810***	0.0821***	0.0299	0.0219	0.0767***
	(0.0289)	(0.0293)	(0.0293)	(0.0262)	(0.0241)	(0.0288)

VARIABLES	Permits	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Urban	-0.0303	-0.0377	-0.0264	-0.0194	0.00755	-0.00894
	(0.0280)	(0.0271)	(0.0278)	(0.0238)	(0.0224)	(0.0275)
Republican	-0.0425	-0.000292	0.00538	0.0149	0.0249	-0.0401
	(0.0666)	(0.0656)	(0.0666)	(0.0588)	(0.0555)	(0.0658)
Observations	986	988	988	985	987	989

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Considering Conditional Use Permits as the dependent variable, there was no statistically significant difference between black respondents randomly assigned to the Equity frame compared to other conditions. The marginal effects for the Control, Nutrition, and Local Aesthetics+Traffic frame were, unexpectedly, in the positive direction (Control=.436 percentage points, Nutrition=2.81 percentage points, Traffic=.08 percentage points). The results were also statistically insignificant with support for Quotas and Bans as the outcome variable, but the coefficients were generally negative consistent with Hypothesis 3. However, there were two exceptions that should be noted. First, blacks randomly assigned to the Control group had a lower chance of supporting a zoning policy introducing Quotas by 9.48 percentage points and this result was statistically significant at α=.05. Second, the Child Nutrition frame had a small, positive marginal effect of 1.68 percentage points but this result was not statistically significant.

There were similar patterns for both Youth-related policies in terms of lack of statistical significance differences with the Equity condition as the omitted group. However, for the Minimum Distance from Youth-oriented Facilities policy, the Control group and treatment frames had the expected, marginal effect. In other words, the Equity frame increased the chance black study participants supported this policy option by 2.04 to 8.14 percentage points more relative to other groups.

To reiterate, none of the marginal effects for Toys and Promotional Games were statistically significant. However, the signs on the coefficients suggest the Child Nutrition (7.58 percentage points), Economy (6.22 percentage points) and Addictive Frames (5.49 percentage points) were more effective than the Equity frame at increasing support for this policy in this subsample.

Black study participants randomly assigned to the Control group and "pure" Nutrition frame had a decreased likelihood of supporting Vehicle Access restrictions by 7.8 ($p<.05$) and 10.6 percentage points ($p<.01$) relative to the Equity condition. The other treatment frames were statistically insignificant, but also in the (expected) negative direction.

The marginal effects on Fast-casual incentives relative to the Equity frame were statistically significant and negative (consistent with Hypothesis 3). One deviation from this trend was the Nutrition frame which had a -7.14 marginal effect but was not statistically significant. Otherwise, respondents that self-identified as black were considerably less likely to support Fast-casual incentives when exposed to a message frame highlighting Child Nutrition (13.2 percentage points, $p<.01$); Local Economy (12.5 percentage points, $p<.05$), Local Aesthetic+Traffic (10.5 percentage points, $p<.05$) and the Addictive frame (9.56 percentage points, $p<.1$). See Table 14. for marginal effects after

ordered probit regression models restricted to black respondents and omitting the Equity condition.

Moderating Effects of Race (Hypothesis 4)

Table 15. Message Frames that Increased Likelihood of Support (by zoning policy category & by race)

	Full Sample	White Subsample	Black Subsample
Conditional Health Zoning Policies			
Permits	Equity	Equity	
Quotas & Bans	Child Nutrition, Traffic, Equity	Equity	Child Nutrition, Equity
Youth-Related Health Zoning Policies			
Minimum Distance from Youth Facilities	Nutrition, Equity	Nutrition	
Toys & Promotional Games Restrictions	Nutrition, Child Nutrition, Economy, Addictive	Nutrition, Child Nutrition, Economy, Addictive	Child Nutrition, Economy
Performance Zoning Policies			
Vehicle Access Limitations			Addictive, Equity
Incentive Zoning Policies			
Fast casual Incentives	Nutrition, Traffic, Economy, Equity	Nutrition, Traffic, Economy, Equity	Equity

The Equity frame was the only treatment that had a statistically significant effect on the predicted probability of supporting conditional use permits in the full sample and white subsample. Based on the full sample, subjects randomly assigned to this condition were 6.3 percentage points more likely to support this type of zoning restriction relative to the control group (p=.047). When the sample is restricted to whites,

the equity frame resulted in an 8.17 percentage point increase in the likelihood of support (p=.03). There were no significant marginal effects compared to the control groups among black respondents.

The Equity frame also increased the chance of indicating support for Quotas in the full sample (7.99%, p=.009) and both subsamples (6.46 pts. for Whites, p=.08) and (9.9 pts for Blacks, p=.07). In the full sample, respondents randomly assigned to the Local Aesthetics+Traffic condition had a higher probability of supporting a policy introducing Quotas by 5.08 percentage points. Blacks randomly assigned to the Child Nutrition treatment group were 11.62 percentage points more likely to indicate support for introducing Quotas than Blacks randomly assigned to the Control group.

Respondents randomly assigned to the Nutrition message frame were 5.48 percentage points more likely than the Control group to support zoning policies targeting Youth-oriented Facilities (p=.075). Relative to this result in the full sample, among White subjects this [nutrition] condition increased the chance of supporting Youth-oriented zoning restrictions by 6.32 percentage points. By contrast, there were no frames that had a statistically significant impact on support for a policy of this kind.

The likelihood of support for introducing restrictions on Toys and Promotional games in fast food restaurants was increased by the Child Nutrition and Local Economy +Nutrition message frames across all three samples. Considering all survey respondents

assigned to the Child Nutrition, individuals were 8.19 percentage points more likely to support this policy compared to 7.32(p=.025) and 9.35 percentage points (p= .049) in the White and Black subsamples, respectively. In the full sample, people randomly assigned to the Local Economy+ Nutrition frame were 7.02 percentage points (p=.002) more likely to report supporting restrictions on toys. Blacks in the same treatment group had a higher chance of supporting this policy by 9.35 percentage points (p=.093) in contrast to 6.18 (p=0.059) for Whites. With the exception of the subsample of Black participants, the Nutrition and Addictive Food frames also increased support as well. Results showed the Nutrition frame had statistically significant marginal increases of 8.2 percentage points (p=.003) including all sample members compared to 11.3 among Whites (p=.001). Subjects randomly assigned to the Addictive Food frame in the full sample and White sample had an increased chance of supporting restrictions on toys and promotional games (6.15 percentage points [p=.024] vs. 5.43 percentage points, respectively.)

Results of marginal effects on the outcome variable for fast casual incentives after ordered probit regression analysis reveal the Nutrition frames increases the probability of support. (Full sample: 6.76 percentage point, p=.029) vs. (White subsample: 7.62 percentage points, p=. 042). The Local Economy + Nutrition frame increased the likelihood of support in the full sample by 5.5 percentage points (p=.075). The marginal effect of this treatment on support for fast casual incentives increased to 8.53 percentage

points (p=.022) when the sample was restricted to whites and there was no significant marginal effect for the black subsample. Similarly, the likelihood of support for fast casual incentives increased relative to the control frame among full sample (6.23 percentage points, p=.044) and white subsample members (8.54 percentage points, p=.022) randomly assigned to the Traffic/Aesthetics + Nutrition frame. Notably, the Equity + Nutrition framed had a similar statistically significant marginal effect on support for a zoning policy targeting fast-casual establishments for both the Black and White subsamples (13.56 percentage points, p=.015 vs. 12.39 percentage, p=.001).

The Equity+ Nutrition frame was the only treatment that had a statistically significant marginal effect on limiting vehicle access zoning policies. Black study participants randomly assigned to this condition were more likely to support a zoning policy limiting vehicle access to fast food retailer by 8.39 percentage points (p=.056). The Equity frame did not have a significant marginal effect in the White subsample or in the full sample.

See Table 15 for a general overview of frames that had a significant, positive effect on support by policy type (relative to the control group) and stratified by race. Refer to Appendix Tables 15 –20 for ordered probit regression models informing this table.

Local Aesthetics & Traffic Frame (Hypothesis 5)

Table 16. Marginal Effects After Ordered Probit, Full sample (Local Aesthetics & Traffic Frame as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Control	0.00785	-0.0492*	0.0208	-0.0132	-0.0262	-0.0614**
	(0.0285)	(0.0271)	(0.0285)	(0.0248)	(0.0214)	(0.0282)
Nutrition	0.0346	-0.0207	0.0751***	0.0704***	-0.0258	0.00522
	(0.0282)	(0.0274)	(0.0284)	(0.0270)	(0.0214)	(0.0284)
Child Nutrition	0.0444	-0.00160	0.0126	0.0703***	-2.54e-06	-0.0385
	(0.0281)	(0.0275)	(0.0282)	(0.0266)	(0.0223)	(0.0280)
Economy	0.0427	-0.0174	0.0444	0.0580**	-0.0351*	-0.00725
	(0.0282)	(0.0275)	(0.0284)	(0.0265)	(0.0208)	(0.0284)
Addictive	0.0199	-0.0556**	0.0487*	0.0489*	-0.00414	-0.0377
	(0.0283)	(0.0269)	(0.0286)	(0.0265)	(0.0224)	(0.0283)
Equity	0.0689**	0.0287	0.0702**	0.00424	-0.0138	0.0662**
	(0.0283)	(0.0282)	(0.0287)	(0.0252)	(0.0219)	(0.0287)
Annual Income	-0.00157	0.0122***	0.000100	0.00903**	-0.000378	0.00778*
	(0.00465)	(0.00455)	(0.00466)	(0.00405)	(0.00371)	(0.00466)
Age	-0.00274***	-0.00308***	-0.000821	-0.000599	-0.000715*	-0.00236***
	(0.000515)	(0.000505)	(0.000519)	(0.000455)	(0.000414)	(0.000516)
Female	0.123***	0.0750***	0.0611***	0.00577	0.0182	0.0709***
	(0.0155)	(0.0155)	(0.0156)	(0.0136)	(0.0126)	(0.0155)
Urban	0.0185	0.0269	0.0287*	0.0371**	0.0374***	-0.00589

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
	(0.0170)	(0.0168)	(0.0170)	(0.0154)	(0.0142)	(0.0169)
Republican	-0.101***	-0.0871***	-0.100***	-0.0886***	-0.0160	0.00339
	(0.0174)	(0.0165)	(0.0171)	(0.0138)	(0.0137)	(0.0177)
Observations	3,145	3,144	3,148	3,141	3,147	3,149

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Local Aesthetics+Traffic Frame was more effective than the Control group and the majority of the treatment frames at increasing support for Quotas, Vehicle Access Restrictions and Fast-casual establishments, in general. One deviation from this pattern was the Equity frame which had a positive marginal effect on Quotas and incentives for Fast-casual establishments. Regarding the latter, there was a +6.62 percentage point difference ($p<0.05$). Otherwise, compared to the Local Aesthetic+Traffic frame, the non-Equity treatment frames and Control group lowered the chance for support of Quotas by .16 to 5.56 percentage points. There was a similar finding for incentivizing Fast-casual establishments where respondents in the Control, Child Nutrition, Economy and Addictive frames were less likely to be in favor of this policy option by .72 to 6.14 percentage points ($p<.05$). In regards to Vehicle Access Restrictions, there were negative marginal effects for the Control group and all message frames. The Economy message frame had a statistically significant difference of -3.51 percentage points ($p<.1$) on this policy option.

By contrast, the Local Aesthetics+Traffic was generally less effective at increasing approval of Conditional Use Permits and both Youth-related Health Zoning policies. The marginal effects for the Conditional Use Permits were all in the positive direction including the Equity message frame which increased the likelihood of support by 6.89 percentage points ($p<.05$). Notably, all other conditions had a positive marginal effect on

the Minimum Distance from Youth-oriented Facilities policy ranging from 1.26 percentage points for Child Nutrition to the Nutrition frame's marginal effect of 7.51 ($p<.01$). For Toys and Promotional Games, the Nutrition and Child Nutrition frames' marginal effects were both about 7 percentage points higher relative to the Local Aesthetics+Traffic message frame ($p<.01$). Study participants primed with the Economy or Addictive Properties frame were also more likely to favor this Youth-related Zoning policy. Though, results showed slightly lower effective sizes of 5.8 ($p<.05$) and 4.8 ($p<.1$) percentage points, respectively. Refer to Table 16 for a list of marginal effects after ordered probit regression including the full sample, but omitting the Local Aesthetics+Traffic frame for comparison.

Discussion

Hypothesis 1 that bundling Nutrition frames with non-Nutrition benefits was supported for the following policy types: Conditional Use Permits, Quotas, Vehicle Access Restrictions, and Fast-casual incentives. In particular, combining nutritional benefits with an Equity frame was the most effective at increasing support for these types of health zoning policies. The Youth-related health zoning policies contradicted Hypothesis 1 where the Nutrition frame was the most effective in increasing the chance that respondents favored Minimum Distance from Youth-oriented Facilities and Toys and Promotional Games. Surprisingly, considering the full sample, the adult Nutrition

frame led to more positive results than the Child Nutrition frame. This provides counterevidence to Hypothesis 1, suggesting there are specific types of zoning interventions and community settings that a Nutrition message frame is likely most effective.

To bolster public support for Minimum distance requirements from Youth-oriented Facilities, Toy restrictions and Fast Casual Incentives in mixed race or predominately white areas this pure nutrition frame could be appropriate. To achieve the same goal in a majority black neighborhoods, framing the matter as either beneficial for Child Nutrition specifically, the Local Economy or being more Equitable would be more effective.

Regarding **Hypothesis 2**, this study also aimed to replicate results from Study 1 testing the hypothesis that the Addictive Properties frame would be a "new frame" effective at increasing supporting for zoning restrictions on fast food outlets. The evidence on Youth-related policies generally supported this prediction. This frame would be useful for strengthening the backing for Toy restrictions in a mixed-race community. However, this hypothesis was generally <u>not supported</u> for the Conditional or Incentive zoning policies. The Equity frame was notably more effective at increasing support for Permits, Quotas and Fast casual incentives than the Addictive Properties Frame.

Hypothesis 3 was supported because the Equity frame highlighting gains included in the survey experiment was effective in increasing support among black respondents for Vehicle Access Restrictions and Fast-casual incentives. In general, blacks responded more positively to the Nutrition and Child Nutrition message frames for the other two categories of health zoning (Conditional and Youth-related Health Zoning). Notably, findings suggest the Equity message frame would also work to increase the amount of people in Mixed race communities favoring all but one category of zoning restrictions as well (Conditional Use Permits, Quotas, Minimum Distance requirements from youth-oriented facilities and Fast Casual Incentives). Message frames focusing on gains in Equity would also increase public opinion of Conditional Use Permits, Quotas and Fast casual incentive policies among Whites based on the results of this study.

Study 2 finds evidence in support of differential framing effects by race and by zoning policy category (**Hypothesis 4**). As reflected in Table 15., the White and Black subsamples varied in their response to the (adult) Nutrition frame in particular. This frame increased support for Youth-related Zoning policies as well as Incentive Zoning policies whereas black respondents appear to have responded most positively to Youth-related policies when primed with Child Nutrition Frames, for example.

