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Associations of Fast-Food Zoning Policy and Cardiovascular Disease in African American Communities

Starrlett Pena-Johnson
Walden University

Walden University

College of Health Sciences and Public Policy

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Starrlett Johnson

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Review Committee
Dr. Olivia Yu, Committee Chairperson,
Public Policy and Administration Faculty

Dr. Kristin Dailey, Committee Member,
Public Policy and Administration Faculty

Dr. Steven Matarelli, University Reviewer,
Public Policy and Administration Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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Starrlett Johnson

MPhil, Walden University, 2021

MA, Webster University, 2014

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Cardiovascular disease (CVD) remains a major public health concern, causing one in every four deaths in the United States. Despite availability of effective disease management, African Americans bear the burden of incidence and mortality as CVD prevails as the primary cause of disparities in life expectancy, stroke, and heart failure. This cross-sectional study investigated fast-food restaurant (FFR) availability and socioeconomic status (SES; income, occupation, and education) to predict CVD risk scores in African Americans residing in Jackson, Mississippi. The social construction of target populations theory was used to inform this study. Using hierarchical multiple linear regression, a secondary data analysis of 3,744 baseline records of African American adult participants in the Jackson Heart Study was conducted. Results showed that SES (median household income, education, and occupation), $R^2 = .150$, $F(14, 3607) = 28.365$, $p < .0005$, predict CVD risk and attributes more than FFR availability, $R^2 = .003$, $F(6, 3711) = 64.936$, $p = .037$, among the sample. FFR availability showed statistical significance within the 3-mile buffer at the moderate availability level and trended towards significance at the 3-mile-high availability level. The covariates of age and population density were significant in the analysis and males had a higher CVD score than females, $M = .94$ ($SD = 1.14$) vs. $M = .91$ ($SD = 1.00$). The overall findings can contribute to positive social change by extending our understanding of the influence of FFR availability on CVD health in African Americans living in the southern region of the United States.

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Dedication

I dedicate this dissertation to my loving and supportive partner MPJ who encouraged and supported me along the way. I would also like to extend this dedication to my family and friends who cheered me on throughout my journey. Finally, this research is dedicated to the African American community. My hope is that investigation into this topic continues until CVD disparities among African Americans are no longer an inequity.

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I would not have made it to this point without the support and guidance of my former committee chair, Dr. Melanie Smith. Her keen academic advice and mentorship greatly impacted me on a professional and personal level. Additionally, I offer my gratitude to my committee member, Dr. Kristin Dailey, who was always so responsive to any of my inquiries throughout my journey. I also offer my sincerest gratitude to Dr. Steven Matarelli, University Research Reviewer, for his passion, dedication, and expert opinion and suggestions provided for my study. I would like to give a special thank you to Dr. Olivia Yu for your support. Lastly, I would like to thank the Jackson Heart Study for the incredible work that you are doing and for allowing me to access the data and utilize your work groups for the research I conducted.

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Chapter 1: Introduction to the Study

African Americans have not equally shared in the nation's strategic efforts to promote cardiovascular health and reduce incidence and mortality of cardiovascular disease (CVD; Carnethon et al., 2017). Despite availability of effective disease management, the burden of CVD remains high in the African American community, prevailing as the primary cause of disparities in life expectancy, stroke, and heart failure (Cole et al., 2018; Ferdinand & Mahata, 2017). While individual-level risk factors, such as poor diet, obesity, lower socioeconomic status (SES), sedentary behaviors and family health history are important contributors (Cunningham et al., 2017; Mozaffarian et al., 2015a), there is a growing recognition that environmental factors, such as neighborhood environment, may also affect health outcomes (Diez-Roux et al., 2017; Gebreab et al., 2017; Kim et al., 2019; Nixon et al., 2015). Greater detail on the influence of neighborhood environments can be found in Chapter 2, where an in-depth review of the literature presents three different stances on built environment as a contributor to chronic conditions; a possible influence (Cooksey-Stowers et al., 2017; Diez-Roux et al., 2017; Gebreab et al., 2017; Nykiforuk et al., 2018), a positive influence (Peng & Kaza, 2020; Thornton et al., 2016; Vaughan et al., 2017), and no influence at all (Sturm & Hattori, 2015; Xu & Wang, 2014; Zenk et al., 2017).

This chapter provides a synopsis of the CVD problem within the African American community as well as the purpose of the study. The study's research questions are presented, followed by the theoretical framework of Schneider and Ingram's social construction of target populations (1993), the nature of the study, and operational

definitions. Also outlined in this section are the scope, limitations, and significance of the investigation. Concluding the chapter is a comprehensive summary of the research presented on built environment, chronic conditions, and the influence of policy.

Background of the Study

As a possible target for policy and prevention efforts, assessing neighborhood environments, and other built environment characteristics, are a promising but controversial strategy to improve community food environments (Krishnan et al., 2010; Moore et al., 2009; Morland et al., 2002, 2006; Nixon et al., 2015; Popkin et al., 2005; Sacks et al., 2008; Schootman et al., 2007). A large percentage of the literature addressing health disparities and built environment, or fast-food availability, are centered around obesity in the United States (Gebreab et al., 2017; Mitchell et al., 2011; Nixon et al., 2015), which presents a gap in the literature in that no studies found have explored associations of fast-food restaurant (FFR) zoning policies and heart disease within African American communities.

My study analyzed associations of neighborhood food environments and prevalence of CVD among participants in the Jackson Heart Study (JHS), a 20-year longitudinal study investigating the causes of CVD among African Americans (JHS, 2020b). The JHS is a community-based observational study whose 3,728 participants were enrolled in the 1985 Atherosclerosis Risk in Communities (ARIC) Study, a nationwide study of the causes and origin of atherosclerosis and its natural progression by race, sex, age, and location. Jackson, Mississippi, was one of four locations chosen for the study (Collaborative Studies Coordinating Center, n.d.). In addition to ARIC

participants, 1,574 participants were recruited from Hinds, Rankin, and Madison counties known as the metropolitan statistical area (MSA) of Jackson, Mississippi. At baseline (2000–2004), 5,302 eligible subjects, aged 21–84 years, were enrolled with a total of 3,393 women and 1,909 men, with half of the participants being middle aged. Additionally, most of the participants resided in Hinds County. Subjects were evaluated for their marital status, sex, education, employment status, socioeconomic and health status. Follow-up examinations conducted in 2005–2008 (Year 2) and 2009–2013 (Year 3) had retention rates of 79% and 71% of the surviving cohort, respectively. Annual follow-ups are conducted with the latest being in 2019.

Key clinical discoveries made by JHS researchers at the time of my investigation included the finding that blood pressure spikes created higher risks of death; the risk of heart disease in African Americans doubled with the presence of a gene variant; and a higher risk of kidney disease was linked to sickle cell trait (National Heart, Lung, and Blood Institute [NHLBI], n.d.). My study provided further insight into health disparities experienced by African Americans by adding to the JHS research on the influence of neighborhood environment on CVD, specifically availability of fast food. For policy makers, this study could provide insight into how land-use policy designs impact community health. Further, findings of this study may help to lower incidence rates of heart disease in African Americans.

Problem Statement

In the United States, one in every four deaths is due to heart disease (Centers for Disease Control and Prevention [CDC], 2020), making it a major public health concern

over the past decade (Mendy et al., 2016). Recent studies have illustrated that minorities and lower socioeconomic groups are the most affected by heart disease, with the African American population living in the southern region of the United States being disproportionately affected (Li et al., 2014; McNeill et al., 2015). Previous researchers have explored causes of the disparity (Carnethon et al., 2017; Gebreab et al., 2017; JHS, 2020b; Nixon et al., 2015) but have not investigated the influence of land-use policy on prevalence of heart disease. The aim of this research was to build on previous efforts that addressed heart disease disparities in the African American community by focusing on how the availability of FFRs influences prevalence of CVD.

Purpose of the Study

The purpose of this quantitative study was to explore the relationship between FFR zoning policies and prevalence of heart disease in African American communities in Jackson, Mississippi. I used baseline data from the JHS to analyze the prevalence of CVD in participants aged 35–64. There was one dependent variable (prevalence of heart disease) and two independent variables (availability of FFRs whose density was to serve as a proxy for zoning, and residential location by way of mock census tract, percent residential land use per square mile and population density per square mile). There was one moderating variable, SES, which included median household income, educational attainment, and occupation. Moderator variables (Z), according to Aguinis (2004), are variables between the dependent variable (X) and independent variable (Y) that provide a more descriptive account of how X and Y are manipulated or changed. Additionally, age, participant sex, and residential location acted as covariates.

Research Question and Hypotheses

RQ1: Will variations in local fast-food zoning policies predict a statistically significant percent change in R^2 variance in CVD prevalence in African Americans more than SES when controlling for age, sex, and residential location?

$H_0$1: Local fast-food zoning policies are not a statistically significant contribution of variations to the percent R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location.

$H_1$1: Local fast-food zoning policies are a statistically significant contribution of variations to the percent R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location.

RQ2: Is there a difference in prevalence rate of CVD across three zoning areas when controlling for number of FFRs?

$H_0$2: When controlling for number of FFRs there is no difference in prevalence of CVD amongst individuals across three zoning areas.

$H_1$2: When controlling for number of FFRs there is a difference in prevalence of CVD amongst individuals across three zoning areas.

Theoretical Framework

The theoretical framework of this study stemmed from Schneider and Ingram's social constructions of target populations theory. The theory argues that "social constructions influence policy and agenda and the selection of policy tools, as well as the rationales that legitimate policy choices" (Schneider & Ingram, 1993, p. 334). Ingram and Schneider (1995) stated that their purpose was to understand how policy designs are

shaped by social constructions, which then affect perceptions and participation of citizens. According to Pierce et al. (2014), this theory was created to better understand why public policies sometimes fail to produce greater equality of citizenship, fail to solve public problems, and fail to support democratic institutions. They also noted that the application of social construction and policy design theory has been widely used in the social welfare policy domain as well as public health.

It is also stated that the use of this theory contributes to understanding a wide variety of social inequalities (Ingram & Schneider, 2015). The theory assists with analyzing how benefits and burdens, hypothesized as being potentially reflected in the socioeconomic impact of the availability of certain food choices as it relates to zoning policies (Barbehön et al., 2020), are distributed and the function of political power of target groups. Target groups of Schneider and Ingrams theory are articulated by a matrix that includes four overall categories: advantaged, contenders, dependents, and deviants. Those who are advantaged, characterized by deserving and having more political power versus those who are negatively constructed, typically fare best in terms of benefitting from public policies. Contenders generally have some workings of political power but are regularly seen as being less deserving of societal generosities and are therefore unable to fully reap political or social benefits. Dependents are even less deserving, conjuring sympathetic treatment but are still unable to make policy systems demands. Lastly, deviants, sufficiently lacking in both political power and social inclusion, are largely excluded from political and societal bounties and often face the brunt of political sanctions.

Propositions of the theory denote that systematically biased policy patterns are more likely to be seen because policy makers are incentivized to reward groups that are positively constructed and are pressured to develop burdensome policies for target populations, or negatively constructed groups, being especially harsh to those groups with little power (Kreitzer & Smith, 2018).

Target Population Proposition

Proponents of the theory propose that:

> Policy designs structure opportunities and send varying messages to differently constructed target groups about how government behaves and how they are likely to be treated by government. The allocation of benefits and burdens to target groups in public policy depends upon their extent of political power and their positive or negative social construction on the deserving and undeserving axis. (Ingram et al., 2007, p. 101)

Feed-Forward Proposition

In reference to the second proposition of the theory, Ingram et al. (2007) state that "the treatment of target groups through policy design has enduring effects on the political orientation and participation patterns of target populations" (p. 98).

The ideologies associated with social construction of target populations theory rightfully aligned with my investigation by investigating who gets what, when, and how (Lasswell & Kaplan, 2017) within African American communities. Using Schneider and Ingram's (2015) approach to build upon the literature reinforced my study of health and social equity by implementing the concept of benefits and burdens as it relates to food

choices. According to research, food choices are based on SES and individual characteristics, geographic location, built environment, and neighborhood cohesion (Gebreab et al., 2017). Additionally, the theory used social construction and power to identify how zoning is used or asks the question of policy for whom (Hoflund et al., 2017).

Nature of Study

To identify relationships between heart disease and fast-food availability among JHS participants, a well-designed quantitative study using regression analysis was best suited to test the hypotheses (Gordon, 2015; Schroeder et al., 2017). Using a cross-sectional regression design, I assessed secondary data from primary JHS research to identify any relationship between prevalence of heart disease and fast-food availability among JHS participants. The JHS is a community-based observational study that aims to improve future health by investigating the epidemiology of environmental and genetic factors associated with CVD among African Americans (JHS, 2020b) and includes 3,728 participants who were enrolled in the 1985 ARIC (Fuqua et al., 2005), and 1,574 local county recruits, family members, and volunteers.

ARIC is a nationwide study that investigates the causes and origin of atherosclerosis and its natural progression by race, sex, age, and location (Collaborative Studies Coordinating Center, n.d.) and had a current project timeline of 1985-2021 at the time my research was conducted (NHLBI, n.d.). Jackson, Mississippi, was one of four locations chosen for the study the Jackson ARIC sample consisted of people, aged 45 to 64 years at the time of the ARIC baseline examination (1987-1989), who were selected

by probability sampling from the city of Jackson residents listed in the Mississippi Driver's License and Identification List. All Jackson ARIC participants who were alive when the JHS was initiated in 2000 were invited to participate in the JHS; the ARIC participants were then 59 to 78 years old (Fuqua et al., 2005).

In addition to ARIC participants, the JHS recruited 1,574 participants from Hinds, Rankin, and Madison counties known as the metropolitan area of Jackson, Mississippi or for the purpose of the JHS, the MSA (Fuqua et al., 2005). These participants were selected using multiple commercially available lists to provide counts of households with adults aged 35 and older. Additionally, an open enrollment period was provided for volunteers to participate in the JHS if they met eligibility criteria. Family members were also allowed to participate in the study if eligibility criteria were met.

The final cohort of 5,302 participants continue to provide a robust dataset of variables (i.e., age, income, education level, sex, CVD, CVD risk factors, diet and physical activity, sleep and depression, and awareness and control of risk factors; Fuqua et al., 2005; NHLBI, 2008). Raw individual exam data collection occurred at base line 2000–2004, Exam 2 from 2005–2008, and Exam 3 from 2009–2013. Annual follow-ups occurred after each exam period.

Utilizing JHS data and IBM SPSS software, I examined the previously stated study variables. The dependent variable, prevalence of CVD, refers to several types of heart conditions. Heart conditions were described using the JHS criteria as all diseases of the heart, stroke, abnormal arrhythmia, and heart failure or self-reported occurrence of a stroke, myocardial infraction (i.e., heart attack), coronary revascularization (i.e.,

restorative vascular surgery), or angina (i.e., chest pain; NHLBI, 2008). The independent variable, density of FFRs, was described as the percentage of FFR availability within each participant's residential ZIP code, which was already calculated by JHS researchers. One moderating variable was employed, SES, which included income, education, and occupation.

Operational Definitions

Prevalence of CVD (dependent variable): CVD is defined using the JHS criteria of all diseases of the heart, stroke, abnormal arrhythmia, and heart failure or self-reported occurrence of a stroke, myocardial infraction (heart attack), coronary revascularization (restorative vascular surgery), or angina (chest pain; NHLBI, 2008).

Fast-food availability (independent variable): The number of FFRs contained within a ZIP code of each participant's residential location (Hickson et al., 2011).

Residential location (independent variable):

- *Residential district*: Land use provided for low density, moderate density, medium density, high density, manufactured home subdivision, estate residential, manufactured home park, planned unit residential development, patio home or townhome dwelling development (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020)
- *Commercial district*: Land use provided for the development of commercial office building use, retail, services, and vehicle-oriented traffic i.e., lodging, vehicle sales, outdoor entertainment (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020).

- *Special use district*: Land use provided for the development of specific types of land use that does not fit into other established zones due to size, characteristics, or institutional nature i.e., medical complexes, religious institutions, educational institutions (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020).

SES (moderating variable): The social standing or class of an individual or group categorized by education, income, and occupation (American Psychological Association [APA], n.d.).

Age (control variable): JHS study participants needed to meet attained age criteria at date of recruitment (Fuqua et al., 2005). For this study, age is operationalized as 35–64 age attained at time of data collection.

Sex (control variable): Study participants identifying as male or female

Zoning policy: Governance over the use of all land through regulations, restrictions, or ordinances (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020).

Fast-food restaurant (FFR): An establishment that has a limited menu, items prepared in advance or heated quickly, no table service, and disposable wrappings or containers (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020).

Fast-food zoning: The permitted use of land for a commercial structure whose principal business is the sale of pre-prepared or rapidly prepared food and beverages for consumption either within the restaurant or for carry-out, and where customers are not

served food and beverages by a waiter or waitress at the same table or counter where items are consumed and or the establishment includes a drive-through service facility or offers curb service (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020).

Food environment: The distribution of food stores, food service, and any physical entity by which food may be obtained and affect a person's diet (CDC, 2014).

Net residential density: The number of persons per residential acre within the household's census block group (Frank et al., 2004).

Assumptions

An objective of the JHS is to understand the role sociocultural factors play in the disproportionate CVD risk and mortality in African Americans (Payne et al., 2005). Therefore, it is assumed that the sample of records is representative of the population studied, and there is similarity of participants' characteristics within the study. This assumption is necessary because "researchers cannot be certain that any particular sample is completely representative of the larger population" (Tokunaga, 2015, p. 29). When enlisting a representative sampling frame, JHS recruiters experienced challenges with identifying a large enough ethnic specific sample (Fuqua et al., 2005). To overcome this, eligibility pre-screening was implemented during open enrollment as well as with the volunteer sample.

A community-driven recruitment model developed with community representatives, included an interviewer-administered survey that assessed the relationship of selected key participant, organization, protocol, and community

involvement factors to potential participation in the study (Fuqua et al., 2005). JHS researchers used the Jamerson K. Recruitment survey instrument that was developed for a previous study that analyzed kidney disease in African Americans. In my study, stratified random sampling was used to ensure representation, dividing records into strata by age and sex.

With consideration given to the JHS being a longitudinal study, it was assumed that data collected throughout the life of the study are still reflective of the neighborhoods and people of interest for my research. This assumption is also supported by current literature that has utilized JHS's data and or population to further research on the topic (Beckles et al., 2019; Bruce et al., 2015; Glover et al., 2017). Data collection instruments were also assumed to be valid and reliable based upon their previous use. This assumption helped to increase validity and replication of this and previous studies (Heale & Twycross, 2015).

The JHS collected data on several variables ranging from physical health metrics to lifestyle and socioeconomic metrics (JHS, 2020a). To assess physical activity, a survey instrument was administered by interview (Dubbert et al., 2005). According to the study, a 24-hour pedometer monitoring and accelerometer provided objective measures for validation of cohort survey responses (Smitherman et al., 2009). Dietary assessment methods were calibrated and validated by employing a short food frequency questionnaire with all JHS participants (Carithers et al., 2005). A longer food frequency questionnaire was used with a subset of the participants in addition to four 24-hour diet recalls. Carithers et al. (2005) stated that these methods were used to validate culturally

explicit data collection instruments developed by Delta Nutrition Intervention Research Initiative for assessing dietary intake in an all-African American cohort.