Hypothesis 5 was partially supported. The Local Aesthetics and Traffic frame was more effective for one of the Conditional Health Zoning policies as well as both the

Performance and Incentive Zoning Policies. This Hypothesis was not supported for the Youth-related Health Zoning category. In particular, the Traffic and Local Aesthetics Frame bolstered support for Quotas, Vehicle Access restrictions and Fast Casual incentives in the Full Sample.

General Discussion

Overview of Key Findings and Policy Implications

In general, causal evidence from the more representative, proportionally matched sample may be used to inform public health advocates' efforts to pass zoning restrictions on fast food establishments (accounting for racial composition). The public policy implications of my results are as follows:

- Bundling Nutrition with an Equity (gains) message frame would be most effective for increasing support for Conditional, Incentive and Performance Zoning Policies in mixed race, predominantly black and majority white communities.
- A general (adult) Nutrition or Addictive Properties campaign would be a successful strategy for advocating Youth-related Health Zoning activities in a predominantly white or mixed race neighborhood.

- Health advocates promoting Youth-related Health Zoning or Conditional Health Zoning policy interventions in predominantly black communities should tailor the campaign to focus on Child Nutrition versus a general (adult) Nutrition message.

Key Findings by Study Objectives 1, 2 & 3

The three primary goals for Study 1 and Study 2 taken together included investigating whether Nutrition messaging could be combined with non-Nutritional benefits to increase public support for health zoning restrictions targeting fast food establishments. I find that a message frame about Nutrition and increasing Equity in the food system was particularly effective at increasing support for health zoning policies targeting fast food outlets across policy categories (Conditional, Youth-related, Performance, and Incentive) and across racial groups. This finding is consistent with an influential environmental justice scholar's description of "injustice frames" as effective at mobilizing supporters around environmental issues (Taylor 2000). I extend this rationale to food environment obesity prevention efforts and identify Nutrition combined with Equity frames as an arguably universal campaign strategy for bolstering public support of zoning restrictions on fast food retailers.

The second objective of this chapter was to more narrowly consider the relative effectiveness of an Equity-related health marketing campaign for zoning restrictions in

black communities. I find evidence supporting a strong positive response to this frame for Vehicle Access Restrictions (Performance Zoning Category) and Fast-casual restaurant incentives (Incentive Zoning Category), specifically. Interestingly, compared to Equity-related messaging, black communities may especially favor Conditional and Youth-related zoning policies more when exposed to Child Nutrition frames.

Third, this chapter of my dissertation set out to identify differential effects of each frame on black versus white study participants. This goal was met using stratification by race and assessing disparate distribution in level of support for each policy by experimental condition. I indeed find evidence of differential treatment effects and the importance of health zoning advocates' careful consideration of racial composition in communities where restrictions on fast-food restaurants are on the agenda. Next, I will highlight key findings pertaining to the moderating effects of race in framing zoning restrictions. The Nutrition frame evoked support for Youth-related and Incentive Zoning Policies for white but not black study participants. For black respondents, the Child Nutrition frame increased support even for Conditional Health Zoning policies (quotas and bans) and restrictions on toys and promotional games in fast food establishments. The Addictive food frame increased support for Youth-related policies in the Full Sample and for the Whites sample. It also had a positive effect on black respondents' response to Performance zoning efforts (vehicle access restrictions).

Study 1 vs. Study 2

The finding from Study 1 that the Equity frame was more effective than the Nutrition frame at increasing support for Fast Casual incentives was replicated for Study 2. Unexpectedly, the Nutrition frame resulted in more support for Minimum distance requirements from youth-oriented facilities than both the Child Nutrition message frame and the Traffic/Aesthetics condition. This finding was consistent after controlling for key demographics. The Nutrition frame also increased support for Toy restrictions for the Full sample and white subsample, but not for blacks in this study (consistent with Study 1). The Nutrition frame increased support for fast casual incentives among the full samples and among whites but not for blacks as well. However, likely as a result of the sampling approach and the sample size, this was not a significant effect in Study 1.

Table 17 above compares significant, positive message frames by race and policy category between the convenience sample and proportionally matched sample. Interestingly, framing effects on both Toy restrictions and Fast-casual restaurant incentives were robust in both Study 1 and Study 2. Fielding the same online survey instrument to two different samples offers provides a robustness check, and thus strengthens these findings.

Table 17. Message Frames that Increased Likelihood of Support (by zoning policy category & by race)

	Full Sample Community Study 1	Full Sample Community Study 2	White Subsample Study 1	White Subsample Study 2	Black Subsample Study 1	Black Subsample Study 2
Conditional Health Zoning Policies						
Permits		Equity		Equity		
Quotas & Bans	Nutrition	Child Nutrition, Traffic, Equity		Equity	Nutrition	Child Nutrition, Equity
Youth-Related Health Zoning Policies						
Minimum Distance from Youth Facilities		Nutrition, Equity		Nutrition		
Toys & Promotional Games Restrictions	Nutrition, Child Nutrition, Addictive	Nutrition, Child Nutrition, Economy, Addictive	Nutrition, Addictive	Nutrition, Child Nutrition, Economy, Addictive	Child Nutrition, Addictive, Equity	Child Nutrition, Economy
Performance Zoning Policies						
Vehicle Access Limitations	Economy				Child Nutrition	Addictive, Equity
Incentive Zoning Policies						

	Full Sample Community Study 1	Full Sample Community Study 2	White Subsample Study 1	White Subsample Study 2	Black Subsample Study 1	Black Subsample Study 2
Fast casual Incentives	Economy, Equity	Nutrition, Traffic, Economy, Equity	Equity	Nutrition, Traffic, Economy, Equity	Child Nutrition, Economy, Equity	Equity

Study Limitations

This study has a few key limitations. While random assignments into control (no frame) and treatment conditions enhance internal validity, the survey data used in Sample 1 and Sample 2 was not collected from a random probability sample to achieve greater external validity. Therefore, we cannot be certain that the findings from this investigation are generalizable to the adult American population. In an effort to strengthen the external validity of this paper's findings, sample 2 was collected using a quota sampling scheme aiming to proportionally match the American population on education, gender, and party affiliation. This strategy was employed by Rosenzweig (2015) who found estimates from a proportionally matched sample from TurkPrime were comparable to a random probability sample than a convenience sample of Amazon Mechanical Turkers. Sample 2, in particular, might have been made more generalizable to the U.S. adult population if more than three dimensions could have been incorporated into the quota sampling scheme or a random draw of online respondents for specific subgroups (i.e. blacks). However, these strategies were not feasible using Amazon Mechanical Turk or Turk Prime given budgetary constraints. In the case of random sampling, weighting might have been used to correct for any additional imbalances in the sample. However, weighting the samples would have only been misleading if applied in this context.

The second limitation of this paper is that it observes self-reported rather than actual behavior given a hypothetical situation rather than actual behavior. The study described in this paper uses a text-based vignette describing new zoning restrictions on fast food outlets in the area manipulating the proposed benefit of the policy that is emphasized (Mutz, 2011).

Strengths & Contributions

Despite these limitations, this paper makes several contributions to what we know about health zoning restrictions on fast food retailers as a matter for public health, public policy and environmental justice. This study takes a novel methodological approach to investigating how message frames previously used in the media can be used to most effectively initiate previously proposed health zoning policies targeting fast. To my knowledge, this is the first study of its kind to employ both survey and experimental design elements to effort to identify "what works" to bolster public support of health zoning restrictions on fast food retail.

The findings from this analysis have real-world policy applications because lack of public support appears to be a real barrier to implementing such interventions like the ban in South L.A. as well as other cases (Abdollah 2007, Creighton 2009). Another key implementation issue that undermined the South L.A. ban was how to define 'fast food restaurants' and thus identify which type of establishments new zoning restrictions would apply to (Sturm and Cohen 2009). However, results from Study 1 and Study 2

show some consensus around 'fast food restaurants' having key characteristics such as a drive-thru, processed food items, large portions, etc.

The ability to compare data from fielding the same survey instrument on two separate online samples is another strength of this study given the evolving literature on using Amazon Mechanical Turk to conduct social science research. Amazon Turk Prime is relatively new, innovative option for creating online samples allowing researchers to introduce inclusion criteria or quotas for specific demographics. Findings from this analysis can used to examine the marginal benefits of collecting data on Turk Prime relative to a convenience sample.

Lastly, the research described here offers theoretical contributions for public policy and public health as well. Results from this online survey experiments provide supporting evidence for gains-loss framing (Stalans 2012), Dardis' theory on the efficacy of new vs. repetitive frames (Dardis, Baumgartner et al. 2008) as well as the Socio-Ecological Model of Community-Level Obesity (Kumanyika, Whitt-Glover et al. 2007).

More specifically, equity-related messaging pertaining to zoning policies for fast food retailers, have only emerged in communities of color up to now, but have framed the issues in terms of loss (Nixon, Mejia et al. 2015). However, the findings outlined here show the potential efficacy of Equity-related frames emphasizing a more equitable food system as a potential gain of new health zoning policies not only for majority black communities but for white or mixed-race neighborhoods as well.

The evidence described here also supports the notion of a new Addictive Food frame as a potential contender for bolstering public opinion as it evokes a different aspect of American values and belief than has been used so far. Lastly, extrapolating from the results of both Study 1 and Study 2, racial identity is a moderator of framing effects (Hypothesis 4). Adaptive messaging should be employed because black communities have unique, historical relationships compared to other demographics (Kumanyika, Whitt-Glover et al. 2007).

Future Work

Future iterations of this work may aim to achieve greater external validity by fielding the same survey instrument used in this study on a random (probability) sample of adults (i.e.KnowledgePanel). A study of this nature comparing survey results from a convenience sample, quota sample, and probability sample would contribute to the growing literature on population-based survey experiments (Mutz 2011). One might also attempt to replicate the findings of who found that effects from a proportionally matched Amazon Turk prime sample were quite comparable to those taken from a random sample of U.S. adults that had completed the same questionnaire (Rosenzweig 2015).

Future work might also supplement quantitative analysis with qualitative studies in order to better explore mechanisms linking racial identity and framing effects associated with health zoning interventions targeting the food environments. To

exemplify this point, one future investigation might seek to understand *why* Blacks in both Study 1 and Study 2 responded more positively to certain types of zoning restrictions when primed with a frame about Child Nutrition but not (adult) Nutrition. To expand this research, in-depth interviews or focus groups are potential ways to investigate whether there are preexisting opinions or experiences in this group (Chong and Druckman 2007a, Chong and Druckman 2007b) or a group-specific value system that might explain such a finding (Stalans 2012). Also relevant to the matter of differential treatment effects by race, the current study should be expanded to incorporate an in-depth analysis of support for zoning restrictions among Hispanics and Asians. In this paper, Hispanics and Asians were included in the Full Sample but not stratified as Blacks and Whites were. Assuming sufficient sample size, modeling these groups separately would afford detecting unique distributions in level of support for various types of health zoning policies. Lastly, an expansion if this paper might run separate analyses modeling predictors of opposition to zoning policies, exploring significant mean difference in treatment effects beyond the control and nutrition conditions as baseline and an assessing key takeaways from statistically insignificant results.

Chapter 3: Conclusions and Implications for Public Policy and Research

Scholars argue policies limiting the availability or affordability of unhealthy foods may have more impact on obesity than those highlighting the lack of healthy food options (Fox and Horowitz 2013). Given limited resources for policy interventions, it is important that we make strides to identify which strategies are likely to have the greatest impact (Sim, Parker et al. 2010, Steeves, Martins et al. 2014). However, the systems approach to obesity prevention reveals that alleviating unhealthy food items without introducing alternative food stores could be problematic and potentially just lead to more food insecurity in these communities (which has also been linked to weight gain) (Fox and Horowitz, 2013).

Regarding efforts like zoning, the Institute of Medicine suggests that we consider all domains simultaneously: "These efforts should include encouraging or attracting retailers and distributors of healthy food (e.g., supermarkets) to locate in underserved areas and limiting the concentration of unhealthy food venues (e.g., fast-food restaurants, convenience stores). Incentives should be linked to public health goals in ways that give priority to stores that also commit to health-promoting retail strategies (e.g., through placement, promotion, and pricing) (Glickman, Parker et al. 2012).

My dissertation contributes to furthering this agenda in research and practice by considering health zoning restrictions as a means of correcting imbalanced community food environments across the country. My results suggest that it is important to use food

environment measures which incorporate both "healthy" and "unhealthy" food stores (Chapter 1) and to test different means of framing zoning policy options such as conditional use permits contingent on the sales of healthy alternatives or incentives for fast casual establishments (Chapter 2). In their 2013 article "Best Practices in Policy Approaches to Obesity Prevention", Fox and Horowitz propose a framework for evaluating obesity prevention in terms of the adequacy of available evidence and ethical dimensions such as liberty, equity, and political feasibility (Fox and Horowitz 2013).

Evidence

Currently there is insufficient evidence to know whether limiting access to less healthy food options will have the anticipated impact on eating behaviors and the prevalence of obesity. Chapter 1 of my dissertation contributes empirical evidence on this topic accounting for relative food store access, but is limited in that it does not explore mechanisms linking food swamps and obesity due to data limitations.

Although there is a dearth of empirical papers on zoning out fast food restaurants, the literature consistently shows a relationship between zoning policies and community food environments. Mayo et al. found that increasing permitted uses for healthy food outlets in zoning districts increased access to fruits and vegetables in rural North Carolina counties (Mayo, Pitts et al. 2013). A Bridging the Gap report analyzed data from 175 communities across the country and found that zoning ordinances

permitted fast-food restaurants and conveniences stores more often than grocery stores, supermarkets, farmers markets and community gardens (Chriqui, Thrun et al. 2012). My findings from Chapter 1 that food swamps have a stronger impact on obesity than food deserts are consistent with a longitudinal study that examined individuals' access to grocery stores and fast food outlets and found evidence to support 3 km zoning restrictions from low-income residents (Boone-Heinonen, Gordon-Larsen et al. 2011). The authors conclude that increased access to grocery stores would need to be done in combination with other strategies because access to these food stores had no impact on dietary changes.

Notably, standardized measures of food swamps and "fast food restaurants" in the context of health zoning policies should be priority aims in future research on this topic. Fleischhacker et al. find that out of forty articles, twenty had their own way of definition of fast food (Fleischhacker, Evenson et al. 2011). It is problematic that the Los Angeles City Council, in fact, passed a moratorium (or temporary prohibition) on issuing licenses for the construction of new fast food restaurants without a sound definition of what constitutes a "fast food restaurant" (Creighton, 2009). Survey data from Chapter 2 of this dissertation can be used to inform this discussion as there was some consensus around characteristics such as having a drive-thru.

Issues of Liberty and Equity in Designing Zoning Policies Targeting Fast Food Establishments

Fox and Horowitz assert that obesity policies should consider the extent to which they limit or preserve liberties (Fox & Horowitz, 2013). The authors make a strong case for considering how interventions influence liberty and equity. Regarding liberties, their model was informed by the libertarian-paternalist framework proposed by Sustein and Thaler which would involve government introducing defaults to induce healthy eating behavior through "soft paternalistic nudges". To further explore the issue of liberty, the public opinion survey with a built-in framing experiment (Paper 2) aimed to learn more about public perception of zoning restrictions on fast food outlets.

My findings from Chapter 2 are consistent with previous work pointing to the challenging task public health advocates will have in passing land-use policies targeting consumer food environments, particularly those that focus on restricting fast food restaurants (Ashe, Jernigan et al. 2003, Nixon, Mejia et al. 2015). The vast majority of study participants perceived fast food establishments as sources of unhealthy food and playing a key role in the prevalence of obesity. About 20 percent of the second sample reported eating at a fast food restaurant often, most of the time, or always, yet, both samples were evenly split on whether the government should play a role in obesity prevention efforts. One might argue that the ability to zone out fast-food establishments is a form of liberty and that public support is a key component of the policy process. Qualitative evidence reveals the steps residents and local organizations in Chula Vista

and Watsonville, California took in order to mobilize the community to revise their general plans to incorporate restrictions on fast food retailers (Feldstein 2006).

The framework proposed by Fox and Horowitz for evaluating obesity prevention policies also stresses the importance of addressing equity. They add equity to their model using inverse equity theory which claims that health disparities widen because the most advantaged are the first to take advantage of new knowledge about prevention or treatment. As previously mentioned, disparities in the prevalence of obesity are widening based on where people live, between individuals high and low on the socioeconomic gradient and between whites and communities of color, in particular (Glickman, Parker et al. 2012). These trends are paralleled by the well-documented overexposure of fast-food establishments in predominantly socially disadvantaged neighborhoods (Block, Scribner et al. 2004, Kumanyika, Whitt-Glover et al. 2007, Boone-Heinonen, Gordon-Larsen et al. 2011).

This is important as efforts to address health disparities along race and social class were explicitly mentioned by the 2012 IOM report on accelerating progress in obesity prevention and by the Healthy People 2020 Report (United States Department of Health & Human Services 2012).

Regarding health zoning efforts, there is empirical evidence to suggest that residential segregation, discriminatory planning, and exclusionary zoning play a major role in unequal development and that poor and minority neighborhoods are

undersupplied with "health-promoting resources" (like parks and gyms) and oversupplied with "health-restricting resources" (such as fast food and liquor stores) (Wilson, Hutson et al. 2008, Cannuscio, Tappe et al. 2013). Researchers have linked residential segregation to SES as a fundamental cause of health disparities (Williams and Collins 2001, Rossen and Pollack 2012). More specifically, a recent analysis of a racially integrated, low-income neighborhood in Baltimore found that racial differences in obesity were insignificant after controlling for residential segregation (LaVeist, Pollack et al. 2011). There is causal evidence linking neighborhood conditions to extreme obesity where participants randomly assigned to enroll in the Moving to Opportunity program (MTO) had lower rates of BMI >35 or BMI>40 relative to people in the control group (Ludwig, Sanbonmatsu et al. 2011). They conclude that the underlying mechanisms of the relationship remained unknown. However, they do not incorporate food environment measures in their analysis which has been identified as important in urban food environments (Cannuscio, Weiss et al. 2010, Cannuscio, Tappe et al. 2013). Results from Chapter 1 point to a causal relationship between food swamp areas inundated with unhealthy food retailers and rates of obesity among adults.

In reference to newer mixed-use "smart growth" and "urban revitalization" zoning approaches being adopted by planners, Wilson et al. make an ecological and systems argument for community health issues (Wilson 2009). The authors write: "Unfortunately, without the infusion of principles of equity and justice to ensure that

racial/ethnic and low socioeconomic status populations who reside in urban communities benefit from these planning approaches, more segregation, gentrification, and uneven planning, zoning and development may occur" (Wilson, Hutson et al. 2008, Wilson 2009). The IOM report states: Targeted actions are needed to reduce the inequitable distribution of health promotion resources and risk factors that contribute to health disparities in low-income, minority, and other disadvantaged populations.

Chapter 2 of my dissertation contributes to the current policy debates around using zoning policies to address both obesity and environmental justice. Key takeaways may be used to inform advocates' public health communication efforts. Extrapolating from the results of the national survey experiment, considering how the policy is framed along with characteristics of the neighborhood where restrictions on fast food retail are proposed restrictions will be critical determinants of where it passes. Arguably, this matters for both decision makers (i.e. city councils) and their communities as they both significantly impact the policy process.

Zoning policies targeting fast food outlets have been mostly passed in white, affluent areas throughout the country. These types of health zoning interventions have been proposed for communities of color but have mostly failed. In the case of South Los Angeles, zoning was changed but then overturned. Yet, the overexposure of black and Hispanic neighborhoods to fast food retailers persists (Kumanyika 2008).

I argue the media and how the issue has been framed is a key contributor to this outcome. Bridging my findings from both chapters, using food swamps as a spatial metaphor may work to identify priority areas for policy intervention, but only if there is an equitable distribution of resources and mobilization efforts. If the structural forces which ration access to land-use planning persist (arguably including the media as gatekeepers to information and producers of message frames) disparities in obesity are likely to widen.

My results on the effectiveness of the equity frame across subsamples and types of zoning policies reinforce this point. Individuals respond more positively to this frame but there may be structural factors and institutions that are incentivized to promote unfavorable messages about such restrictions. To date, equity as a value dimension has only surfaced when zoning interventions targeting fast food outlets were pursued for predominantly black neighborhoods. However, it was framed in the media in an unfavorable matter (i.e. unfair targeting) evoking negative responses from the public. Still, I find evidence of differential treatment effects where the nutrition frame worked for whites and the child nutrition frame for blacks, but not vice versa.

Results from this study support the notion that reframing the discussion about zoning out fast food establishments by highlighting gains in Equity is not only compelling for blacks, but for whites and other racial groups as well.

Appendix A: Chapter 1

Appendix Table 1. Definitions for Adult Obesity Rate & Food Environment Variables

Variable	Description	Data Source
Adult Obesity Rate	Estimate of age-adjusted percentage of persons age 20 and older who are obese, where obesity is Body Mass Index (BMI) greater than or equal to 30 kilograms per meters squared.	Center for Disease Control
BUILT ENVIRONMENT		
Grocery Stores NAICS:445110	The number of supermarkets and grocery stores in the county. Grocery stores include establishments generally known as supermarkets and smaller grocery stores primarily engaged in retailing a general line of food, such as canned and frozen foods; fresh fruits and vegetables; and fresh and prepared meats, fish, and poultry.	U.S. Census Bureau, County Business Patterns
Specialized Food Stores NAICS 445200	The number of specialized food stores in the county. Specialized food stores include establishments primarily engaged in retailing specialized lines of food, such as retail bakeries, meat and seafood markets, dairy stores, and produce markets.	U.S. Census Bureau, County Business Patterns
Farmers Markets	Number of Farmers Markets in the county. A farmers' market is a retail outlet in which two or more vendors sell agricultural products directly to customers through a common marketing channel. At least 51 percent of retail sales are direct to consumers.	USDA Agricultural Marketing Service
Supercenters NAICS:452910	The number of supercenters and warehouse club stores in the county. Warehouse clubs and supercenters are primarily engaged in retailing a general line of groceries in combination with general lines of new merchandise.	U.S. Census Bureau, County Business Patterns

Fast Food Restaurants NAICS:722211	The number of limited-service restaurants in the county. Limited-service restaurants include establishments primarily engaged in providing food services where patrons generally order or select items and pay before eating. Food and drink may be consumed on premises, taken out, or delivered to the customer's location	U.S. Census Bureau, County Business Patterns
Convenience Stores/Food Marts NAICS:445120 and 447110	The number of convenience stores in the county. Establishments known as convenience stores or food marts are primarily engaged in retailing a limited line of goods that include soda, snack foods, etc.	U.S. Census Bureau, County Business Patterns

Appendix Table 2. Food Environment Measures

Food Environment Description	# of counties
Food Swamp (dummy=1 if RFEI>3.44)	1718
Food Swamp2 (dummy=1 if RFEI>4.75)	947
RFEI Traditional>3.44	887
Expanded RFEI 2 (supercenters unhealthy)	1831
Both Food Swamp & Food Desert	568
Food Oasis (Neither Swamp or Desert)	31
Fast food retailers per 1000>.577	1704
Fast food retailers per 1000>.722	925
Food Desert (dummy based on USDA)	807
Food Desert (%low income & low access)	939

Note: Both food swamp and food desert counties and Food oases counts reflect only food swamp and food desert dummies

Appendix Table 3. Correlations Between Food Swamp and Food Desert Measures

	Food desert	Low Access & Low income (%)
Food swamp	0.06	**-0.07**
Food swamp 2	0.06	0.03
Expanded RFEI	**0.07**	**-0.10**
Expanded RFEI2	**0.09**	**-0.10**
Traditional RFEI	**0.10**	**-0.06**
Fast food retailers per 1000	-0.04	**-0.17**
Fast-food/ Total Food Store	0.07	**-0.29**

Appendix Table 4. Correlations between Obesity, Highway Exits, Food Environment Measures, Physical Activity and Demographics

	Obesity	Highway Exits
Obesity		
Highway Exits	-0.20	
Physical Activity Measures		
Fitness Center	-0.29	0.84
Natural Amenities	-0.36	0.15
Food Stores		
Fast Food Restaurants	-0.22	0.86
Full Service Restaurants	-0.26	0.82
Grocery Stores	-0.20	0.74
Supercenters	-0.18	0.76
Convenience Stores	-0.18	0.86
Specialized Food Stores	-0.23	0.76
Farmers Market	-0.29	0.68
Food Environment Measures		
% Low Access to Grocery Store	-0.12	-0.02
Traditional RFEI	0.16	-0.07
Expanded RFEI_1	0.11	0.04
Expanded RFEI_2	0.11	0.05
Fast Food retailers per 1,000	-0.20	0.15
% Fast food retail of total food stores	-0.04	0.27
Food Swamp (RFEI>3.44)	0.12	0.07
Food Swamp2 (RFEI>4.75)	0.12	-0.0035*
Food Desert	0.20	0.07
Both Food Swamp & Food Desert	0.30	-0.03
Food Oasis (Neither Swamp or Desert)	-0.22	-0.07
Demographics		
% Black	0.41	0.09
%Hispanic	-0.25	0.18
Median Household Income	-0.47	0.26
Poverty Rate	0.45	-0.08
Population	-0.21	0.86
% Bachelor's degree	-0.57	0.32
% Drove to work	0.30	-0.02*
%Public transportation to work	-0.24	0.30
% Walked to work	-0.18	-0.07

	Obesity	Highway Exits
Gini Index	-0.16	0.15
Other Key County Characteristics		
Gas stations with food	-0.16	0.85
Square Miles	-0.21	0.14
Area	-0.23	0.84
Metro	-0.14	0.33

Appendix Table 5. IV First-Stage Results

VARIABLES	**Food swamp**	**Food swamp 2**	**RFEI**	**RFEI 2**	**Traditional RFEI**	**Fast food retail/ 1000**	**Fast food retail/ Total food store**
F statistic	27.1	17.27	33.49	31.58	21.23	20.07	74.73
Highway exit coefficient	0.003	0.002	0.01	0.012	0.005	0.0011	0.001
Highway exit p value	0	0	0	0	0.004	0.004	0.004
Instrument Test F test	38.35	19.76	23.92	27.06	8.34	12.94	35.13

Note: In the first stage, the outcome is food swamps (a different measure of this phenomenon in each specification) and number of highway exits in a county in the independent variable.

Appendix Table 6. IV Coefficient Estimates of Food Swamps on Obesity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food swamp	4.406***						
	(0.974)						
Food swamp 2		6.372***					
		(2.107)					
RFEI			1.221***				
			(0.291)				
RFEI2				1.049***			
				(0.266)			
Traditional RFEI					2.090***		
					(0.691)		
Fast food retail/1,000 people						19.81***	
						(5.813)	
Fast food retail/Total Food Store							28.02***
							(6.745)
% Low income and Low Access	0.0295*	0.00286	0.0497***	0.0461**	0.0523**	0.145***	0.104***
	(0.0161)	(0.0178)	(0.0185)	(0.0187)	(0.0216)	(0.0431)	(0.0251)
Recreational Facilities	-0.0211***	-0.0171***	-0.0158***	-0.0156***	-0.00525	-0.0493***	-0.0228***
	(0.00630)	(0.00658)	(0.00531)	(0.00540)	(0.00799)	(0.0110)	(0.00718)
Natural Amenities	-1.042***	-1.146***	-1.163***	-1.155***	-1.190***	-1.418***	-0.997***
	(0.222)	(0.213)	(0.226)	(0.219)	(0.260)	(0.332)	(0.187)
Milk: Soda Price	0.175	-0.946	-0.619	-0.415	-1.889	2.254	2.321
	(1.926)	(1.696)	(1.672)	(1.649)	(1.799)	(2.423)	(1.785)
Bachelors degree (%)	-0.338***	-0.314***	-0.309***	-0.316***	-0.263***	-0.758***	-0.390***
	(0.0432)	(0.0437)	(0.0432)	(0.0423)	(0.0475)	(0.164)	(0.0408)
Black (%)	0.0381*	0.0422*	0.0396	0.0425*	0.0449*	0.0465*	0.0518**
	(0.0223)	(0.0255)	(0.0264)	(0.0253)	(0.0244)	(0.0252)	(0.0204)
Hispanic (%)	-0.0552***	-0.0639***	-0.0713***	-0.0695***	-0.0658***	-0.0760***	-0.0678***
	(0.0132)	(0.0149)	(0.0150)	(0.0155)	(0.0173)	(0.0159)	(0.0145)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age over 65	1.44e-05***	1.45e-05**	1.30e-05***	1.24e-05***	1.39e-05**	3.17e-05***	3.57e-06
	(5.44e-06)	(5.87e-06)	(4.65e-06)	(4.60e-06)	(6.13e-06)	(8.57e-06)	(7.99e-06)
Median HH Income	4.12e-06	1.44e-05	-5.02e-06	-2.27e-06	-1.06e-06	0.000154***	-3.20e-05
	(2.69e-05)	(2.75e-05)	(2.86e-05)	(2.89e-05)	(3.28e-05)	(5.65e-05)	(3.24e-05)
Poverty Rate	0.0998*	0.123**	0.0904	0.0913	0.0867	0.172**	0.0300
	(0.0550)	(0.0533)	(0.0556)	(0.0568)	(0.0589)	(0.0802)	(0.0692)
Square Miles	-7.82e-05	-2.73e-05	-1.97e-05	-1.93e-05	-5.87e-05	-6.04e-05	-3.80e-05
	(9.99e-05)	(0.000106)	(0.000108)	(0.000104)	(0.000109)	(0.000172)	(9.86e-05)
Constant	34.08***	35.06***	32.88***	33.02***	29.70***	21.29***	30.16***
	(2.260)	(2.219)	(2.353)	(2.309)	(3.070)	(5.380)	(2.791)
Observations	3,108	3,108	3,069	3,069	3,055	3,108	3,102
R-squared	0.367	0.206	0.269	0.301			0.285

Robust standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1

Appendix Table 7. IV Coefficient Estimates of Food Swamps on Obesity (Models Stratified by Means of Transportation to Work & Income Inequality)

	1	2	3	4	5
VARIABLES	Public transport<41	Drive to work<80	Drive to work>80	Gini <.41	Gini>.41
Food Swamp	4.243***	3.585***	5.122***	4.797*	4.353***
	-1.031	-1.11	-1.929	-2.753	-1.014
Low Income & Low Access	0.0288*	0.0379**	-0.0211	-0.00623	0.0347**
	-0.0159	-0.0165	-0.0271	-0.0189	-0.0169
Recreational Facilities	-0.0251***	-0.0253***	-0.00691	-0.0672**	-0.0193***
	-0.00832	-0.00703	-0.0127	-0.031	-0.00578
Natural Amenities	-1.053***	-1.132***	-0.781***	-1.006***	-1.037***
	-0.221	-0.242	-0.212	-0.295	-0.223
Milk: Soda Price	0.299	1.089	-1.491	3.631	-0.113
	-1.924	-2.135	-2.31	-2.728	-1.944
Constant	33.90***	32.97***	35.53***	33.70***	33.41***
	-2.273	-2.531	-2.379	-2.863	-2.336
Observations	3,104	1,502	1,604	636	2,472
R-squared	0.381	0.48	0.047	0.045	0.423

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1All specification control for # fitness centers, natural amenities, %black, %hispanic, number of people over 65, median household income, poverty rate and county size (in square miles)

Appendix B: Chapter 2 (Study 1)

Survey Instrument

Perceptions and Policy Survey

Thank you for your interest in this research. This study hopes to advance our understanding of how individuals form opinions about zoning policies. You will be asked a series of questions about your attitudes toward policies and judgments about some aspects of daily life. Your participation is voluntary and your responses will be anonymous. The survey should take about 7 minutes to complete. You will receive $0.70 for completing the survey. To receive compensation, you must complete the survey and provide your unique completion code in the Mechanical Turk page. If you have any questions about this research, you may contact Kristen Cooksey Stowers (kristen.cooksey@duke.edu) at any time. If you have any concerns about your rights as a subject in this study, you may contact the Chair of the Human Subjects Committee (Institutional Review Board) at 919-684-3030. Please reference IRB study # D0256 in your communication with the IRB, and you may contact them anonymously if you wish. To acknowledge that you have read this information and consent to participate in this study, please click on the "Next" button below.