Scope and Delimitations

In this research, I chose to look only at self-reporting African American male and female participants of the JHS, ages 35–64, who resided in the three counties of the JHS study: Hinds, Rankin, and Madison. Although the JHS study included participants aged 21–84, those who did not fall within the 35–64 age range were excluded from this study. At the time of my study, the CDC (n.d.) provided an interactive atlas of heart disease and stroke data that could be filtered by state, county, death, hospitalization, and discharge status associated with heart disease. The age filter for each option began at 35, which guided the starting age range in my study. It was also stated that coronary artery disease is responsible for roughly 2 in 10 deaths in adults younger than 65 (Benjamin et al., 2019). This guided the maximum age selection in my study, creating an age range of 35–64. Because my research studied the African American population in a single site of Jackson, Mississippi, results might not be generalizable to other geographic areas (Gebreab et al., 2017).

Limitations

The primary limitation of the cross-sectional study design is that there is generally no evidence of a causal relationship between exposure and outcome because the exposure and outcome are simultaneously assessed (Setia, 2016). In other words, a researcher measures the exposure and outcome in study participants at the same time, making it difficult to derive causal relationships. Another potential limitation of this research that

was highlighted in another study is that results could be affected by residual confounding unmeasured determinants that simultaneously and independently influence outcomes (MIT Critical Data, 2016) and unmeasured time-varying factors (Gebreab et al., 2017). According to Mansournia et al. (2017), when confounders have values that change over time, which in epidemiological studies is generally body mass index (BMI), smoking status, blood pressure, or SES, time varying confounding occurs. Gebreab et al. (2017) controlled for all known confounders as was done in my study. Additionally, findings might not be generalizable to other geographic areas as the study was based on an African American population at a single site of Jackson, Mississippi. The age range chosen was also a potentially limiting factor because results may be different in younger and/or older populations.

Significance

According to Mujahid et al. (2017), racial or ethnic differences in health remain alarming and may result from more than just differences in the individual. Studies show that neighborhood context may also contribute to these disparities (Diez-Roux et al., 2017; Gebreab et al., 2017; Xiao & Graham, 2018) emphasizing the importance of creating physical and social environments that are conducive to healthy lifestyles and providing the greatest potential to improve health (Office of Disease Prevention and Health Promotion [ODHP], 2020). This study could provide guidance to policy makers and those who influence policy by offering an understanding of potential barriers to eating properly and how zoning policies potentially influence such barriers, specifically among the African American population.

By exploring a sample of JHS participants, this study aimed to provide insight into the prevalence of heart disease in three counties in Jackson, Mississippi, by measuring availability of FFRs in residential locations with differing zoning regulations. As previously stated, African Americans experience the highest diet-related mortality rate (McNeill et al., 2015) and experience conditions where poorer choices in quality food are made available (Horst et al., 2016; Thibodeaux, 2015). It is believed that targeted information could help reduce deaths related to heart disease, which could potentially lead to a reduction in local and federal medical expenditures. Findings from this study adds to the literature and the overarching goal to improve health for African Americans.

Summary

Heart disease among African Americans is a major public health concern in the United States and the high burden of mortality weighs heavily on this population (Graham, 2015; JHS, 2020b). Moreover, African Americans are 60% more likely than European Americans to have high blood pressure (Ostchega et al., 2020). Although individual-level risk factors contribute to the occurrence of the disease and associated conditions (Gebreab et al., 2017), there is growing evidence to suggest the importance of built environment in contributing to incidence and mortality of CVD (Moore et al., 2009; Morland et al., 2006; Nixon et al., 2015; Popkin et al., 2005). Many studies have implemented cross-sectional analysis to assess associations between built and or food environment and obesity (Drewnowski et al., 2016; Gebreab et al., 2017; Hall, 2017; Nixon et al., 2015). However, to date, no studies were found to have specifically targeted fast-food zoning as a potential contributor to CVD within the African American

population. Using quantitative methods to assess data, I explored the relationship between FFR zoning policies in three Jackson, Mississippi, counties and prevalence of heart disease among African American JHS participants aged 35–64. The information obtained from this study could help local policy makers and add to the literature of the 20-year longitudinal JHS. Findings will also contribute to the literature on health disparities of African Americans by providing material on the potential barriers to leading a healthy life while also contributing to the overarching heart disease and stroke objectives of Healthy People 2030 (ODHP, n.d.).

Next, Chapter 2 presents a review of relevant literature on the topic which focuses on chronic conditions, fast-food, and zoning to understand causes of CVD disparities. Following the literature review, Chapter 3 describes the methodology of the study including the design and data analysis.

Chapter 2: Literature Review

With mortality rates averaging about 170 per 100,000 people, heart disease has become a major public health concern in the United States over the past decade (Mendy et al., 2016). In a recent study, Li et al. (2014) reported that minorities and lower socioeconomic groups are the most affected by heart disease, and McNeill et al. (2015) state that the African American population living in the southern region of the United States is disproportionately affected. Carnethon et al. (2017) also stated that in the African American community the burden of CVD remained high with unequally shared reductions in CVD incidence and mortality.

There are researchers who have studied the associations of built environment, chronic conditions, and diseases, and their relation to the diet of African Americans, but the literature is limited to fast-food availability, consumption, and the impact on BMI or obesity specifically (Hickson et al., 2011; Reitzel et al., 2014; Zhang et al., 2014). A gap exists in the literature in that no studies have been found to comparatively explore fast-food availability as a predictor of prevalence of CVD within African American communities. It has been noted that it is difficult to explain the multifactorial disparities in CVD which span from the individual level to the social environment (Carnethon et al., 2017). In order to draw relationships between the social environment and prevalence of CVD, the literature review focused on the variables arguably related to food availability and chronic disease in African Americans.

The major sections that follow include the literature search strategy, theoretical foundation, conceptual framework, and review of the literature. In addition, the summary and conclusion bring this chapter to a close.

Literature Search Strategy

To evaluate the association between fast-food availability and prevalence of heart disease among African Americans, I used multiple databases with key search terms, including Academic Search Complete, ProQuest, and PubMed through the Walden University Library. Google Scholar was also used to search published research articles. The JHS, an ongoing 20-year longitudinal study, served as a landmark piece of work focusing on heart disease in African Americans. The JHS website provided several links to ancillary and original research, which I used to locate data, methods, and publications. The geographic focus of the JHS study included three counties: Hinds, Rankin, and Madison (JHS, 2020a). I accessed county websites and made phone calls to county employees to retrieve zoning and ordinance documents.

Search strategies were developed by using terms in the research question as well as key terms found in associated publications. For some terms, synonyms and broader versions of the term were employed. For example, when searching for the key term *African American*, I expanded the search to terms such as *Black* and *Black-American*. Other search terms included *fast food*, *convenience food*, *food service*, *land use, policy*, *zoning*, *obesity*, *heart disease*, *cardiovascular disease*, and *disparities*. I then arranged the key terms to create different combinations of search phrases.

Any correlation between built environment and obesity has only recently been recognized as a public health phenomenon (Giles-Corti et al., 2015; Hruby et al., 2016; Salvo et al., 2018), making the search for seminal work difficult. I used several search engines to explore seminal work on zoning or built environment and health disparities. An exploration of the subject area using ProQuest Dissertations and Theses Global provided 63 results with dates ranging between 2007 and 2020.

Taking the uniqueness of the issue into consideration, the literature surveyed ranged between 2000 and 2020. The literature pertaining to the built environment and obesity was found to be much more prevalent than the literature surrounding the association between the built environment and heart disease. To address this, the use of associated terms such as *disparities* was used in place of *heart disease* or *cardiovascular disease*. However, search results still proved to be limited.

Using the database Academic Search Complete, a search for *African American* or *Black Americans* or *Blacks* and *obesity* yielded 4,020 findings, of which 3,933 were from academic journals, five were book reviews, 81 were from magazines, and one was from a trade publication. To narrow results, I used the subject picker to select geographical locations which included the United States, North Carolina, and Texas as these were the only two southern states available on the list. This provided 639 records from which I selected roughly 30 articles for review.

Applying the same limiters, with the addition of Alabama, to a Boolean search for *African American or Black Americans or Blacks and fast food, convenience food, or food service* yielded 237 journal articles, and six magazine articles. Twelve articles were

previewed and selected for further review. In a preliminary review, the articles exhibited a heavier focus on food environments versus the previous search using the term obesity. Replacing the term *African American* with *obesity* formed the search phrase *obesity and fast-food, convenience food, or food service*, which gave rise to 1,860 search results and 20 relevant articles after selecting United States as a geographic location.

A search for *zoning*, *land use policy, or built environment* and *fast-food*, *convenience food, or food service* supplied a list of 126 resources. After adjusting for location, 17 search results remained, of which 11 were reviewed. A literature search pertaining to African Americans and heart disease revealed 13,123 results. A subject search was refined to *location*, *cardiovascular disease related mortality*, *risk factors*, *health of African American women*, *social aspects*, *biological sex differences*, *mortality risk factors*, *heart disease research*, *U.S. Census*, *myocardial infarction diagnosis*, and *environmental aspects*. This produced 599 results which were further delineated by geographic location to include the United States, southern states, Georgia, and Louisiana, rendering 106 results. Twenty-two titles were selected for evaluation. Search results for *fast-food and heart disease* were far scarcer, providing only 13 results after filtering for location and subject. Of the 13 results, only three articles were relevant.

The PubMed database provided access to National Institutes of Health (NIH) funded research projects. An advanced search was used, inserting key terms of *African American and heart disease or fast-food*. After I selected the described time-frame parameters, there were 18,331 results. A book and documents inquiry did not offer any relevant sources; however, a meta-analysis, systematic review, and review types revealed

1,474 items. The first 200 articles displayed were scanned and of the 200, eight articles were selected to be studied. Another PubMed search for *built environment and fast food* found four results of which one item was selected for analysis. Many of the PubMed selections lead to full text articles located on the ProQuest database. A search for related terms on Google Scholar produced 14 additional articles from the NIH website that were not selected from the grouping of 200 originally reviewed.

In total, I reviewed an estimated 130 peer-reviewed articles as part of the literature review. The JHS provided extensive documentation for methodology, ongoing data collection, and ancillary studies offering mixed foci. The literature reviewed was confined to English language material and includes both quantitative and qualitative approaches, as well as literature reviews conducted by other researchers. As previously mentioned, the literature surrounding fast food and heart disease, even within the JHS database, proved to be limited, requiring the need to explore other disciplines outside of sociological research to include medical literature from sources such as the American Heart Association, for example.

Theoretical Framework

This study's theoretical framework stemmed from Schneider and Ingram's social constructions of target populations theory. Schneider and Ingram (1993) argued that "social constructions influence policy and agenda and the selection of policy tools, as well as the rationales that legitimate policy choices" (p. 334). According to Pierce et al. (2014), this theory was created to better understand why public policies sometimes fail to produce greater equality of citizenship, fail to solve public problems, and fail to support

democratic institutions. They also note that the application of social construction and policy design theory has been widely used in the social welfare policy domain as well as public health. The use of this theory has also contributed to understanding a wide variety of social inequalities (Ingram & Schneider, 2015).

Target groups of Schneider and Ingrams theory (2015) are articulated by a matrix that includes four overall categories: advantaged, contenders, dependents, and deviants. Those who are advantaged, characterized by deserving and having more political power versus those who are negatively constructed, typically fare best in terms of benefitting from public policies. Contenders generally have some workings of political power but are regularly seen as being less deserving of societal generosities and are therefore unable to fully reap political or social benefits. Dependents are even less deserving, conjuring sympathetic treatment but are still unable to make policy systems demands. Lastly, deviants, sufficiently lacking in both political power and social inclusion, are largely excluded from political and societal bounties and often face the brunt of political sanctions.

The benefits and burdens of the advantaged and disadvantaged populations (Barbehön et al., 2020), and as hypothesized, are potentially reflected in the socioeconomic impact of the availability of certain food choices as it relates to zoning policies. Based on the literature presented by Weible and Sabatier (2018), the ideologies associated with social construction and policy design theory rightfully align with this investigation into zoning policies within African American communities. deLeon (2005) noted that the theory's "plausibility" factor makes good administrative and political sense

and is strengthened by the fact that examples can be seen in nearly every facet of social and political life. However, deLeon offered that there is a lack of a clear causal driver guiding the construction of target populations.

Propositions of the theory denote that systematically biased policy patterns are more likely to be seen because policy makers are incentivized to reward groups that are positively constructed and are pressured to develop burdensome policies for target populations, or negatively constructed groups, being especially harsh to those groups with little power (Kreitzer & Smith, 2018).

Target Population Proposition

Ingram et al, (2007) remark that:

> Policy designs structure opportunities and send varying messages to differently constructed target groups about how government behaves and how they are likely to be treated by government. The allocation of benefits and burdens to target groups in public policy depends upon their extent of political power and their positive or negative social construction on the deserving and undeserving axis. (pp. 98, 101)

Feed-Forward Proposition

The theory also proposes feed-forward effects of policy where policy design works to instrumentally shape the broader culture and institutions (Ingram et al., 2007; Pierce et al., 2014; Schneider & Sidney, 2009) According to Ingram et al. (2007) “the treatment of target groups through policy design has enduring effects on the political orientation and participation patterns of target populations” (p. 98). While critics of the

theory have emerged (deLeon, 2005; Lieberman et al., 1995; Sabatier, 2007), Schneider and Ingram have provided empirical evidence in other writings (Ingram & Schneider, 1995; Schneider & Ingram, 2005a; 2005b), rebutting these arguments in a way that persuaded scholars to continue with the research agenda (Kreitzer & Smith, 2018; Pierce et al., 2014). Lieberman (1995) proposed a historical-institutional framework for interpreting the role of group identities in political change in his critique of Schneider and Ingram's "circular" view of public policy and social construction. Using the example of how political institutions and policy change affects changing group constructions, Lieberman examined the dual experience of African Americans in the American welfare state.

In response, Ingram and Schneider (1995) stated that their purpose was to understand how policy designs are shaped by social constructions, which then affect perceptions and participation of citizens. They argued that no analytic improvement is produced with Lieberman's ideas of institutions and history. In their own analysis, they provided illustration of the advantages for future research of their conception of policy targets in the case of welfare.

Sabatier and Weible's (2018) fourth edition book on policy process theories does not include criticisms of Schneider and Ingram's social construction theory. However, in the 1999 publishing, Sabatier, on fostering the development of policy theory, stated that the social constructionist framework is relatively promising, but needs to be "developed into more logically coherent and denser theoretical framework and, eventually, into fully developed theory" (p. 321). Sabatier's opinion shifted in the second edition in 2007 after

Schneider and Ingram proved that their framework rose to the standard of science (Sabatier, 2007).

The theory is founded upon eight assumptions that can be divided into three categories (Pierce et al., 2014). The categories are (a) the model of the individual, (b) power, and (c) the political environment. The model of the individual assumptions are such that

- actors cannot process all of the information relevant to make a decision, and therefore rely on common sense to decide what information to recollect (Jones, 2001; Simon, 2019);
- information is filtered in a biased manner due to mental heuristics (North, 2014), which results in individuals having a tendency to reject information that is not consistent with preexisting beliefs and confirm that new information is (Lord et al., 1979; Munro & Ditto, 1997; Munro et al., 2002);
- social constructions are used by people in a subjective manner that is calculating (Edelman, 1988); and
- as Edelman also suggests, one's social reality is where the perception of generalizable patterns of social constructions is boundedly relative within objective conditions (Collins, 1989).

The second category and set of assumptions applied to power, which postulated that within a political environment there is no equal distribution of power among individuals (Bachrach & Baratz, 1962; Lasswell & Kaplan, 2017; Lukes, 2021). Building on Bachrach and Baratz's (1962) "faces" and Lukes's (2021) three dimensions of power,

the theory used the classic schemes for categorizing power. According to Pierce et al. (2014), the first dimension's primary focus is observable behavior, conflict, and influence. The second concerns itself with what can be observed and what is not present (e.g., the ability to thwart policies from the agenda). The third dimension of power emphasizes ideology and the influential potential of entities on rationale for preferential creation.

The third set of assumptions involves the political environment and comprises the following:

- future politics are created by policies that feed-forward, creating new politics and policy (Lowi, 1964; Schattschneider, 2017);
- citizens participation patterns and orientations are affected by messages policies send (Ingram & Schneider, 1991); and
- the creation of policies is done in an environment of political uncertainty (Kingdon, 2014).

Pierce et al. (2014) conducted an analytical review of past applications of social construction and policy design theory between the years 1993–2013. They studied English language peer-reviewed journals by publication years and authors, policy domain, federal, state, local or international policy applications, methodology, theories, and categories. Across all the publications examined, 62% were solely focused on the proposition of target populations. Examples of this application are seen throughout varying disciplines such as theory, policy studies, and health politics (Barney, 2020; Bell, 2019; Clavier et al., 2021; Kay & Smith, 2016). Barney's (2020) article applied the social

construction of target populations theory to explore reasoning behind the introduction and enforcement of Louisiana's HIV criminalization law.

Kay and Smith (2017) applied Schneider and Ingram's (2015) framework to investigate whether states that have a larger percentage of socially marginalized population experience a higher presence of HIV criminalization laws. They concluded that states with larger African American populations have HIV criminalization laws. Studying the issue of population health, Clavier et al. (2021) analyzed the influence of political parties on health and equity. Investigating variations in public support for affirmative action policies through the lens of randomly assigned target populations, Bell (2019) applied social construction of target populations theory to understand policy benefits and burdens. Older applications of the theory in HIV and AIDS policy studies include Schroedel and Jordan (1998) and Hogan (1997). Hirshberg's (2002) study examined the impact of race and ideology on education policy making while Ingram and Schneider continue to contribute to the field of policy construction.

Using Schneider and Ingram's (2015) approach to build upon the literature reinforced my study of health and social equity by implementing the concept of benefits and burdens as it relates to food choices. According to research, these choices are based on SES and individual characteristics, geographic location, built environment, and neighborhood cohesion (Gebreab et al., 2017). Additionally, it used social construction and power to identify who gets what, when and how (Pierce et al., 2014), or asks the question of policy for whom (Hoflund et al., 2017).

The Literature

The JHS was initiated in 1998 as an extension of the ARIC study, which began in 1987 (JHS, 2020a; Collaborative Studies Coordinating Center, n.d.). The ARIC study aims to investigate the causes of atherosclerosis in adults from four U.S. communities and has an objective of measuring how cardiovascular risk factors, medical care, and outcomes vary by sex, race, time, and place (NHLBI, n.d.). While both are longitudinal studies, the JHS seeks to investigate genetic and environmental risk factors associated with the burden of CVD in the African American population. In expanding the ARIC study, the JHS sought out to secure new and continuing participation of 5,302 African Americans for long-term observation of cardiovascular risk factors (Fuqua et al., 2005). They enlisted a representative, population-based cohort of self-defined African American persons aged 35–84 years living in the Jackson, Mississippi metropolitan area of Rankin, Hinds, and Madison Counties.