Please enter your age.

Please select your gender.

- ❍ Male (1)
- ❍ Female (2)

In what region of the country do you live?

- ❍ Midwest – IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI (1)
- ❍ Northeast – CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA (2)
- ❍ Southeast – AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV (3)
- ❍ Southwest – AZ, NM, OK, TX (4)
- ❍ West – AK, CA, CO, HI, ID, MT, NV, OR UT, WA, WY (5)

This study will cover a broad range of topics. Please carefully read and answer the questions asked. Please ensure that you have answered a question as honestly and completely as possible before moving on to the next page.
Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live.

Timing
First Click (1)
Last Click (2)
#QuestionText, TimingPageSubmit# (3)
#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that it would promote good diet and health for adult residents.

Timing
First Click (1)
Last Click (2)
#QuestionText, TimingPageSubmit# (3)
#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that it would improve children's diet and health.

Timing
First Click (1)
Last Click (2)
#QuestionText, TimingPageSubmit# (3)

#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that it would improve the local economy as well as promote good diet and health for residents.

Timing

First Click (1)

Last Click (2)

#QuestionText, TimingPageSubmit# (3)

#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that studies have shown foods with very high amounts of fat, sugar and salt make people addicted and the new restrictions would lower the availability of these addictive foods.

Timing

First Click (1)

Last Click (2)

#QuestionText, TimingPageSubmit# (3)

#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that it would address fast food companies' unfair marketing practices in Black and Hispanic neighborhoods to make room for stores selling healthy food.

Timing

First Click (1)

Last Click (2)

#QuestionText, TimingPageSubmit# (3)

#QuestionText, TimingClickCount# (4)

Instructions: Please carefully read the information below. After you read this information you will be asked a few questions. You turn on your local news and hear about a new proposal to change zoning laws. It would introduce restrictions on fast food restaurants where you live. Consider that it would improve how your neighborhood looks, lower traffic congestion and promote good diet and health for residents.

Timing

First Click (1)

Last Click (2)

#QuestionText, TimingPageSubmit# (3)

#QuestionText, TimingClickCount# (4)

Q1 To what extent do you favor or oppose the following zoning changes? Take into account that each option addresses the problem previously mentioned.

	Strongly Favor (1)	Favor (2)	Somewhat Favor (3)	Neither favor nor oppose (4)	Somewhat Oppose (5)	Oppose (6)	Strongly Oppose (7)
Limit the total number of fast food restaurants in a community by introducing bans, quotas or limits. (1)	❍	❍	❍	❍	❍	❍	❍
Require permits for fast-food retailers that only alllow their development if they stock a certain proportion of shelf-space with healthy food products. (2)	❍	❍	❍	❍	❍	❍	❍
Require fast-food outlets to locate a minimum distance from youth-oriented facilities such as schools and playgrounds. (3)	❍	❍	❍	❍	❍	❍	❍
Limit vehicle access and curb cuts (meaning	❍	❍	❍	❍	❍	❍	❍

breaks in a curb allowing access from the road) into fast-food restaurant parking lots to decrease the convenience of fast food and drive-thrus. (8)							
Prevent fast-food restaurants from giving away toys and promotional games or from having play equipment and video games to attract youth. (5)	❍	❍	❍	❍	❍	❍	❍
Offer tax breaks and subsidies to incentivize fast-casual establishments (i.e. Panera Bread and Chipotle) to locate in certain neighborhoods. (6)	❍	❍	❍	❍	❍	❍	❍

Q2 Do you live in an urban, suburban, or rural area?

- Urban (1)
- Suburban (2)
- Rural (3)

Answer If Do you live in an urban, suburban, or rural area? Rural Is Not Selected

Q3 How many of each food store do you have within 1 mile from your home?

Answer If Do you live in an urban, suburban, or rural area? Rural Is Selected

Q4 How many of each food store do you have within 5 miles from your home?

	# of (1)
Grocery store/supercenter (1)	
Supercenter/club store (2)	
Farmer's market (3)	
Full service/Sit-down restaurant (4)	
Convenience store/corner store (5)	
Fast food/limited service (6)	
Gas stations with food (7)	

Q5 In your opinion, how much (if at all) does each food store type contribute to growing rates of obesity in the U.S.?

	Not at all (44)	Very little (45)	Somewhat (46)	Quite a bit (47)	A great deal (48)
Grocery store/supermarket (1)	❍	❍	❍	❍	❍
Supercenter/club store (2)	❍	❍	❍	❍	❍
Farmer's market (3)	❍	❍	❍	❍	❍
Specialty store (i.e.produce, meat market, bakery, etc.) (4)	❍	❍	❍	❍	❍
Full service/ sit-down restaurant (5)	❍	❍	❍	❍	❍
Convenience store/ corner store (6)	❍	❍	❍	❍	❍
Fast food/limited service (7)	❍	❍	❍	❍	❍
Gas stations with food (8)	❍	❍	❍	❍	❍

Q6 Generally speaking, how often do you:

	Almost Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Most of the Time (5)	Always (6)
Eat dairy (1)	❍	❍	❍	❍	❍	❍
Eat 5 servings of fruits/vegetables each day (2)	❍	❍	❍	❍	❍	❍
Eat dessert or indulgent snacks (3)	❍	❍	❍	❍	❍	❍
Eat at a fast-food restaurant (4)	❍	❍	❍	❍	❍	❍
Eat organic food (5)	❍	❍	❍	❍	❍	❍
Eat whole grain foods (6)	❍	❍	❍	❍	❍	❍
Drink sugar-sweetened beverages (7)	❍	❍	❍	❍	❍	❍
Cook at home (8)	❍	❍	❍	❍	❍	❍
Eat at a full-service/sit-down restaurant (9)	❍	❍	❍	❍	❍	❍
Exercise/Are active for 20 min+ (10)	❍	❍	❍	❍	❍	❍

Q7 In general, would you say your health is excellent, very good, good, only fair, or poor?

- ❍ Excellent (1)
- ❍ Very Good (2)
- ❍ Good (3)
- ❍ Fair (4)
- ❍ Poor (5)

Q8 How would you describe your weight?

- ❍ Slightly underweight (1)
- ❍ About right (2)
- ❍ Slightly overweight (3)
- ❍ Very overweight (4)

Q9 Please categorize each food store type as healthy or unhealthy.

Q10 Please categorize each restaurant as healthy or unhealthy:

Healthy	Unhealthy
_____ Panera Bread (1)	_____ Panera Bread (1)
_____ Au Bon Pain (2)	_____ Au Bon Pain (2)
_____ Noodles & Company (3)	_____ Noodles & Company (3)
_____ Jason's Deli (4)	_____ Jason's Deli (4)
_____ Wendy's (5)	_____ Wendy's (5)
_____ KFC (6)	_____ KFC (6)
_____ Burger King (7)	_____ Burger King (7)
_____ McDonalds (8)	_____ McDonalds (8)
_____ Subway (9)	_____ Subway (9)
_____ Chick-fil-A (10)	_____ Chick-fil-A (10)
_____ Chipotle (11)	_____ Chipotle (11)
_____ Taco Bell (12)	_____ Taco Bell (12)

Q11 How do you describe a "fast-food restaurant"? Please select all that apply.

- ❑ No waiter/No server (1)
- ❑ Sells food prepared by manufacturers (2)
- ❑ National brand/chain (i.e. McDonalds) (3)
- ❑ Sells "quick" or "to-go" food (4)
- ❑ Promotes unhealthy food (high fat, sugar or salt) (5)
- ❑ Sells food that tastes good (6)
- ❑ Menu has few healthy options (7)
- ❑ Sells greasy food (8)
- ❑ Has a drive-thru (9)
- ❑ Sells cheap/low-cost food (10)
- ❑ Sells processed food (11)
- ❑ Sells food with large portions/high calorie count (12)
- ❑ Other (please explain). (13) _____

Q12 So far, how closely do you read survey questions? To show that you're paying attention, please click the "Not closely at all" option as your answer. That's right, just select not closely at all.

- ❍ Extremely closely (1)
- ❍ Very closely (2)
- ❍ Somewhat closely (3)
- ❍ Not too closely (4)
- ❍ Not closely at all (5)
- ❍ None of the above (6)

Q13 What would you say is the original purpose of the zoning law proposed?

- ❍ To promote good diet and health for adult residents. (1)
- ❍ To improve children's diet and health. (2)
- ❍ To improve the local economy as well as promote good diet and health for residents. (3)
- ❍ To improve how your neighborhood looks, lower traffic congestion and promote good diet and health for residents. (4)
- ❍ To lower the availability of addictive foods. (5)
- ❍ To address fast food companies' unfair marketing practices in Black and Hispanic neighborhoods (6)

Q14 What is your zip code?

Q15 Please select your highest level of education completed:

- ❍ Some high school or less (1)
- ❍ High school diploma/GED (2)
- ❍ Associates degree/vocational training (3)
- ❍ Some college (4)
- ❍ Bachelor's degree (5)
- ❍ Master's or Professional degree (6)
- ❍ Doctorate degree (7)

Q16 Are you Hispanic or Latino? (A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.)

- ❍ No, not Hispanic or Latino (1)
- ❍ Yes, Hispanic or Latino (2)

Q17 What is your race? Please check all that apply.

- ❑ White/Caucasian (1)
- ❑ Black/African American (2)
- ❑ Asian (4)
- ❑ Native Hawaiian/ Pacific Islander (6)
- ❑ American Indian or Alaska Native (3)
- ❑ Other (please specify) (7) _____

Q18 What is your annual income range?

- Below $25,000 (1)
- $25,000 - $34,999 (2)
- $35,000 - $49,999 (3)
- $50,000 - $74,999 (4)
- $75,000 - $99,999 (5)
- $100,000 - $149,999 (6)
- $150,000 or more (7)

Q19 Generally speaking, do you usually think of yourself as a Republican, a Democrat, an independent, or what?

- Republican (1)
- Democrat (2)
- Independent (3)
- Something else (4)

Answer If Generally speaking, do you usually think of yourself as a Republican, a Democrat, an independent,... Democrat Is Selected

Q20 Do you think of yourself as a strong Democrat or a not so strong Democrat?

- Strong Democrat (1)
- Not so strong Democrat (2)

Answer If Generally speaking, do you usually think of yourself as a Republican, a Democrat, an independent,... Republican Is Selected

Q21 Do you think of yourself as a strong Republican or a not so strong Republican?

- Strong Republican (1)
- Not so strong Republican (2)

Answer If Generally speaking, do you usually think of yourself as a Republican, a Democrat, an independent,... Independent Is Selected Or Generally speaking, do you usually think of yourself as a Republican, a Democrat, an independent,... Something else Is Selected

Q22 Do you think of yourself as closer to the Republican Party or to the Democratic Party?

- Closer to the Republican Party (1)
- Closer to the Democratic Party (2)
- Neither (3)

Q23 Do you think government should or should not play a significant role in reducing obesity?

- Should play a significant role (4)
- Should not play a significant role (5)

Q24 In regards to the role of government, which statement comes closer to your point of view.

- Government should do more to solve problems and help meet the needs of people (1)
- Government is doing too many things better left to businesses and individuals. (2)

Q25 Regardless of your other political views, overall which party do you think has better ideas about the right size and role of government--the Democratic Party or the Republican Party?

- Democratic Party (1)
- Republican Party (2)
- Both (3)
- Neither (4)

Q26 Please provide your weight without shoes (in pounds).

Q27 Please provide your height (i.e. 5 feet 4 inches)

Height (feet) (1)
Height (inches) (2)

Q28 Please indicate your current family structure.

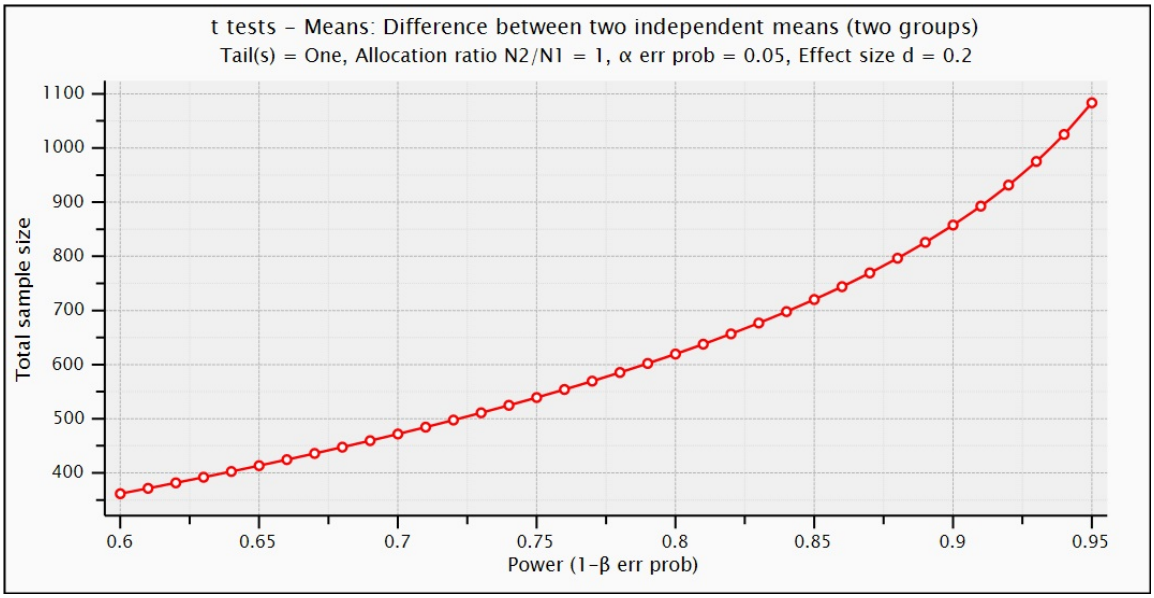
- ❍ Single without children (1)
- ❍ Single with children (2)
- ❍ Married without children (3)
- ❍ Married with children (4)
- ❍ Life partner without children (5)
- ❍ Life partner with children (6)

Q29 Do you own a car, or does someone else in your house own a car, or not?

- ❍ Own a car (1)
- ❍ Someone in my house own a car (2)
- ❍ No, do not own a car (3)

Q30 Please enter any additional comments here (OPTIONAL).

Sample 1 Power Calculation



Ordered Probit Regression Results: Unadjusted Estimates

Appendix Table 8. Ordered Probit Regression Results w/ No Covariates, Full Sample (Control Group as Baseline)

VARIABLES	Permit	Quotas & Bans	Minimum Distance from Youth-oriented Facilities	Toys & Promotional Games	Vehicle Access Restrictions	Fast-casual establishments
Nutrition	-0.0310	0.046	0.00890	0.0416	0.0173	-0.0175
	(0.0309)	(0.0308)	(0.0308)	(0.0291)	(0.0241)	(0.0302)
Child Nutrition	-0.00961	0.00196	-0.0110	0.0445	0.0217	-0.00370
	(0.0311)	(0.0302)	(0.0306)	(0.0293)	(0.0244)	(0.0304)
Economy	0.0254	0.0446	0.0213	0.0414	0.0496*	0.0772**
	(0.0312)	(0.0309)	(0.0309)	(0.0292)	(0.0255)	(0.0306)
Addictive Properties	0.0112	0.0200	0.0176	0.0832***	0.0211	0.0213
	(0.0311)	(0.0305)	(0.0308)	(0.0301)	(0.0243)	(0.0304)
Equity	0.0108	0.0276	-0.0121	0.0164	0.0153	0.108***
	(0.0311)	(0.0306)	(0.0306)	(0.0285)	(0.0240)	(0.0305)
Observations	2,740	2,738	2,737	2,739	2,738	2,738

Standard errors in parentheses
* p<0.01, ** p<0.05, * p<0.1

Ordered Probit: Adjusted Estimates (Control As Baseline Group)

Appendix Table 9-14. Marginal Effects After Ordered Probit, by race

Outcome: Support for Conditional Permits VARIABLES	Full	White	Black
Nutrition	-0.0147	0.000335	-0.127
	(0.0298)	(0.0333)	(0.0914)
Child Nutrition	0.00809	0.00217	-0.0115
	(0.0299)	(0.0330)	(0.0924)
Economy	0.0234	0.0238	-0.0615
	(0.0300)	(0.0334)	(0.0901)
Addictive	0.0208	0.0262	-0.0816
	(0.0299)	(0.0328)	(0.0966)
Equity	0.0350	0.0192	0.119
	(0.0299)	(0.0326)	(0.0925)
Annual Income	-0.00616	-0.00425	-0.00465
	(0.00548)	(0.00602)	(0.0189)
Age	-0.00347***	-0.00353***	-0.00247
	(0.000687)	(0.000744)	(0.00228)
Female	0.147***	0.150***	0.0541
	(0.0159)	(0.0177)	(0.0558)
Urban	0.0169	0.0194	-0.0433
	(0.0193)	(0.0221)	(0.0548)
Republican	-0.144***	-0.142***	-0.118
	(0.0215)	(0.0225)	(0.131)
Observations	2,699	2,221	288

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Quotas & Bans VARIABLES	Full	White	Black
Nutrition	0.0523*	0.0364	0.199**
	(0.0300)	(0.0333)	(0.0868)
Child Nutrition	0.0125	-0.00368	0.158*
	(0.0294)	(0.0323)	(0.0869)
Economy	0.0376	0.0261	0.111
	(0.0299)	(0.0331)	(0.0868)
Addictive	0.0232	0.0126	0.121
	(0.0297)	(0.0323)	(0.0940)
Equity	0.0402	0.0247	0.206**
	(0.0298)	(0.0325)	(0.0892)
Annual Income	-2.34e-06	0.00317	-0.0101
	(0.00532)	(0.00586)	(0.0180)
Age	-0.00196***	-0.00250***	0.00152
	(0.000675)	(0.000734)	(0.00219)
Female	0.138***	0.121***	0.202***
	(0.0175)	(0.0196)	(0.0505)
Urban	0.0478**	0.0543**	0.0261
	(0.0193)	(0.0220)	(0.0534)
Republican	-0.104***	-0.112***	0.111
	(0.0203)	(0.0212)	(0.129)
Observations	2,697	2,219	287

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Minimum Distance for Youth Oriented Facilities VARIABLES	Full	White	Black
Nutrition	0.0206	0.0186	0.115
	(0.0301)	(0.0337)	(0.0887)
Child Nutrition	-0.00305	-0.00963	0.128
	(0.0300)	(0.0331)	(0.0877)
Economy	0.0171	0.00567	0.126
	(0.0301)	(0.0334)	(0.0865)
Addictive	0.0203	0.0310	-0.0210
	(0.0300)	(0.0331)	(0.0930)
Equity	0.00372	-0.0130	0.0944
	(0.0300)	(0.0328)	(0.0912)
Annual Income	-0.00225	0.00157	-0.0117
	(0.00549)	(0.00603)	(0.0184)
Age	-0.00170**	-0.00201***	-0.00150
	(0.000697)	(0.000757)	(0.00225)
Female	0.0750***	0.0691***	0.128**
	(0.0177)	(0.0197)	(0.0544)
Urban	0.0138	0.00645	0.00298
	(0.0194)	(0.0222)	(0.0544)
Republican	-0.130***	-0.126***	-0.112
	(0.0211)	(0.0223)	(0.122)
Observations	2,696	2,219	287

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Toys and Promotional Games VARIABLES	Full	White	Black
Nutrition	0.0564*	0.0726**	0.0533
	(0.0289)	(0.0327)	(0.0872)
Child Nutrition	0.0555*	0.0370	0.277***
	(0.0290)	(0.0317)	(0.0887)
Economy	0.0442	0.0337	0.125
	(0.0287)	(0.0316)	(0.0873)
Addictive	0.0871***	0.0733**	0.198**
	(0.0295)	(0.0321)	(0.0937)
Equity	0.0315	0.00617	0.167*
	(0.0284)	(0.0305)	(0.0929)
Annual Income	-0.00104	-0.000504	-0.00946
	(0.00499)	(0.00553)	(0.0166)
Age	-0.00137**	-0.00232***	0.00411**
	(0.000631)	(0.000690)	(0.00197)
Female	0.0476***	0.0528***	0.00577
	(0.0171)	(0.0191)	(0.0524)
Urban	0.0306*	0.0385*	-0.00627
	(0.0180)	(0.0208)	(0.0485)
Republican	-0.0971***	-0.109***	0.170
	(0.0180)	(0.0188)	(0.133)
Observations	2,698	2,221	286

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Fast Casual Incentive VARIABLES	Full	White	Black
Nutrition	-0.0179	-0.0317	0.114
	(0.0296)	(0.0326)	(0.0797)
Child Nutrition	0.00168	-0.0249	0.205***
	(0.0297)	(0.0324)	(0.0720)
Economy	0.0653**	0.0622*	0.132*
	(0.0300)	(0.0333)	(0.0764)
Addictive	0.0188	0.00941	0.0338
	(0.0297)	(0.0322)	(0.0901)
Equity	0.114***	0.114***	0.175**
	(0.0297)	(0.0325)	(0.0788)
Annual Income	-0.00406	-0.00503	0.0143
	(0.00545)	(0.00595)	(0.0183)
Age	-0.00287***	-0.00335***	0.00253
	(0.000687)	(0.000739)	(0.00222)
Female	0.112***	0.126***	0.0202
	(0.0170)	(0.0186)	(0.0567)
Urban	-0.00303	-0.00216	-0.0626
	(0.0193)	(0.0219)	(0.0551)
Republican	-0.00950	0.00459	-0.0908
	(0.0222)	(0.0232)	(0.130)
Observations	2,697	2,218	288

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

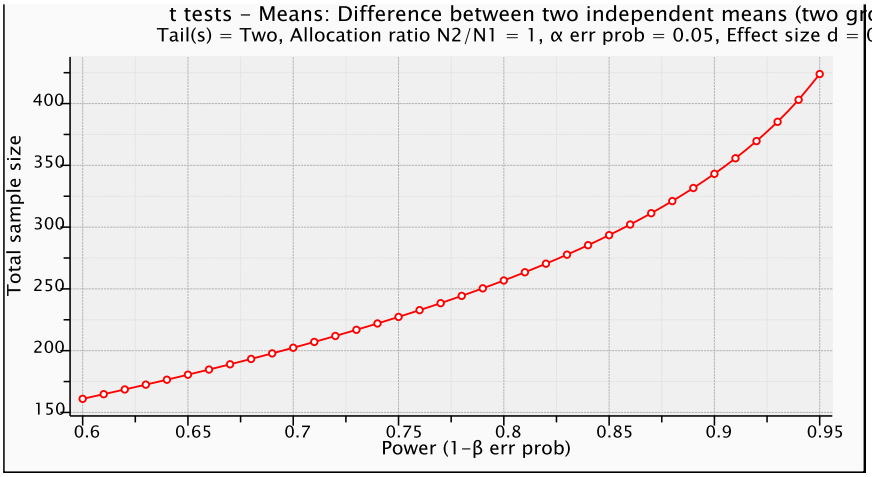
Outcome: Support for Vehicle Access Limitations VARIABLES	Full	White	Black
Nutrition	0.0259	0.0176	0.0882
	(0.0241)	(0.0261)	(0.0814)
Child Nutrition	0.0313	0.00432	0.287***
	(0.0244)	(0.0251)	(0.0942)
Economy	0.0490*	0.0372	0.106
	(0.0250)	(0.0268)	(0.0819)
Addictive	0.0241	0.0260	-0.00524
	(0.0240)	(0.0259)	(0.0766)
Equity	0.0251	0.0105	0.0604
	(0.0240)	(0.0250)	(0.0822)
Annual Income	0.00107	0.00168	0.00640
	(0.00413)	(0.00447)	(0.0146)
Age	-0.00188***	-0.00195***	-0.00161
	(0.000526)	(0.000563)	(0.00175)
Female	0.0382***	0.0345**	0.0324
	(0.0148)	(0.0161)	(0.0482)
Urban	0.0219	0.0150	0.0418
	(0.0152)	(0.0169)	(0.0444)
Republican	-0.0404***	-0.0369**	0.106
	(0.0154)	(0.0160)	(0.119)
Observations	2,697	2,219	287

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix C: Chapter 2 (Study 2)

Sample 2 Power Calculation



Ordered Probit: Adjusted Estimates (Control As Baseline Group)

Appendix Table 15-20 Marginal Effects After Ordered Probit, by race

Outcome: Support for Conditional Permits VARIABLES	Full	White	Black
Nutrition	0.0268	0.0262	0.0371
	(0.0285)	(0.0348)	(0.0503)
Child Nutrition	0.0366	0.0339	0.0606
	(0.0284)	(0.0345)	(0.0495)
Traffic	-0.00785	-0.0117	0.0337
	(0.0285)	(0.0344)	(0.0506)
Economy	0.0348	0.0517	0.0327
	(0.0285)	(0.0346)	(0.0505)
Addictive	0.0120	0.0436	-0.0445
	(0.0286)	(0.0346)	(0.0515)
Equity	0.0611**	0.0801**	0.0328
	(0.0287)	(0.0350)	(0.0504)
Annual Income	-0.00157	4.79e-05	0.000340
	(0.00465)	(0.00543)	(0.00936)
Age	-0.00274***	-0.00256***	-0.00245**
	(0.000515)	(0.000601)	(0.00107)
Female	0.123***	0.111***	0.119***
	(0.0155)	(0.0187)	(0.0289)
Urban	0.0185	0.0175	-0.0303
	(0.0170)	(0.0223)	(0.0280)
Republican	-0.101***	-0.0850***	-0.0425
	(0.0174)	(0.0192)	(0.0666)
Observations	3,145	2,161	986

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Minimum Distance for Youth Oriented Facilities	Full	White	Black
VARIABLES			
Nutrition	0.0543*	0.0630*	0.0311
	(0.0286)	(0.0348)	(0.0509)
Child Nutrition	-0.00816	0.00470	-0.0301
	(0.0282)	(0.0343)	(0.0503)
Traffic	-0.0207	-0.0145	-0.0271
	(0.0282)	(0.0342)	(0.0505)
Economy	0.0236	0.0280	0.0282
	(0.0285)	(0.0344)	(0.0509)
Addictive	0.0279	0.0340	0.0278
	(0.0288)	(0.0348)	(0.0516)
Equity	0.0494*	0.0523	0.0514
	(0.0289)	(0.0352)	(0.0512)
Annual Income	0.000100	-0.00183	0.00955
	(0.00466)	(0.00543)	(0.00940)
Age	-0.000821	-0.000399	-0.00190*
	(0.000519)	(0.000604)	(0.00106)
Female	0.0611***	0.0486***	0.0821***
	(0.0156)	(0.0186)	(0.0293)
Urban	0.0287*	0.0498**	-0.0264
	(0.0170)	(0.0225)	(0.0278)
Republican	-0.100***	-0.0985***	0.00538
	(0.0171)	(0.0189)	(0.0666)
Observations	3,148	2,161	988

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Quotas & Bans VARIABLES	Full	White	Black
Nutrition	0.0292	0.0363	0.0337
	(0.0285)	(0.0349)	(0.0506)
Child Nutrition	0.0487*	0.0252	0.114**
	(0.0284)	(0.0343)	(0.0502)
Traffic	0.0503*	0.0446	0.0789
	(0.0286)	(0.0347)	(0.0505)
Economy	0.0326	0.0168	0.0756
	(0.0285)	(0.0343)	(0.0510)
Addictive	-0.00658	-0.0168	0.0321
	(0.0282)	(0.0339)	(0.0513)
Equity	0.0795***	0.0651*	0.0971*
	(0.0289)	(0.0353)	(0.0506)
Annual Income	0.0122***	0.00990*	0.0264***
	(0.00455)	(0.00532)	(0.00920)
Age	-0.00308***	-0.00290***	-0.00365***
	(0.000505)	(0.000593)	(0.00102)
Female	0.0750***	0.0737***	0.0810***
	(0.0155)	(0.0186)	(0.0293)
Urban	0.0269	0.0543**	-0.0377
	(0.0168)	(0.0224)	(0.0271)
Republican	-0.0871***	-0.0901***	-0.000292
	(0.0165)	(0.0183)	(0.0656)
Observations	3,144	2,158	988