Information on psychosocial factors, demographics, risk factors, medication use, and behaviors was obtained via self-administered questionnaires, in-home interviews, and medical data was captured from three clinical examinations in 2000–2004, 2005–2008, and 2009–2013 (JHS, 2020a). Clinical exam four will be conducted from 2020–2022 and will include an investigation of the associations between brain health and cardiovascular health as part of the current 2018–2024 JHS contracts supported by National Institute on Minority Health and Health Disparities (NIMHD) and the NHLBI. Additionally, ARIC and JHS personnel administer annual contact by telephone (preferred), or in person (if necessary), to JHS participants to update vital status, personal information,

hospitalizations, interim medical events, sociocultural information, and functional status. Data linkages between hospital discharge lists, deaths, and medical records of CVD risk factors and CVD incidence also provide ongoing surveillance of JHS participants.

The JHS study sample was drawn from several different sources and initially targeted adults aged 35 to 84 years (Fuqua et al., 2005). The first source (approximately 31% of the full JHS sample) were participants from the Jackson Field Center of the ARIC Study. The Jackson ARIC sample consisted of 3,732 people aged 45–64 years at the time of the ARIC baseline examination (1987–1989) who were selected by probability sampling from City of Jackson residents listed in the Mississippi Driver's License and Identification List.

All Jackson ARIC participants who were alive when the JHS was initiated in 2000 were invited to participate in the JHS; the ARIC participants were then 59 to 78 years old (Fuqua et al., 2005). The second source (47% of the full JHS sample) was a community sample recruited using two approaches: (a) a random sample from a commercially available list of all residents aged 35 to 84 years in the tri-county area (slightly less than half of the community sample) and (b) volunteers aged 35 to 84 years (identified through participant referral or out-reach activities) selected to be representative in age, sex, and socioeconomic characteristics of the population of the tri-county area. The third source (31% of the full JHS sample) was relatives of JHS participants. Family members were included even if they were younger than 35 years or older than 84 years.

The final study sample consisted of 5,301 men and women between the ages of 21 and 95 years, representing nearly 7% of age-eligible African American men and women living in the tri-county area (Hinds, Madison, and Rankin Counties) of the Jackson MSA (Fuqua et al., 2005). A total of 5,236 (98.8%) JHS participants were successfully geocoded (Robinson et al., 2009) and have generally been shown to be geographically representative of the underlying African American population in the Jackson MSA (Hickson et al., 2011).

According to Taylor et al. (2005) participants undergo exams, and major, abnormal clinical findings are reported to the participants and to their health care providers. Follow-up information on vital status, major illness or injuries, and hospitalizations to identify intervening clinical events is done annually by phone. The baseline examination (2000 to 2004) included demographics, psychosocial inventories, medical history, anthropometry, resting and ambulatory blood pressure, a blood draw and 24-hour urine collection, electrocardiography (ECG), echocardiography, and lung function. Exam 2 (2005–2008), included some repeated measures from Exam 1 and several new components, including distribution of self-monitoring blood pressure devices, DNA collection, and computerized tomography (CT) scans of the heart and abdomen. Exam 3 (2009–2013) contained repeat measures from the first two exams and new questionnaires to assess sleep history and cognitive function in a subset of participants. Researchers also analyzed cardiac magnetic resonance imaging (MRI) scans with gadolinium MRI contrast in this group. Both assessments were aimed at identifying silent heart attacks.

Funded by the NHLBI and NIMHD, the JHS is conducted and supported in collaboration with Tugaloo College, Jackson State University, the University of Mississippi Medical Center, and the Mississippi State Department of Health, serving as a resource to the scientific community (JHS, 2020a). According to the study's *About* page, research from the JHS study has generated extensive data on "cardiovascular disease risk factors and measures of subclinical cardiovascular disease from echocardiography, cardiac magnetic resonance imaging and computed tomography scans" (para. 3). Between 1999-2020, over 620 scientific studies using JHS data have been published with topics ranging from clinical research (Crook, 1999; Teslovich et al., 2010; Wilson et al., 2005), study design and methods (Lee et al., 2016; Robinson et al., 2009; Smitherman et al., 2009), to the impact of environmental risks associated with health (Gebreab et al., 2017; Tamura et al., 2020). Key clinical discoveries made by JHS researchers at the time of this study include the finding that spikes in blood pressure, even small spikes, can lead to a higher risk of death; African Americans have a gene variant that doubles the risk of heart disease; and a sickle cell trait linked to a higher risk of kidney disease (NHLBI, n.d.).

To build upon the JHS, my study looked at environmental influences (i.e., availability and zoning) of FFRs and their contribution to prevalence of CVD in JHS participants. Gebreab et al. (2017) assessed associations between the prevalence of FFRs and obesity among JHS participants, as did Hickson et al. (2011) and found that attracting healthy food retailers might be helpful in preventing Type 2 diabetes in African American communities. However, Type 2 diabetes is but one risk factor for heart disease

and is not always an indicator of CVD (Carbone et al., 2017), which is where my study differed.

Fast-Food Availability and Chronic Conditions

The growing prevalence of diet-related chronic conditions has led to a dramatic increase in the number of individuals afflicted with Type 2 diabetes, which can lead to kidney failure, eye diseases, cardiovascular problems, and early death (CDC, 2017a). Conversations on how to combat the current health of the nation often lead to controversial strategies on the use of zoning and other land-use policies to improve community food environments (Nixon et al., 2015). After reviewing the current literature, I found that studies surrounding obesity and fast food were much more prevalent than the literature on heart disease and fast food. However, both were limited in scope which resulted in utilizing some sources that were outside the time frame prescribed by current literature. Because obesity is a contributing risk factor of heart disease, as stated above, I centered this review on obesity and zoning literature in order to provide a more robust assessment.

In review of the literature, three noticeable concepts emerged. The first concept encompassed the idea that utilizing land use policies could potentially impact food availability and health, but more research is needed (Cooksey-Stowers et al., 2017; Diez-Roux et al., 2017; Gebreab et al., 2017; Nykiforuk et al., 2018). The second notion implied that land use policies have a positive impact on food availability and health (Peng & Kaza, 2020; Thornton et al., 2016; Vaughan et al., 2017), and the third adversely provided that there is no substantiating evidence to support the effectiveness of using

zoning policy strategies to control an individual's food choice thereby having no effect on their health (Sturm & Hattori, 2015; Xu & Wang, 2014; Zenk et al., 2017).

Potential Influence of Zoning Policies

In addressing the first concept, Ashe et al. (2003) wanted to gain a better understanding of how public health is protected by legal tools, such as the density and location of firearms, alcohol, tobacco, and fast-food retail outlets. After determining how land use regulations function as a control tool for public health advocates, they found that it lessened the negative effects of alcohol retail outlets in neighborhoods. However, their research showed that more is needed to determine if the same effects are visible from other retail outlets on community health. Nykiforuk et al. (2018) similarly found that after studying the utilization of land use policies to determine the viability of fast-food drive-through service bans within Canada, further research is required to assess whether it is beneficial in promoting healthier food environments.

Cooksey-Stowers et al. (2017) investigated the effect of food environments on adult Type 2 obesity and found that local policies such as zoning laws warrant consideration as strategies to increase health equity. In addressing obesity, Davis (2008) stated that "a change in the built environment, facilitated by zoning ordinances, could alter the landscape in our communities and result in more active, healthier lifestyles" (p. 288). It was cautioned by Davis that this type of zoning regulation, however, may confront challenges under the dormant commerce clause, which restricts states power over interstate commerce.

On a micro level, Diez-Roux et al. (2017) and Chum and O'Campo (2015) examined the relationship between neighborhood socioeconomic factors and prevalence of coronary heart disease and risk factors. They found there to be increased odds of CVD associated with reduced access to parks/recreations, food stores, and increased access to FFRs. It is further noted that this suggests that neighborhood environments may be a pathway through which coronary heart disease risk are shaped by social structure. Gebreab et al. (2017) and Hickson et al. (2011) also investigated the physical environment and its impact on type 2 diabetes in African Americans. Their results showed that attracting healthy food retail outlets or strengthening community ties might be important strategies to consider for prevention of Type 2 diabetes in African Americans.

Positive Influence of Zoning Policies

There was consensus among several studies that conceded to the second set of ideas, which identified the need for land use policies and interventions to improve health (Calling et al., 2016; Escaron, 2009; Mair et al., 2005). In a large-scale neighborhood study, Calling et al. found that an increased but small odd of coronary heat disease and stroke was associated with neighborhood availability of potentially unhealthy food. After investigating the use of zoning as a potential strategy to reduce rates of obesity, Mair et al. (2005), Escaron (2009), Black and Macinko (2008) found that environmental factors significantly impact a person's health. Black and Macinko's research revealed a positive association between individual-level demographics, such as lifestyle and SES factors, and obesity, but concluded that additional variances were explained by neighborhood

characteristics. The study stated that decreased availability of large supermarkets and fitness facilities were consistently associated with obesity and may serve as potentially modifiable loci for intervention, confirming that both neighborhood and individual-level factors influence body weight status.

In conjunction with Black and Macinko's 2008 findings, Escaron's work found that the highest need for built environment interventions that targeted obesity were in underserved communities (2009). Highlighted in the results were the need for regional and municipal policies on mixed land use to help to reduce obesity levels and increase health. Built environment, according to the CDC "includes all of the physical parts of where we live and work (e.g., homes, buildings, streets, open spaces, and infrastructure)" (CDC, 2019a, 2 section). The Environmental Protection Agency generally defines built environment as the man-made structures that provide people with recreational, working, and living spaces (United States Environmental Protection Agency [EPA], 2017). Boone-Heinonen et al. (2011), Reitzel et al. (2014) and Thornton et al. (2016) found that infrastructures that provided fast food were directly related to increased levels of fast-food consumption. In the former study, greater impact was seen in low-income respondents residing within 1-2.9km of a fast-food establishment. It is recognized by Boone-Heinonen et al. that greater supermarket availability was not related to an increase in fruit and vegetable intake, which provides some evidence for zoning restrictions on FFRs within 3km of low-income residents. However, they also suggested that in order to promote dietary behavior change, alternative or complimentary strategies may be needed.