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Toys and Promotional Games VARIABLES	Full	White	Black
Nutrition	0.0846***	0.120***	-0.00535
	(0.0276)	(0.0346)	(0.0450)
Child Nutrition	0.0845***	0.0764**	0.0965**
	(0.0273)	(0.0332)	(0.0483)
Traffic	0.0134	0.0316	-0.0334
	(0.0257)	(0.0321)	(0.0429)
Economy	0.0721***	0.0642*	0.0827*
	(0.0271)	(0.0330)	(0.0483)
Addictive	0.0629**	0.0563*	0.0752
	(0.0272)	(0.0330)	(0.0488)
Equity	0.0177	0.0102	0.0194
	(0.0259)	(0.0318)	(0.0457)
Annual Income	0.00903**	0.00813*	0.0120
	(0.00405)	(0.00479)	(0.00821)
Age	-0.000599	-0.000324	-0.00208**
	(0.000455)	(0.000540)	(0.000919)
Female	0.00577	0.00137	0.0299
	(0.0136)	(0.0165)	(0.0262)
Urban	0.0371**	0.0763***	-0.0194
	(0.0154)	(0.0212)	(0.0238)
Republican	-0.0886***	-0.108***	0.0149
	(0.0138)	(0.0154)	(0.0588)
Observations	3,141	2,158	985

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Fast Casual Incentive VARIABLES	Full	White	Black
Nutrition	0.0667**	0.0755**	0.0610
	(0.0284)	(0.0347)	(0.0496)
Child Nutrition	0.0230	0.0331	9.74e-05
	(0.0283)	(0.0344)	(0.0495)
Traffic	0.0615**	0.0846**	0.0274
	(0.0284)	(0.0345)	(0.0498)
Economy	0.0543*	0.0845**	0.00719
	(0.0285)	(0.0346)	(0.0499)
Addictive	0.0238	0.0193	0.0370
	(0.0286)	(0.0345)	(0.0503)
Equity	0.127***	0.123***	0.131***
	(0.0282)	(0.0347)	(0.0484)
Annual Income	0.00778*	0.000205	0.0340***
	(0.00466)	(0.00541)	(0.00916)
Age	-0.00236***	-0.00250***	-0.000680
	(0.000516)	(0.000600)	(0.00106)
Female	0.0709***	0.0526***	0.0767***
	(0.0155)	(0.0186)	(0.0288)
Urban	-0.00589	-0.0257	-0.00894
	(0.0169)	(0.0220)	(0.0275)
Republican	0.00339	0.0359*	-0.0401
	(0.0177)	(0.0195)	(0.0658)
Observations	3,149	2,162	989

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Outcome: Support for Vehicle Access Limitations VARIABLES	Full	White	Black
Nutrition	0.000418	0.0183	-0.0325
	(0.0230)	(0.0291)	(0.0393)
Child Nutrition	0.0274	0.0148	0.0600
	(0.0238)	(0.0285)	(0.0443)
Traffic	0.0274	0.0191	0.0598
	(0.0239)	(0.0287)	(0.0449)
Economy	-0.00926	-0.0250	0.0320
	(0.0224)	(0.0266)	(0.0432)
Addictive	0.0231	0.00122	0.0810*
	(0.0239)	(0.0281)	(0.0465)
Equity	0.0130	-0.0288	0.0884*
	(0.0235)	(0.0266)	(0.0465)
Annual Income	-0.000378	0.00190	-0.00141
	(0.00371)	(0.00437)	(0.00755)
Age	-0.000715*	-0.000772	-0.000460
	(0.000414)	(0.000489)	(0.000851)
Female	0.0182	0.0148	0.0219
	(0.0126)	(0.0152)	(0.0241)
Urban	0.0374***	0.0470**	0.00755
	(0.0142)	(0.0191)	(0.0224)
Republican	-0.0160	-0.0146	0.0249
	(0.0137)	(0.0153)	(0.0555)
Observations	3,147	2,162	987

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

References

Abdollah, T. (2007). A strict order for fast food. *Los Angeles Times*, A1.

Affenito, S. G., Franko, D. L., Striegel-Moore, R. H., & Thompson, D. (2012). Behavioral determinants of obesity: research findings and policy implications. *Journal of obesity, 2012*.

Ahern, M., Brown, C., & Dukas, S. (2011). A National Study of the Association Between Food Environments and County-Level Health Outcomes. *The Journal of Rural Health, 27*(4), 367-379.

Altham, J. (1973). Rawls's Difference Principle. *Philosophy, 48*(183), 75-78.

Alviola, P. A., Nayga, R. M., Thomsen, M. R., Danforth, D., & Smartt, J. (2014). The effect of fast-food restaurants on childhood obesity: a school level analysis. *Economics & Human Biology, 12*, 110-119.

American Heart Association (2013). *Obesity and Cardiovascular Disease*. Washington, DC

American Heart Association (2013). Statistical fact sheet 2013 update. Overweight and obesity. *Circulation, 127*.

Anderson, M. L., & Matsa, D. A. (2011). Are restaurants really supersizing America? *American Economic Journal: Applied Economics*, 152-188.

Ashe, M., Graff, S., & Spector, C. (2011). Changing places: policies to make a healthy choice the easy choice. *Public Health, 125*(12), 889-895.

Ashe, M., Jernigan, D., Kline, R., & Galaz, R. (2003). Land use planning and the control of alcohol, tobacco, firearms, and fast food restaurants. *American Journal of Public Health, 93*(9), 1404-1408.

Austin, S. B., Field, A. E., Wiecha, J., Peterson, K. E., & Gortmaker, S. L. (2005). The impact of a school-based obesity prevention trial on disordered weight-control behaviors in early adolescent girls. *Archives of pediatrics & adolescent medicine, 159*(3), 225-230.

Babey, S. H., Diamant, A. L., Hastert, T. A., & Harvey, S. (2008). Designed for disease: the link between local food environments and obesity and diabetes. *UCLA Center for Health Policy Research*.

Baker, R., Blumberg, S. J., Brick, J. M., Couper, M. P., Courtright, M., Dennis, J. M., . . . Groves, R. M. (2010). Research synthesis AAPOR report on online panels. *Public Opinion Quarterly, 74*(4), 711-781.

Barnhill, A., & King, K. F. (2013). Ethical agreement and disagreement about obesity prevention policy in the United States. *International journal of health policy and management, 1*(2), 117-120.

Barnhill, A., King, K. F., Kass, N., & Faden, R. (2014). The Value of Unhealthy Eating and the Ethics of Healthy Eating Policies. *Kennedy Institute of Ethics Journal, 24*(3), 187-217.

Barry, C. L., Brescoll, V. L., Brownell, K. D., & Schlesinger, M. (2009). Obesity metaphors: how beliefs about the causes of obesity affect support for public policy. *Milbank Quarterly, 87*(1), 7-47.

Barry, C. L., Brescoll, V. L., & Gollust, S. E. (2013). Framing Childhood Obesity: How Individualizing the Problem Affects Public Support for Prevention. *Political Psychology, 34*(3), 327-349. doi: 10.1111/pops.12018

Barry, C. L., Jarlenski, M., Grob, R., Schlesinger, M., & Gollust, S. E. (2011). News media framing of childhood obesity in the United States from 2000 to 2009. *Pediatrics*, peds. 2010-3924.

Bell, J., & Standish, M. (2009). Building healthy communities through equitable food access. *Community Development Investment Review*(3), 075-087.

Black, C., Moon, G., & Baird, J. (2014). Dietary inequalities: What is the evidence for the effect of the neighbourhood food environment? *Health & place, 27*, 229-242.

Blanchard, T. C., & Lyson, T. (2006). Food Availability and Food Deserts in the Nonmetropolitan South. Assistance Needs of the South's Vulnerable Populations. Number 12 Southern Rural Development Center, Mississippi State University.

Block, J. P., Scribner, R. A., & DeSalvo, K. B. (2004). Fast food, race/ethnicity, and income: a geographic analysis. *American journal of preventive medicine, 27*(3), 211-217.

Bolsen, T., Druckman, J. N., & Cook, F. L. (2014). How frames can undermine support for scientific adaptations: Politicization and the status-quo bias. *Public Opinion Quarterly, 78*(1), 1-26.

Boone-Heinonen, J., Gordon-Larsen, P., Kiefe, C. I., Shikany, J. M., Lewis, C. E., & Popkin, B. M. (2011). Fast food restaurants and food stores: longitudinal associations with diet in young to middle-aged adults: the CARDIA study. *Archives of Internal Medicine, 171*(13), 1162-1170.

Booth, K. M., Pinkston, M. M., & Poston, W. S. C. (2005). Obesity and the built environment. *Journal of the American Dietetic Association, 105*(5), 110-117.

Born, B. R., Eva. (2011). Food Access Policy and Planning Guide.

Boutelle, K. N., Zucker, N., Peterson, C. B., Rydell, S., Carlson, J., & Harnack, L. J. (2014). An intervention based on Schachter's externality theory for overweight children: The regulation of cues pilot. *Journal of pediatric psychology*, jst142.

Braveman, P. A., Kumanyika, S., Fielding, J., LaVeist, T., Borrell, L. N., Manderscheid, R., & Troutman, A. (2011). Health disparities and health equity: the issue is justice. *American Journal of Public Health, 101*(S1), S149-S155.

Brennan, L. K., Brownson, R. C., & Orleans, C. T. (2014). Childhood obesity policy research and practice: evidence for policy and environmental strategies. *American journal of preventive medicine, 46*(1), e1-e16.

Brownell, K. D., Kersh, R., Ludwig, D. S., Post, R. C., Puhl, R. M., Schwartz, M. B., & Willett, W. C. (2010). Personal responsibility and obesity: a constructive approach to a controversial issue. *Health Affairs, 29*(3), 379-387.

Budzynska, K., West, P., Savoy-Moore, R. T., Lindsey, D., Winter, M., & Newby, P. (2013). A food desert in Detroit: associations with food shopping and eating behaviours, dietary intakes and obesity. *Public health nutrition, 16*(12), 2114-2123.

Burdette, H. L., & Whitaker, R. C. (2004). Neighborhood playgrounds, fast food restaurants, and crime: relationships to overweight in low-income preschool children. *Preventive medicine, 38*(1), 57-63.

Butts, R., & Gasteyer, S. (2011). ENVIRONMENTAL REVIEWS & CASE STUDIES: More cost per drop: Water rates, structural inequality, and race in the united states--the case of michigan. *Environmental Practice, 13*(4), 386-395. doi:http://dx.doi.org/10.1017/S1466046611000391

Cannon, C. L., Thomas, S., Treffers, R. D., Paschall, M. J., Heumann, L., Mann, G. W., . . . Nauenberg, S. (2013). Testing the results of municipal mixed-use zoning

ordinances: a novel methodological approach. *Journal of health politics, policy and law*, 2208612.

Cannuscio, C. C., Tappe, K., Hillier, A., Buttenheim, A., Karpyn, A., & Glanz, K. (2013). Urban food environments and residents' shopping behaviors. *American journal of preventive medicine, 45*(5), 606-614.

Cannuscio, C. C., Weiss, E. E., & Asch, D. A. (2010). The contribution of urban foodways to health disparities. *Journal of Urban Health, 87*(3), 381-393.

Caspi, C. E., Sorensen, G., Subramanian, S., & Kawachi, I. (2012). The local food environment and diet: a systematic review. *Health & place, 18*(5), 1172-1187.

Chen, S., Raymond, F., & Snyder, S. (2009). Obesity in urban food markets: Evidence from georeferenced micro data. *West Lafayette, IN: Purdue University*.

Chen, S. E., Florax, R., & Snyder, S. D. (2009). *Obesity, fast food, and grocery stores: Evidence from geo-referenced micro data.* Paper presented at the Research Conference on Understanding the Economic Concepts and Characteristics of Food Access. Washington, DC: USDA, Economic Research Service and University of Michigan National Poverty Center.

Chen, S. E., & Florax, R. J. (2010). Zoning for health: the obesity epidemic and opportunities for local policy intervention. *The Journal of Nutrition, 140*(6), 1181S-1184S.

Chen, S. E., Florax, R. J., & Snyder, S. D. (2013). Obesity and fast food in urban markets: a new approach using geo-referenced micro data. *Health economics, 22*(7), 835-856.

Chong, D., & Druckman, J. N. (2007). Framing public opinion in competitive democracies. *American Political Science Review, 101*(04), 637-655.

Chong, D., & Druckman, J. N. (2007). Framing theory. *Annu. Rev. Polit. Sci., 10*, 103-126.

Chong, D., & Druckman, J. N. (2010). Dynamics in mass communication effects research. *The Sage Handbook of Political Communication. Thousand Oaks, CA: Sage Publications*.

Chong, D., & Druckman, J. N. (2013). Counterframing effects. *The Journal of Politics, 75*(01), 1-16.

Chou, S.-Y., Grossman, M., & Saffer, H. (2004). An economic analysis of adult obesity: results from the Behavioral Risk Factor Surveillance System. *Journal of health economics, 23*(3), 565-587.

Chriqui, J., Thrun, E., Rimkus, L., Barker, D., & Chaloupka, F. (2012). Zoning for healthy food access varies by community income—a BTG research brief. Chicago (IL): Bridging the Gap Program. *Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago*.

City, B. Baltimore City Food Policy Task Force, Final Report and Recommendations.

Courtemanche, C., & Carden, A. (2011). Supersizing supercenters? The impact of Walmart Supercenters on body mass index and obesity. *Journal of Urban Economics, 69*(2), 165-181.

Creighton, R. (2009). Cheeseburgers, race, and paternalism: Los Angeles' ban on fast food restaurants. *The Journal of legal medicine, 30*(2), 249-267.

Cummins, S., Findlay, A., Petticrew, M., & Sparks, L. (2005). Healthy cities: The impact of food retail-led regeneration on food access, choice and retail structure. *Built Environment (1978-)*, 288-301.

Currie, J., DellaVigna, S., Moretti, E., & Pathania, V. (2010). The effect of fast food restaurants on obesity and weight gain. *American Economic Journal: Economic Policy*, 32-63.

Dallari, S. G. (1988). The right to health. *Revista de Saúde Pública, 22*(1), 57-63.

Dardis, F. E., Baumgartner, F. R., Boydstun, A. E., De Boef, S., & Shen, F. (2008). Media framing of capital punishment and its impact on individuals' cognitive responses. *Mass Communication & Society, 11*(2), 115-140.

De Vogli, R., Kouvonen, A., & Gimeno, D. (2014). The influence of market deregulation on fast food consumption and body mass index: a cross-national time series analysis. *Bulletin of the World Health Organization, 92*(2), 99-107A.

Ding, D., & Gebel, K. (2012). Built environment, physical activity, and obesity: what have we learned from reviewing the literature? *Health & place, 18*(1), 100-105.

Dixon, J., Omwega, A. M., Friel, S., Burns, C., Donati, K., & Carlisle, R. (2007). The health equity dimensions of urban food systems. *Journal of Urban Health, 84*(1), 118-129.