To understand the role of individual and environmental influences on behavior, Vaughan et al. (2017) held interviews in two predominantly low-income African American neighborhoods in Pittsburgh, Pennsylvania. The household interviews collected self-reported sociodemographic characteristics, dietary intake, and food shopping behavior. They discovered that there was little variance with intake of sugar-sweetened beverages, added sugars, and discretionary fats in models with sociodemographic characteristics, reinforcing the need for interventions and policies at both the individual and environmental levels to improve health in food desert residents.

Insignificant Influence of Zoning Policies

An insignificant impact of the use of zoning policy interventions to address poor dietary habits were the results found in several studies (Sturm & Cohen, 2009; Sturm & Hattori, 2015; Zenk et al., 2017; Zhang et al., 2014). Sturm and Cohen reported that in 2008, a South Los Angeles area with about 700,000 residents, implemented a one-year fast-food ban, a regulation that prohibited the establishment of new stand-alone FFRs. While the effort was driven by the need to reduce rates of obesity, Sturm and Cohen found that the ordinance was inefficient and, like Zhang et al., proposed that counter advertisements and portion control were more likely to lead to positive dietary habits. A later study conducted by Sturm and Hattori in 2015 on the 2008 Los Angeles FFR ban also found no evidence that it resulted in improving the diet of residents or reduced obesity rates. This was also the result of a study conducted by Lydon et al. (2011), which stated that while it is a promising idea, placing fast-food establishment restrictions on an

already-established zoning process and limiting consumption of unhealthy foods within a given community, it is not ready for a widescale intervention.

Zenk et al. (2017) and Xu and Wang (2014) followed suit with the notion that zoning is ineffective at reducing obesity as it relates to diet. After examining whether proximity to food outlets was related to a change in the BMI of 1.7 million veterans in 382 metropolitan areas, Zenk et al found no evidence to support that geographic accessibility to FFRs, supermarkets, or mass merchandisers changed a person's BMI over time. They noted that "while policies that alter only geographic access to food outlets may promote equitable access to healthy food and improve nutrition, our findings suggest they will do little to combat obesity in adults" (Zenk et al., 2017, p. 1433).

At the county level, Xu and Wang (2014) examined similar variables as Zenk et al. (2017). Using regression models, the researchers found that the fast-food/full-service restaurants ratio is not a significant factor in reducing rates of obesity. While the contribution of the variables varied spatially, Xu and Wang found that in most counties, street connectivity, walk score, and poverty rate, played a role in obesity rates. However, the existing scientific evidence related to built environment, such as street connectivity, does not tell a clear story when discussing contributing factors to the obesity epidemic (Feng et al., 2010). For example, Peng and Kaza (2020) discovered that a greater degree of neighborhood street connectivity was associated with less frequent use of neighborhood FFRs and grocery stores, and individuals living in neighborhoods with more sit-down restaurants frequented sit-down restaurants more. They also cautioned using these types of interventions to increase access to healthy food.

Zoning is likely to be an area for future research into health equity promotion since current research has implications for zoning policies to reduce harm associated with areas with a high-density of establishments selling high-calorie fast-food, relative to healthier food options (Cooksey-Stowers et al., 2017). Cooksey-Stowers et al.'s (2017) quantitative study suggested that areas with high-density of fast-food establishments is a stronger predictor of obesity than the absence of grocery stores. They came to this conclusion by utilizing multivariate regression analysis to model county-level obesity rates as a function of the food swamp effect and the food desert effect while controlling for several neighborhood factors. Their study included census block population data as a variable as well as sociodemographic and food store variables.

Methods and Limitations

Cooksey-Stowers et al.'s (2017) study presented several limitations, the first pertaining to the instrumentation of county highway exits. After using Dunn information, they discovered that 1,672 counties did not have highway exits, an approach that did not provide information about counties where the food environments were not associated with the number of highway exits. The second limitation occurred because it did not study mechanisms linking food environments to obesity. Third, the study did not assess the influence of micro-level food environments, as it collected data at the county level. The fourth limitation references the cross-sectional design of the dataset which limited the ability to infer a causal relationship. Lastly, there were issues of validity with secondary data sources in addition to analyzing self-reported data.

Gebreab et al. (2017), Hickson et al. (2011), Chum and O'Campo (2015), Peng and Kaza (2020), and Xio and Graham (2018) also used a cross-sectional design with regression models to explore the relationship between built environment and chronic health conditions. Using JHS data, Gebreab et al.'s 2017 research revealed that after investigating associations of social, neighborhood and physical environments with Type 2 diabetes, there was a positive relationship with the number of unfavorable food stores and incidence of diabetes. The limitations of their study included generalizability, residual confounding, issues with using self-reported data, using data that was only collected at baseline, measurement errors from the presence and absence of commercial listings, and missing data. Their study findings suggested strengthening community ties and efforts to attract healthy food outlets as a possible prevention strategy.

Targeting healthy food outlets as a potential health promotion strategy was studied by Peng and Kaza (2020). They researched whether neighborhood supermarket and convenience store availability along with the broader built environment were associated with food purchasing behavior in a national population. Using observational data to perform a cross-sectional study of food purchases for U.S. households in 2010, they found that, although the magnitude was small, the broader built environment was associated with food purchase. Like the results of the study conducted by Cooksey-Stowers et al. (2017) Peng and Kaza's findings recommended that policy interventions focusing only on increasing the availability of neighborhood supermarkets will not likely promote fruit and vegetable consumption.

Important findings of the cross-sectional study conducted by Hickson et al. (2011) suggested a strong relationship between FFR availability, individual and neighborhood SES. However, their study was also limited in its ability to draw causal inferences as well as being able to generalize results. An additional limitation included the absence of food consumption measurement, which would have allowed direct examination of the relationship between consumption, diet, and fast-food availability. The use of regression models and selected variables of this study is closely aligned with my study. I also used participant data from the JHS and employed similar variables such as FFR availability, neighborhood measures and sociodemographic data to analyze associations of FFR availability with prevalence of heart disease, as opposed to weight and dietary intake.

These cross-sectional studies all shared an objective of investigating health disparities by assessing the influence of built environment on health (Cooksey-Stowers et al., 2017; Gebreab et al., 2017; Hickson et al., 2011; Peng & Kaza, 2020). They presented a limitation of inferring a causal relationship due to the inherent nature of the method of analysis and addressed the issue of generalizability when selecting a specific population. The use of a cross-sectional regression design for my study, as well as choosing the selected variables i.e., built environment, neighborhood and individual measures, is well supported by their use in other research (Sturm & Hattori, 2015; Thornton et al., 2016; Vaughan et al., 2017; Xu & Wang, 2014).

Other methods used in additional research that examined the relationship between built environment and health disparities included literature reviews, which were conducted by Ashe et al. (2003), Davis (2008), Black and Macinko (2008), and Feng et

al. (2010). Sturm and Cohen (2009) conducted an empirical evidence review while Vaughan et al. (2017) employed a qualitative approach using home interviews. Zhang et al. (2014) utilized an agent-based simulation model while Boone-Heinonen et al. (2011) and Zenk et al. (2017) took a longitudinal approach. Few studies were found to have been monographic (Lydon et al., 2011; Mair et al., 2005), a singular multiple case history approach (Nykiforuk et al., 2018), and a multilevel analysis conducted by Diez-Roux et al. (2017) was used.

Covariates

The covariates of this study, age, sex, and residential location, were selected based on the literature surrounding risk factors of CVD (Dhingra & Vasan, 2012; Malambo et al., 2016; O'Neil et al., 2018a; Rodgers et al., 2019). The literature showed that the risks associated with CVD increase with age in both men and women, with built environment also showing a positive relationship. Additionally, the selected covariates were present in the original and auxiliary research this study quasi-replicates (Gebreab et al., 2017; Hickson et al., 2011; *NHLBI,* 2008).

Age

According to Dhingra and Vasan (2012), age is a well-known traditional risk factor and fundamental predictor of CVD. The CDC also reports that heart disease, and associated conditions, can happen at any age and those 35–64 years of age are experiencing increased risk earlier in life due to high blood pressure and obesity (National Center for Chronic Disease Prevention and Health Promotion, n.d.). Rodgers et

al. (2019) explored the risk factors associated with CVD among the aging population and discussed a major causative factor being the physiological aging of the heart.

The 5,301 participants in the JHS study ranged in age from 21–84 when initially enrolled (NHLBI, 2008). However, participants aged 45–64 were a large portion of the initial characterizations of JHS participants, which according to Taylor et al. (2005) "is a range that may be expected to have a high incidence and prevalence of the JHS focus diseases" (pp. S6–13). Of the 5,236 both Hickson et al. (2011) and Gebreab et al. (2017) assessed the entire JHS population to analyze neighborhood social and physical environments and Type 2 diabetes. The age range selected for my study is supported by the CDC's reference that younger populations, 35–64, are experiencing an increased risk of CVD.

Sex

Reshaping how we define and measure gender and sex in survey research is currently underway (Lagos, 2018; Westbrook & Saperstein, 2015). However, in keeping with the variables used in the JHS (NHLBI, 2008), I have selected biological sex assigned at birth, categorized as male or female, as a control variable as it, along with gender, is increasingly being recognized in heart health literature as critical determinants of cardiovascular health (Havranek et al., 2015; O'Neil et al., 2018b; Ventura-Clapier et al., 2020). On a molecular level, Ventura-Clapier et al. (2020) noted that both sex and gender influence CVD, and the pathophysiology of the disease is mainly evident in the clinical outcome and effectiveness in women. Investigating sex and gender as social determinants of health, O'Neil et al. (2018b) concluded that sex and gender as social

determinants of CVD should be considered. In their review of associated risks of CVD with gender and aging Rodgers et al. (2019) postulated that sex is a potential risk factor for aging adults and that greater risk is seen in older women versus men of the same age.