Downs, A. (1972). Up and down with ecology-the issue-attention cycle. *The public interest*(28), 38.

Dowray, S., Swartz, J. J., Braxton, D., & Viera, A. J. (2013). Potential effect of physical activity based menu labels on the calorie content of selected fast food meals. *Appetite, 62*, 173-181.

Druckman, J. N. (2011). What's it all about? Framing in political science. *Perspectives on framing*, 279-302.

Dubowitz, T., Ghosh-Dastidar, M. B., Collins, R., & Escarce, J. (2013). Food policy research: We need better measurement, better study designs, and reasonable and measured actions based on the available evidence. *Obesity, 21*(1), 5-6.

Dunn, R. A. (2010). The effect of fast-food availability on obesity: an analysis by gender, race, and residential location. *American Journal of Agricultural Economics*, aaq041.

Dunn, R. A., Sharkey, J. R., & Horel, S. (2012). The effect of fast-food availability on fast-food consumption and obesity among rural residents: an analysis by race/ethnicity. *Economics & Human Biology, 10*(1), 1-13.

Eertmans, A., Baeyens, F., & Van Den Bergh, O. (2001). Food likes and their relative importance in human eating behavior: review and preliminary suggestions for health promotion. *Health Education Research, 16*(4), 443-456.

Egger, G., & Swinburn, B. (1997). An" ecological" approach to the obesity pandemic. *BMJ: British Medical Journal, 315*(7106), 477.

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of communication, 43*(4), 51-58.

Escaron, A. L., Meinen, A. M., Nitzke, S. A., & Martinez-Donate, A. P. (2013). Peer reviewed: Supermarket and grocery store–based interventions to promote healthful food choices and eating practices: A systematic review. *Preventing chronic disease, 10*.

Evans, W. D., Finkelstein, E. A., Kamerow, D. B., & Renaud, J. M. (2005). Public perceptions of childhood obesity. *American journal of preventive medicine, 28*(1), 26-32.

Fanning, J., Marsh, T., & Stiegert, K. (2002). Determinants of fast food consumption. *WAEA Selected Paper, Long Beach, CA*.

Feldstein, L. (2006). General plans and zoning, A toolkit on land use and health. *Public Health Law Program*.

Fielding, J. E., & Simon, P. A. (2011). Food deserts or food swamps?: Comment on "Fast food restaurants and food stores". *Archives of Internal Medicine, 171*(13), 1171-1172.

Finney Rutten, L., Yaroch, A. L., Patrick, H., & Story, M. (2012). Obesity prevention and national food security: a food systems approach. *ISRN Public Health, 2012*.

Fleischhacker, S., Evenson, K. R., Rodriguez, D. A., & Ammerman, A. S. (2011). A systematic review of fast food access studies. *Obesity Reviews, 12*(5), e460-e471.

Fleischhacker, S. E., Evenson, K. R., Sharkey, J., Pitts, S. B. J., & Rodriguez, D. A. (2013). Validity of secondary retail food outlet data: a systematic review. *American journal of preventive medicine, 45*(4), 462-473.

Flint, E., Cummins, S., & Matthews, S. (2013). Do perceptions of the neighbourhood food environment predict fruit and vegetable intake in low-income neighbourhoods? *Health & place, 24*, 11-15.

Forsyth, A., Wall, M., Larson, N., Story, M., & Neumark-Sztainer, D. (2012). Do adolescents who live or go to school near fast-food restaurants eat more frequently from fast-food restaurants? *Health & place, 18*(6), 1261-1269.

Frederickson, G. (2005). The state of social equity in American public administration. *National Civic Review, 94*(4), 31-38.

Fox, A. M., & Horowitz, C. R. (2013). Best practices in policy approaches to obesity prevention. *Journal of health care for the poor and underserved, 24*(2 0), 168.

Frank, L. D., Saelens, B. E., Powell, K. E., & Chapman, J. E. (2007). Stepping towards causation: do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? *Social Science & Medicine, 65*(9), 1898-1914.

Frederick, D., Saguy, A., Sandhu, G., & Mann, T. (2015). Effects of competing news media frames of weight on antifat stigma, beliefs about weight and support for obesity-related public policies. *International Journal of Obesity*.

Friedman, D. A. (2013). Public Health Regulation and the Limits of Paternalism.

Fry, C., Zimmerman, S., & Kappagoda, M. (2012). Healthy Reform, Healthy Cities: Using Law and Policy to Reduce Obesity Rates in Undeserved Communities. *Fordham Urb. LJ*, *40*, 1265.

Gagnon, M. SLOWING DOWN FAST FOOD.

Gallagher, M. (2006). Examining the impact of food deserts on public health in Chicago: Chicago: Mari Gallagher Research and Consulting Group.

Gearhardt, A. N., Grilo, C. M., DiLeone, R. J., Brownell, K. D., & Potenza, M. N. (2011). Can food be addictive? Public health and policy implications. *Addiction*, *106*(7), 1208-1212.

Gibson, D. M. (2011). The neighborhood food environment and adult weight status: estimates from longitudinal data. *American Journal of Public Health*, *101*(1), 71-78.

Gideon, L. (2012). *Handbook of survey methodology for the social sciences*: Springer.

Giskes, K., van Lenthe, F., Avendano-Pabon, M., & Brug, J. (2011). A systematic review of environmental factors and obesogenic dietary intakes among adults: are we getting closer to understanding obesogenic environments? *Obesity Reviews*, *12*(5), e95-e106.

Gittelsohn, J. (2012). Interventions in small food stores to change the food environment, improve diet, and reduce risk of chronic disease. *Preventing chronic disease*, *9*.

Glanz, K., Resnicow, K., Seymour, J., Hoy, K., Stewart, H., Lyons, M., & Goldberg, J. (2007). How major restaurant chains plan their menus: the role of profit, demand, and health. *American journal of preventive medicine*, *32*(5), 383-388.

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

Glickman, D., Parker, L., Sim, L. J., Cook, H. D. V., & Miller, E. A. (2012). Committee on Accelerating Progress in Obesity Prevention.

Glover, M., Gary, T., Prewitt, T., Odoms-Young, A., & Banks-Wallace, J. (2007). Expanding the obesity research paradigm to reach African American communities.

Gollust, S. E., Niederdeppe, J., & Barry, C. L. (2013). Framing the consequences of childhood obesity to increase public support for obesity prevention policy. *American Journal of Public Health, 103*(11), e96-e102.

Gordon-Larsen, P. (2014). Food availability/convenience and obesity. *Advances in Nutrition: An International Review Journal, 5*(6), 809-817.

Gostin, L. O. (2007). Law as a tool to facilitate healthier lifestyles and prevent obesity. *Jama, 297*(1), 87-90.

Graff, S. K., Kappagoda, M., Wooten, H. M., McGowan, A. K., & Ashe, M. (2012). Policies for healthier communities: historical, legal, and practical elements of the obesity prevention movement. *Annual review of public health, 33*, 307-324.

Haddad, L. J., Hawkes, C., Achadi, E., Ahuja, A., Ag Bendech, M., Bhatia, K., . . . Eriksen, K. (2015). *Global nutrition report 2015: actions and accountability to advance nutrition and sustainable development*: Intl Food Policy Res Inst.

Hammond, P. J. (1976). Equity, Arrow's conditions, and Rawls' difference principle. *Econometrica: Journal of the Econometric Society*, 793-804.

Haley, H., & Sidanius, J. (2006). The positive and negative framing of affirmative action: A group dominance perspective. *Personality and Social Psychology Bulletin, 32*(5), 656-668.

Hart, D. K. (1974). Social Equity, Justice, and the Equitable Administrator. *Public Administration Review, 34*(1), 3-11. doi: 10.2307/974395

Hattori, A. (2013). Neighborhood food outlets, diet, and obesity among California adults, 2007 and 2009. *Preventing chronic disease, 10*.

Hickson, D. A., Diez Roux, A. V., Smith, A. E., Tucker, K. L., Gore, L. D., Zhang, L., & Wyatt, S. B. (2011). Associations of fast food restaurant availability with dietary intake and weight among African Americans in the Jackson Heart Study, 2000–2004. *American Journal of Public Health, 101*(S1), S301-S309.

Hilbert, A., Rief, W., & Braehler, E. (2007). What determines public support of obesity prevention? *Journal of Epidemiology and Community Health, 61*(7), 585-590. doi: 10.1136/jech.2006.050906

Hill, J. O., Wyatt, H. R., & Melanson, E. L. (2000). Genetic and environmental contributions to obesity. *Medical Clinics of North America, 84*(2), 333-346.

Hirschhorn, J. S. (2004). Zoning should promote public health. *American Journal of Health Promotion, 18*(3), 258-260.

Hodge Jr, J. G., Orenstein, D. G., Corbett, A., & Barraza, L. (2013). New frontiers in obesity control: Innovative public health legal interventions. *Duke FL & Soc. Change, 5*, 1.

Huang, T. T., Cawley, J. H., Ashe, M., Costa, S. A., Frerichs, L. M., Zwicker, L., . . . Lambert, E. V. (2015). Mobilisation of public support for policy actions to prevent obesity. *The Lancet, 385*(9985), 2422-2431.

Inagami, S., Cohen, D. A., Brown, A. F., & Asch, S. M. (2009). Body mass index, neighborhood fast food and restaurant concentration, and car ownership. *Journal of Urban Health, 86*(5), 683-695.

Institute of Medicine Committee on Accelerating Progress in Obesity Prevention (2012). *Accelerating progress in obesity prevention: solving the weight of the nation*: National Academies Press Washington, DC.

Jackson, Y., Dietz, W. H., Sanders, C., Kolbe, L. J., Whyte, J. J., Wechsler, H., . . . Vogel-Taylor, M. (2002). Summary of the 2000 Surgeon General's listening session: toward a national action plan on overweight and obesity. *Obesity Research, 10*(12), 1299-1305.

Jeffery, R. W., Baxter, J., McGuire, M., & Linde, J. (2006). Are fast food restaurants an environmental risk factor for obesity? *International Journal of Behavioral Nutrition and Physical Activity, 3*(1), 2.

Jilcott Pitts, S. B., McGuirt, J. T., Carr, L. J., Wu, Q., & Keyserling, T. C. (2012). Associations between body mass index, shopping behaviors, amenity density, and characteristics of the neighborhood food environment among female adult Supplemental Nutrition Assistance Program (SNAP) participants in eastern North Carolina. *Ecology of food and nutrition, 51*(6), 526-541.

Kahnman, D., & Tvesrky, A. (1986). Rational choice and the framing of decisions. *Rational Choice*, 67-94.

Karnani, A., McFerran, B., & Mukhopadhyay, A. (2016). The Obesity Crisis as Market Failure: An Analysis of Systemic Causes and Corrective Mechanisms. *The Journal of the Association for Consumer Research, 1*(3), 000-000.

Kelly, B., Flood, V. M., & Yeatman, H. (2011). Measuring local food environments: an overview of available methods and measures. *Health & place, 17*(6), 1284-1293.

Kennedy, L. E. (2016). The Examination of Mindfulness, Stress, and Eating Behaviors in Mothers of Young Children.

Keren, G. (2011). *Perspectives on framing*: Psychology Press.

Kersh, R. (2015). Of nannies and nudges: the current state of US obesity policymaking. *Public Health, 129*(8), 1083-1091.

Kersh, R., & Elbel, B. (2015). Public Policy & Obesity: Overview and Update. *Wake Forest JL & Pol'y, 5*, 105.

Kim, S.-H., & Anne Willis, L. (2007). Talking about obesity: News framing of who is responsible for causing and fixing the problem. *Journal of health communication, 12*(4), 359-376.

Kingdon, J. (1984). Agendas, alternatives and public choices. *Boston: Little, Brown*.

Kirkpatrick, S. I., Reedy, J., Butler, E. N., Dodd, K. W., Subar, A. F., Thompson, F. E., & McKinnon, R. A. (2014). Dietary assessment in food environment research: a systematic review. *American journal of preventive medicine, 46*(1), 94-102.

Kumanyika, S. K. (2008). Environmental influences on childhood obesity: ethnic and cultural influences in context. *Physiology & behavior, 94*(1), 61-70.

Kwate, N. O. A., Yau, C.-Y., Loh, J.-M., & Williams, D. (2009). Inequality in obesigenic environments: fast food density in New York City. *Health & place, 15*(1), 364-373.

Kyureghian, G., & Nayga, R. M. (2013). Food store access, availability, and choice when purchasing fruits and vegetables. *American Journal of Agricultural Economics*, aat043.

Lamichhane, A. P., Warren, J., Puett, R., Porter, D. E., Bottai, M., Mayer-Davis, E. J., & Liese, A. D. (2013). Spatial patterning of supermarkets and fast food outlets with respect to neighborhood characteristics. *Health & place, 23*, 157-164.

Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to healthy foods in the US. *American journal of preventive medicine, 36*(1), 74-81. e10.

LaVeist, T., Pollack, K., Thorpe, R., Fesahazion, R., & Gaskin, D. (2011). Place, not race: disparities dissipate in southwest Baltimore when blacks and whites live under similar conditions. *Health Affairs, 30*(10), 1880-1887.

Lee, S. H., Rowan, M. T., Powell, L. M., Newman, S., Klassen, A. C., Frick, K. D., . . . Gittelsohn, J. (2010). Characteristics of prepared food sources in low-income neighborhoods of Baltimore City. *Ecology of food and nutrition, 49*(6), 409-430.

Levi, J., Segal, L. M., Laurent, R. S., & Vinter, S. (2010). *F as in Fat: How Obesity Threatens America's Future: 2010*: Trust for America's Health.

Li, F., Harmer, P., Cardinal, B. J., Bosworth, M., & Johnson-Shelton, D. (2009). Obesity and the built environment: does the density of neighborhood fast-food outlets matter? *American Journal of Health Promotion, 23*(3), 203-209.

Liese, A. D., Bell, B. A., Barnes, T. L., Colabianchi, N., Hibbert, J. D., Blake, C. E., & Freedman, D. A. (2014). Environmental influences on fruit and vegetable intake: results from a path analytic model. *Public health nutrition, 17*(11), 2595-2604.

Liu, P. J., Roberto, C. A., Liu, L. J., & Brownell, K. D. (2012). A test of different menu labeling presentations. *Appetite, 59*(3), 770-777.

Lorenc, T., Petticrew, M., Welch, V., & Tugwell, P. (2013). What types of interventions generate inequalities? Evidence from systematic reviews. *Journal of Epidemiology and Community Health, 67*(2), 190-193.

Ludwig, J., Sanbonmatsu, L., Gennetian, L., Adam, E., Duncan, G. J., Katz, L. F., . . . Whitaker, R. C. (2011). Neighborhoods, obesity, and diabetes—a randomized social experiment. *New England Journal of Medicine, 365*(16), 1509-1519.

Lydon, C. A., Rohmeier, K. D., Sophia, C. Y., Mattaini, M. A., & Williams, W. L. (2011). How far do you have to go to get a cheeseburger around here? The realities of an environmental design approach to curbing the consumption of fast-food. *Behavior and Social issues, 20*, 6.

Lytle, L. A. (2009). Measuring the food environment: state of the science. *American journal of preventive medicine, 36*(4), S134-S144.

Maantay, J. (2001). Zoning, equity, and public health. *American Journal of Public Health, 91*(7), 1033.

Maantay, J. (2002). Zoning law, health, and environmental justice: what's the connection? *The Journal of Law, Medicine & Ethics, 30*(4), 572-593.

Mackenbach, J. D., Rutter, H., Compernolle, S., Glonti, K., Oppert, J.-M., Charreire, H., . . . Lakerveld, J. (2014). Obesogenic environments: a systematic review of the association between the physical environment and adult weight status, the SPOTLIGHT project. *BMC Public Health, 14*(1), 1.

Maddock, J. (2004). The relationship between obesity and the prevalence of fast food restaurants: state-level analysis. *American Journal of Health Promotion, 19*(2), 137-143.

Mair, J., Pierce, M., & Teret, S. (2005). The city planner's guide to the obesity epidemic: zoning and fast food. *The Center for Law and the Public's Health at Johns Hopkins & Georgetown Universities). Retrieved July, 7*, 2010.

Mair, J. S., Pierce, M. W., & Teret, S. P. (2005). The use of zoning to restrict fast food outlets: a potential strategy to combat obesity. *The Center for Law and the Public's Health at Johns Hopkins and Georgetown Universities*.

Marlow, M. L. (2015). Big box stores and obesity. *Applied Economics Letters, 22*(12), 938-944.

Marteau, T. M., Hollands, G. J., Shemilt, I., & Jebb, S. A. (2015). Downsizing: policy options to reduce portion sizes to help tackle obesity. *BMJ, 351*, h5863.

Mattes, R., & Foster, G. D. (2014). Research issues: the food environment and obesity. *The American journal of clinical nutrition, 100*(6), 1663-1665.

Mattessich, P. W., & Rausch, E. J. (2014). Cross-sector collaboration to improve community health: a view of the current landscape. *Health Affairs, 33*(11), 1968-1974.

Mayo, M. L., Pitts, S. B. J., & Chriqui, J. F. (2013). Peer Reviewed: Associations Between County and Municipality Zoning Ordinances and Access to Fruit And Vegetable Outlets in Rural North Carolina, 2012. *Preventing chronic disease, 10*.

McGuire, S. (2012). Institute of Medicine. 2012. Accelerating progress in obesity prevention: solving the weight of the nation. Washington, DC: the National Academies Press. *Advances in Nutrition: An International Review Journal, 3*(5), 708-709.

McKinnon, R. A., Reedy, J., Morrissette, M. A., Lytle, L. A., & Yaroch, A. L. (2009). Measures of the food environment: a compilation of the literature, 1990–2007. *American journal of preventive medicine, 36*(4), S124-S133.

Mello, M. M., Studdert, D. M., & Brennan, T. A. (2006). Obesity—the new frontier of public health law. *New England Journal of Medicine, 354*(24), 2601-2610.

Meyers, A. W., & Stunkard, A. J. (1980). Food accessibility and food choice: A test of Schachter's externality hypothesis. *Archives of General Psychiatry, 37*(10), 1133-1135.

Minaker, L. M., Raine, K. D., Wild, T. C., Nykiforuk, C. I., Thompson, M. E., & Frank, L. D. (2013). Objective food environments and health outcomes. *American journal of preventive medicine, 45*(3), 289-296.

Morland, K., Roux, A. V. D., & Wing, S. (2006). Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *American journal of preventive medicine, 30*(4), 333-339.

Morland, K., Wing, S., & Roux, A. D. (2002). The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. *American Journal of Public Health, 92*(11), 1761-1768.

Morley, B., Martin, J., Niven, P., & Wakefield, M. (2012). Public opinion on food-related obesity prevention policy initiatives.

Mutz, D. C. (2011). *Population-based survey experiments*: Princeton University Press.

Neckerman, K. M., Bader, M., Purciel, M., & Yousefzadeh, P. (2009). Measuring food access in urban areas.

Nestle, M. (2013). *Food politics: How the food industry influences nutrition and health* (Vol. 3): Univ of California Press.

Nestle, M., & Jacobson, M. F. (2000). Halting the obesity epidemic: a public health policy approach. *Public health reports, 115*(1), 12.

Nixon, L., Mejia, P., Dorfman, L., Cheyne, A., Young, S., Friedman, L. C., . . . Wooten, H. (2015). Fast-food fights: news coverage of local efforts to improve food environments through land-use regulations, 2000–2013. *American Journal of Public Health, 105*(3), 490-496.

Northridge, M. E., Sclar, E. D., & Biswas, P. (2003). Sorting out the connections between the built environment and health: A conceptual framework for navigating pathways and planning healthy cities. *Journal of Urban Health : Bulletin of the New York Academy of Medicine, 80*(4), 556-568. doi: 10.1093/jurban/jtg064

Ortiz, S. E., Zimmerman, F. J., & Gilliam Jr, F. D. (2015). Weighing In: The Taste-Engineering Frame in Obesity Expert Discourse. *American Journal of Public Health, 105*(3), 554-559.

Otten, J. J., Dodson, E. A., Fleischhacker, S., Siddiqi, S., & Quinn, E. L. (2015). Peer Reviewed: Getting Research to the Policy Table: A Qualitative Study With Public Health Researchers on Engaging With Policy Makers. *Preventing chronic disease, 12*.

Phelan, J. C., Link, B. G., & Tehranifar, P. (2010). Social conditions as fundamental causes of health inequalities theory, evidence, and policy implications. *Journal of health and social behavior, 51*(1 suppl), S28-S40.

Pomeranz, J. (2013). Legal strategies to address America's processed food problem: from public health prevention to state and local preemption.

Poti, J. M., Duffey, K. J., & Popkin, B. M. (2014). The association of fast food consumption with poor dietary outcomes and obesity among children: is it the fast food or the remainder of the diet? *The American journal of clinical nutrition, 99*(1), 162-171.

Prentice, A. M., & Jebb, S. A. (2003). Fast foods, energy density and obesity: a possible mechanistic link. *Obesity Reviews, 4*(4), 187-194.

Puhl, R. M., & Heuer, C. A. (2009). The stigma of obesity: a review and update. *Obesity, 17*(5), 941-964.

Raja, S., Ma, C., & Yadav, P. (2008). Beyond food deserts measuring and mapping racial disparities in neighborhood food environments. *Journal of Planning Education and Research, 27*(4), 469-482.

Ransom, M. M., Greiner, A., Kochtitzky, C., & Major, K. S. (2011). Pursuing health equity: zoning codes and public health. *The Journal of Law, Medicine & Ethics, 39*(s1), 94-97.

Reel, J., & Badger, B. (2014). From Food Deserts to Food Swamps: Health Education Strategies to Improve Food Environments in Urban Areas. *J Obes Wt Loss Ther S, 4*(2).

Richardson, A. S., Boone-Heinonen, J., Popkin, B. M., & Gordon-Larsen, P. (2011). Neighborhood fast food restaurants and fast food consumption: a national study. *BMC Public Health, 11*(1), 1.

Roberto, C. A., Swinburn, B., Hawkes, C., Huang, T. T., Costa, S. A., Ashe, M., . . . Brownell, K. D. (2015). Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking. *The Lancet, 385*(9985), 2400-2409.

Rose, D., Bodor, J. N., Swalm, C. M., Rice, J. C., Farley, T. A., & Hutchinson, P. L. (2009). Deserts in New Orleans? Illustrations of urban food access and implications for policy. *Ann Arbor, MI: University of Michigan National Poverty Center/USDA Economic Research Service Research*.

Rosenzweig, C. (2015). *Using Proportionally Matched Samples to Enhance Sample Representativeness on Amazon Mechanical Turk*. Presentation

Rossen, L. M., & Pollack, K. M. (2012). Making the connection between zoning and health disparities. *Environmental Justice, 5*(3), 119-127.

Saguy, A. C., Frederick, D., & Gruys, K. (2014). Reporting risk, producing prejudice: How news reporting on obesity shapes attitudes about health risk, policy, and prejudice. *Social Science & Medicine, 111*, 125-133.

Salant, T., & Santry, H. P. (2006). Internet marketing of bariatric surgery: Contemporary trends in the medicalization of obesity. *Social Science & Medicine, 62*(10), 2445-2457.

Salkin, P., & Ko, P. (2011). The effective use of health impact assessment (HIA) in land-use decision making. *Zoning Practice, October*.

Salkin, P. E., & Lavine, A. (2010). Regional Foodsheds: Are Our Local Zoning and Land Use Regulations Healthy. *Fordham Envtl. L. Rev., 22*, 599.

Schelling, T. C. (1984). *Choice and consequence*: Harvard University Press.

Severson, K. (2008). Los Angeles stages a fast food intervention. *New York Times*, F1.

Sherry, B., McDivitt, J., Birch, L. L., Cook, F. H., Sanders, S., Prish, J. L., . . . Scanlon, K. S. (2004). Attitudes, practices, and concerns about child feeding and child weight status among socioeconomically diverse white, Hispanic, and African-American mothers. *Journal of the American Dietetic Association, 104*(2), 215-221.

Sim, L. J., Parker, L., & Kumanyika, S. K. (2010). *Bridging the Evidence Gap in Obesity Prevention:: A Framework to Inform Decision Making*: National Academies Press.

Smedley, A., & Smedley, B. D. (2005). Race as biology is fiction, racism as a social problem is real: Anthropological and historical perspectives on the social construction of race. *American Psychologist, 60*(1), 16-26. doi: 10.1037/0003-066X.60.1.16

Spence, J. C., Cutumisu, N., Edwards, J., Raine, K. D., & Smoyer-Tomic, K. (2009). Relation between local food environments and obesity among adults. *BMC Public Health, 9*(1), 1.

Stalans, L. J. (2012). Frames, framing effects, and survey responses *Handbook of survey methodology for the social sciences* (pp. 75-90): Springer

Statistica. (2014). Quick-service (fast food) restaurants in the U.S. Retrieved November 2014

Steeves, E. A., Martins, P. A., & Gittelsohn, J. (2014). Changing the food environment for obesity prevention: key gaps and future directions. *Current obesity reports, 3*(4), 451-458.

Sturm, R., & Cohen, D. A. (2009). Zoning for health? The year-old ban on new fast-food restaurants in South LA. *Health Affairs, 28*(6), w1088-w1097.

Sturm, R., & Hattori, A. (2015). Diet and obesity in Los Angeles County 2007–2012: Is there a measurable effect of the 2008 "Fast-Food Ban"? *Social Science & Medicine, 133*, 205-211.

Taylor, D. E. (2000). The rise of the environmental justice paradigm injustice framing and the social construction of environmental discourses. *American behavioral scientist, 43*(4), 508-580.

Thornton, L. E., & Kavanagh, A. (2012). Association between fast food purchasing and the local food environment. *Nutrition & diabetes, 2*(12), e53.

Thornton, R., Fichtenberg, C., Greiner, A., Feingold, B., Ellen, J., Jennings, J., . . . Bishai, D. (2010). Zoning for a healthy Baltimore: A health impact assessment of the transform Baltimore comprehensive zoning code rewrite. *Baltimore (MD): Johns Hopkins University Center for Child and Community Health Outreach*.

United States Department of Health and Human Services (2011). Healthy people 2020. Washington, DC: US Department of Health and Human Services; 2010.

United States Department of Health and Human Services (2011). Healthy people 2020. Washington, DC: US Department of Health and Human Services; 2010.

Ver Ploeg, M., Breneman, V., Farrigan, T., Hamrick, K., Hopkins, D., Kaufman, P., . . . Williams, R. (2009). Access to Affordable and Nutritious Food–Measuring and Understanding Food Deserts and Their Consequences: Report to Congress. Publication No.(AP-036), USDAERS, 160 pages.

Viola, D., Arno, P. S., Maroko, A. R., Schechter, C. B., Sohler, N., Rundle, A., . . . Maantay, J. (2013). Overweight and obesity: Can we reconcile evidence about supermarkets and fast food retailers for public health policy&quest. *Journal of public health policy, 34*(3), 424-438.

Volkow, N. D., & Wise, R. A. (2005). How can drug addiction help us understand obesity? *Nature neuroscience, 8*(5), 555-560.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: a review of food deserts literature. *Health & place, 16*(5), 876-884.

Wilde, P. E., Llobrera, J., & Valpiani, N. (2012). Household food expenditures and obesity risk. *Current obesity reports, 1*(3), 123-133.

Williams, D. R., & Collins, C. (2001). Racial residential segregation: a fundamental cause of racial disparities in health. *Public health reports, 116*(5), 404.

Wilson, S., Hutson, M., & Mujahid, M. (2008). How planning and zoning contribute to inequitable development, neighborhood health, and environmental injustice. *Environmental Justice, 1*(4), 211-216.

Wilson, S. M. (2009). An ecologic framework to study and address environmental justice and community health issues. *Environmental Justice, 2*(1), 15-24.

Wolfson, J. A., Gollust, S. E., Niederdeppe, J., & Barry, C. L. (2015). The Role of Parents in Public Views of Strategies to Address Childhood Obesity in the United States. *Milbank Quarterly, 93*(1), 73-111.

Woodham, C. L. (2011). *Food desert or food swamp? An in-depth exploration of neighbourhood food environments in Eastern Porirua and Whitby.* University of Otago.

Wooten, H., McLaughlin, I., Chen, L., & Fry, C. (2013). Zoning and Licensing to Regulate the Retail Environment and Achieve Public Health Goals. *Duke FL & Soc. Change, 5*, 65.

Zagorsky, J. L. (2014). Is it Really Just the Poor Who Eat Fast Food? The Impact of Income and Wealth on US Consumption.

Zick, C. D., Smith, K. R., Fan, J. X., Brown, B. B., Yamada, I., & Kowaleski-Jones, L. (2009). Running to the store? The relationship between neighborhood environments and the risk of obesity. *Social Science & Medicine, 69*(10), 1493-1500.

Biography

I was born in Chicago, Illinois on December 5, 1987 to Marcus and Stacey Cooksey. I have three sisters, Kristena, Krista and Kristalyn. My passion for equitable food and nutrition policies stems from my personal experiences with a "broken" food system in the community where I was born and raised, the south side of Chicago. I have been married to my high school sweetheart Daniel Stowers for 6 years and have been blessed with two precious little girls, Naomi Cecelia Stowers and Phoebe Natalie-Rose Stowers.

I have a deep research focus on health disparities, obesity, and diet related diseases. I grew up in a food desert and as a beneficiary of SNAP and WIC. So, my research is motivated by a desire to give the black community a voice in food policy and create more equitable food systems for socially marginalized populations.

As a Ronald E. McNair Scholar at the University of Illinois, I conducted a year-long cost-effectiveness analysis for a maternal and child nutrition supplement program in the Department of Agricultural and Consumer Economics. Before coming to Duke, I completed my MPP at Johns Hopkins University, with a certificate in health policy from the Bloomberg School of Public Health. I'd also worked as a junior economist in the USDA Economic Research Services (ERS) where I assisted with research projects related to food deserts, food security, SNAP, and the National Farm to School Census. I decided

to pursue my PhD in Public Policy at Duke where I was a Dean's Graduate Fellow and NIH Predoctoral Fellow with the Add Health Parent Study.