In a recent study, Min et al. (2017) stated that the prevalence of hypertension among JHS participants aged 20 to 44 years was 4 times higher in women (27.2% versus 7.3%) and 3 times higher in men compared with the population estimates (35% versus 12.5%). Contrary to the findings that women revealed increased associations of CVD risks "CVD has long been seen as a condition primarily affecting men" (Peters et al., 2019, para. 3). Parallel to the work of Peters et al. (2019), it is suggested that in most age groups, age-specific rates of CVD are seen to be higher in men than women (Mozaffarian et al., 2015b). Furthermore, evidence suggests that not only is there a difference between the sexes, but CVD rates can also differ between racial groups within the same sex and age (Benjamin et al., 2018).

Residential Location

In trying to better understand the epidemiology of CVD, Xiao and Graham (2018) recognized a shift in variables from investigating individual level risk factors to exploring physical characteristics of a neighborhood. Malambo et al. (2016) aligned with this shift and confirmed a positive relationship between attributes of neighborhood environment, such as fast-food, and CVD risk and CVD outcomes. Using JHS data, Gebreab et al. (2017) employed survey-and GIS –based measures of neighborhood physical and social environments to analyze associations of neighborhood environment with Type 2 diabetes. They found that at baseline, Type 2 diabetes was most prevalent in women that were

likely to reside in neighborhoods with higher favorable food stores. They also found that in general, “persons with lower income and education were more likely to reside in a neighborhood with lower social cohesion, limited physical activity resources, but with higher violence, problems, and unfavorable food stores” (p. 8).

Chum and O’Campo’s 2015 study claimed to be the first to have investigated a wide range of urban planning related environmental factors. Combining multiple neighborhood influences, they used cross-sectional analysis to evaluate associations between residential exposures and CVD. They found that after adjusting for BMI and physical activity, reduced access to recreation/parks, food stores, and increased access to FFRs were associated with increased odds of CVD. Based on these results, and inferences of other works, residential location was selected as a covariate in this study.

Summary and Conclusion

The literature on whether fast-food zoning is a successful strategy to combat chronic conditions was convoluted. Much of the narrative tended to conclude that land-use policies are effective; however, complimentary interventions are needed to support zoning regulations (Cooksey-Stowers et al., 2017; Diez-Roux et al., 2017; Nykiforuk et al., 2018). A positive association between fast-food availability and occurrence of obesity was present in several studies. Vaughan et al. (2017), Boone-Heinonen et al. (2011), and Black and Macinko (2008) reported that environmental factors as well as individual lever characteristics, such as income, have a role in shaping dietary choices. Mair et al. (2005) and Escaron (2009) surmised that there is consensus that environmental factors alone are responsible for high caloric intake in individuals.

In multiple studies, Sturm et al. (2009; 2015) suggested that an ordinance to ban fast-food establishments is not the right application and there is no evidence to support a positive impact in reducing obesity. This postulation was supported by Zenk et al. (2017) who's longitudinal study of 1.7 million veterans in 382 metropolitan areas found no evidence that either relative or absolute geographic accessibility of FFRs, supermarkets, or mass merchandisers were associated with changes in an individual's BMI over time. In addition, Lydon et al. (2011) contended that, while promising, placing restrictions on an already established zoning process to limit consumption of fast-food is not a method that is ready for large-scale application.

No significant ratio was found between the fast-food/full-service restaurants and walkability (Reitzel et al., 2014), and Feng et al. (2010), who's systematic search of the epidemiologic literature on built environment and obesity, summarized that existing scientific evidence does not tell a clear story. Several reviews showed that local zoning policies such as zoning laws warrant consideration; however, further research is required to determine the viability of this strategy to promote health (Ashe et al., 2003; Gebreab et al., 2017; Nykiforuk et al., 2018). This was the third differentiated concept found in the literature, fast-food zoning ordinances may work but more research is needed.

Investigations that fell into this category were identified by language that was expressed as *could alter*, *warrant consideration*, and *may*. Diez-Roux et al. (2017) used a multivariate analysis to assess whether neighborhood socioeconomic characteristics were associated with CVD prevalence and risk factors, whether there was a variance of the effects of individual-level indicators across neighborhoods, and whether these

associations continued after adjusting for individual-level social class indicators. They, like Chum and O'Campo (2015), found that neighborhood environments may be one of the pathways through which risk of heart disease is shaped by social structure. Chum and Campo expanded on this, noting that living in neighborhoods burdened with FFRs and crime, with inadequate access to food stores may significantly increase the risk of CVD.

Cooksey-Stowers et al. (2017) and Nykiforuk et al. (2018) agreed that enacting zoning ordinances warrants conversation as it may play a role in promoting healthier food environments. These findings upheld the study results offered by Hickson et al. (2011) which maintained that FFR "availability may contribute to greater energy intake in younger African Americans who are also more likely to consume fast-food" (p. S307). These results were also predictable according to the literature review conducted by Black and Macinko (2008). The review contended that a change in the built environment, assisted by zoning ordinances, could result in more active, healthier lifestyles and alter the landscape in our communities.

A review of the literature revealed that there is sufficient research pertaining to the association between fast-food availability, built environment, and obesity. And, while obesity is a risk factor of heart disease, it is but one contributing factor (CDC, 2019b). Research has annotated the need for intervention, though the path appears to be broader than the dichotomous variables. This presented an opportunity to evaluate the association between fast-food zoning policies and the prevalence of heart disease, particularly amongst African American adults who are most at risk of dying from heart disease (American Heart Association, n.d.). Chapter 3 presents my study methodology.

Chapter 3: Research Method

The focus of this study was on examining FFR zoning policies and prevalence of CVD in three African American communities that participated in the JHS in Jackson, Mississippi. Current research indicates that CVD is the leading cause of death for African Americans and their susceptibility of getting the disease is compounded by contributing conditions such as high blood pressure, diabetes, and obesity, which are commonly associated with diet (CDC, 2017b). To identify relationships between CVD and fast-food zoning policies, a well-designed quantitative study using regression analysis was best suited to test the hypotheses (Gordon, 2015; Schroeder et al., 2017).

Each of the tri-state counties included in the JHS—Hinds, Madison, Rankin—shared a common description of zoning policies, regulations, restrictions or ordinances, defining them as governance over the use of all land (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020). The ordinances also had comparable purposes in promoting and preserving public health, morals, safety, and the general welfare of the inhabitants through built environment and population size. For this study, zoning policy served as the umbrella term encompassing these shared descriptions.

This chapter includes a detailed description of the research design and rationale as well as the methodology used to carry out the study. An explanation and operationalization of the research variables follow, along with addressing threats to the validity and ethical considerations of the study. Ensuring that the quantitative technique is adequate offers a comprehensive and replicable approach to the issue and research

process at hand (Johnston, 2017; Patten & Newhart, 2017). The implemented methodology quantitatively assessed secondary data, forming the description of data collection and analysis as two important sections of this chapter.

Research Design and Rationale

For the purpose of this research, there was one dependent variable (prevalence of CVD) and two independent variables (number of FFRs, which served as a proxy for FFR zoning, and SES). At the onset of the study, there were two moderating variables: built environment and SES. Based on the data I received, I decided to use one moderator, SES, and three control variables: age, participant sex, and residential location which was identified by population density. Moderator variables (*Z*), according to Aguinis (2004), are variables between the dependent variable (*X*) and independent variable (Y) that provide a more descriptive account of how *X* and *Y* are manipulated or changed. Additionally, the independent variable acted as a covariate along with age and sex.

To test the hypothesis, I used a quantitative design to analyze secondary data. According to research, quantitative designs are generally deductive and help the researcher make inferences about relationships among variables yielding results that may be generalized to a broader population (Creswell & Creswell, 2017; Leavy, 2017). Leavy (2017) also noted that quantitative research questions are directional in nature using words like correlate and cause. They generally include phrases that ask the relationship between *X* and *Y* in a target population (Claydon, 2015; Yates & Leggett, 2016). Quantitative studies typically concern numerical data that can also be generalized to a population (Leppink et al., 2016; Queiros et al., 2017) and helps in understanding

variations in policy and their cause (Breunig & Ahlquist, 2014). A quantitative approach permitted the analysis of the association between FFR zoning policies and prevalence of CVD among African Americans.

Often when conducting quantitative research, a lack of financial resources is common due to the large sample size needed to conduct the study and collect primary data (Choy, 2014; Creswell & Creswell, 2017). Choy noted that data quality and complexity of data affect the time needed for collection and analysis; however, technological advances have shortened the time required to process quantitative data. In my study, I analyzed secondary data from the JHS research, including the works of Hickson et al. (2011), who examined the associations of FFR availability with dietary intake and weight among African Americans in the JHS, and ancillary study data from Gebreab et al. (2017). An advantage of analyzing secondary data in quantitative research is its low cost (Cheng & Phillips, 2014). Further, a cross-sectional design, which was employed in my study, often involves analysis of secondary data, making data collection time minimal (Johnston, 2017).

According to research, investigators using cross-sectional methods to examine the outcome and exposures in research participants may also study their relationship (Kogevinas & Chatzi, 2012; Setia, 2016). Kesmodel (2018) and Hemed (2018) noted that a cross-sectional design is most applicable when analyzing the presence of disease in a population at a given point in time and when its data is used for analytical purposes of associations between exposure and outcome. This supports the quantitative design choice

of my study that was used to analyze the association between prevalence of heart disease and FFR zoning policies.

Methodology

Population

As previously stated, my research focused on observing the relationship between FFR zoning policies and prevalence of CVD in African Americans using baseline data from the JHS. JHS is a community-based observational study whose 3,728 participants were enrolled in the 1985 ARIC (JHS, 2020a). ARIC is a nationwide study that investigates the causes and origin of atherosclerosis and its natural progression by race, sex, age, and location. Jackson, Mississippi, was one of four locations chosen for the ARIC study (Collaborative Studies Coordinating Center, n.d.). In addition to ARIC participants, 1,574 participants were recruited from Hinds, Rankin, and Madison counties known as the metropolitan area of Jackson, Mississippi to participate in the JHS study.

Sampling and Sampling Procedures

Using G*Power's ANOVA test (Version 3.1.9.7), a statistical analysis tool, I determined that the minimum records needed for the hypothesis testing in the current study was 179 for a statistical power of .80 at an alpha level of $p = .05$. However, all JHS records that fell within the sampling frame ($n = 3744$) were used, which was greater than the recommended minimum for non-experimental multiple linear regression studies (Bujang et al., 2017). The parameters used to derive the sample population were a probability error of .05, which is consistent with research (Gebreab et al., 2017; Hickson et al., 2011; Wang et al., 2016), a power of .80, which is typical in research efforts in

cardiology (Moyé, 2016), and a conventional effect of .25 to show a moderate effect (Cohen, 2013; Rovai et al., 2013). The required effect size for this study was .25. Irvin and Kaplan (2016) conducted an effect sizes and primary outcomes cardiovascular related study analyzing trials funded by the NIH from 1980 to 2012. They reported that about half of the funded studies produced a small effect size, Cohen's *d* between 0.2 and 0.5, while roughly a quarter reported a medium effect size, Cohen's *d* larger than 0.5, and approximately one fifth reported larger than 0.8.

To derive the numerator *df*, ZIP codes were divided into four levels (i.e., north, south, east, and west) providing a numerator *df* of 3 when using the equation $N - 1$, where N = number of levels (Glantz & Slinker, 2016). The number of groups represented the different zoning areas that exist in all three counties, residential, commercial, and special use, and the number of covariates, previously mentioned, is four. The participant age group for my study was selected based on CDC's age filter on their interactive atlas of heart disease and stroke data (CDC, n.d.) and the JHS study, whose participants were placed into one of three age groups: 21–44, 35–64, and 65–84 (JHS, 2020a). CDC research showed that African Americans 35–64 years of age are likely to have higher blood pressure than European Americans by 50% and are two times as likely to die from heart disease between the ages of 18–49 (CDC, 2020). From a policy standpoint, those 45 and older are more likely to have experienced CVD risk factors (Bernstein & Munoz, 2019).

This type of participant selection of records was reflective of purposive sampling. Purposive sampling, according to Etikan et al. (2016, 2.2 section), "is the deliberate

choice of a participant due to the qualities the participant possesses". This non-random technique of homogenous sampling supported the principal and sub questions of this study and its examination of the variables by focusing on the specific characteristics that were shared amongst participants. Etikan et al. noted that this type of sampling does not need underlying theories and allows the researcher to decide what information is needed and set out how to go about collecting that information.

At the onset of my investigation, of the JHS participants aged 35–64, men totaled $n = 963$ and women totaled $n = 1786$, creating a total sample size of $N = 2{,}749$ at base line (NHLBI, 2008), which formed the initial sample size of records for my study. While the JHS study included participants aged 21–84, those who did not fall within the 35–64 age range were excluded from my research. That amounted to 2,580 participant records being excluded without considering baseline JHS data with no responses and participants that were deceased. Marital status, education, employment status, income level, incidence of heart attack, angina pectoris, coronary revascularization, coronary heart disease, stroke, CVD, peripheral arterial disease, and hypertension were factors measured for during the JHS study which I planned to include as conditions associated with heart disease. Additionally, diet, Type II diabetes, BMI, obesity, cholesterol levels, chronic kidney disease, and smoking status were proposed for measurement.

Multiple Linear Regression Analysis

The JHS is a population-based longitudinal study designed to investigate the epidemiology and etiology of CVD among African Americans living in the tri-county metropolitan area of central Mississippi (Hinds County, Rankin County, Madison

County; Hickson et al., 2011; JHS, 2020). At the study's baseline, this area of Mississippi was the most populated area with an estimated 2,361 square miles of land area according to the U.S. Census (2021). The 2000 U.S. Census reported the total tri-county population was 440,801 with nearly 46% of the population self-identifying as African American. A sum of 5,236 (98.8%) JHS participants were successfully geocoded (Hickson et al., 2011) and have been shown to be geographically representative of the African American population in the tri county area (Gebreab et al., 2011).

Recruitment, Participation, and Data Collection

The JHS study sample was drawn from several different sources and initially targeted adults aged 35–84 years (Fuqua et al., 2005). The first source was participants from the Jackson Field Center of the ARIC Study. The second source was a community sample recruited using random sampling and volunteers. The final study sample consisted of men and women living in the tri-county area, Hinds, Madison, and Rankin Counties, of the Jackson MSA. A total of 5236, or 98.8%, of JHS participants were successfully geocoded (Robinson et al., 2009) and have generally been shown to be geographically representative of the underlying African American population in the Jackson MSA (Hickson et al., 2011).

For my research, JHS participant records between the age of 35–64 were analyzed for prevalence of CVD by evaluating raw exam data from JHS code books and analysis datasets. Data requests were submitted and approved by the JHS publication committee via online submissions. To gain access to data, a letter from my committee chair was required, outlining my research (see Appendix A). Additionally, a form marked with the

variables needed was required before data access was granted. All JHS requests are tracked allowing researchers to obtain customized data sets.

Instrumentation and Operationalization of Constructs

In order to identify health disparities between this population group, I collected secondary data from the JHS, and government websites. Concerning reliability, I had no control over how data were originally collected (Gordon, 2015). However, a preliminary analysis of the quality of the dataset was carefully assessed to ensure that it was sufficiently populated with socioeconomic data, demographic data, health status, residential location, and cleanliness (Liu et al., 2018). I also ensured that reliable survey items were employed (Carithers et al., 2005; Dubbert et al., 2005; Fuqua et al., 2005), and the dataset operationalized the variables in a way that was appropriate and valid for what I measured.

Dependent Variable: CVD

I used the JHS criteria to define the dependent variable of interest, CVD. JHS defines CVD as all diseases of the heart, stroke, abnormal arrhythmia, and heart failure or self-reported occurrence of a stroke, myocardial infraction (i.e. heart attack), coronary revascularization (i.e. restorative vascular surgery), or angina (i.e. chest pain; NHLBI, 2008) in an individual. The attributes of CVD, stroke, abnormal arrhythmia, heart failure, heart attack, etc. were measured on a continuous scale level, tallying the number of attributes an individual had from 0 to *x*.

Independent Variables

Fast-Food Zoning. A review of zoning definitions among the three counties included in this study revealed a common definition. Fast-food zoning is the permitted use of land for a commercial structure whose principal business is the sale of pre-prepared or rapidly prepared food and beverages for consumption either within the restaurant or for carry-out, and where customers are not served food and beverages by a waiter or waitress at the same table or counter where items are consumed and/or the establishment includes a drive-through service facility or offers curb service (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020). Zoning was to be measured on a continuous scale level, accounting for the number of zoned areas within a census block group which permitted fast food structures.

Fast-Food Availability. Fast-food availability was defined as the number of FFRs contained within a ZIP code of each participant's residential location. In replicating the statistical methods of Hickson et al. (2011), FFR availability was categorized into three groups and measured ordinally with the lowest 25% (< 25th percentile) = *low availability*; next 50% (25th–75th percentile) = *moderate availability*; top 25% (> 75th percentile) = *high availability*, per ZIP codes net residential density.

Residential Density. Net residential density was a scale level measurement defined as the number of persons per residential acre within the household's census block group (Frank et al., 2004). Essentially, it is calculated by the number of households divided by the land area within residential use (Brownson et al., 2009). The U.S. Census

provides datasets for city and town population totals and land use data for the baseline study year.

Built Environment. The CDC defines built environment as all the physical parts of where we live and work which influences a person's physical activity (CDC, 2019a). This includes infrastructure, streets, homes, buildings, and open spaces. Built environment was measured on a scale level using the GIS methods of Gebreab et al. (2017), by which they investigated the association of neighborhood and physical environments with incidence of Type 2 diabetes among JHS participants. The assessed variable included land-use mix, defined as degree to which mixed-land activities are easy to reach by residents (Brownson et al., 2009), specifically intensity. GIS-based densities of food stores and physical activity resources were derived from JHS researchers who accessed commercially available business listings through the National Establishment Time-Series (NETS) database developed by Walls and Associate, which were linked to JHS geocoded addresses. From this, the number of FFRs was calculated in each ZIP code, and its proportion to other land uses yielding a percentage.

SES. According to the American Psychological Association (n.d.) SES is conceptualized as "the social standing or class of an individual or group. It is often measured by a combination of factors that influence a person's income, education, and occupation in relation to others (Baker, 2014; Noel, 2018). In replicating the methods of Hickson et al. (2011), I used JHS summary index of education, income, and occupation. The income construct was measured ordinally in dollars with groups that ranged from < 25,000, 25,000–49,999, ≥ 50,000, and unknown for refuse or do not know. Income

categories were represented by the values 1, 2, 3, and 4 respectively. Education was measured using ordinal scales, coded as level of education attained (*less than high school* = 0, *high school or GED* = 1, *attended trade school, vocational school or college* = 2). The construct of occupation was nominally measured as status (*management/professional* = 1, *service* =2, *sales* = 3, *farming* =4, *construction* = 5, *production* = 6, *military* = 7, *sick* = 8, *unemployed* = 9, *homemaker* = 10, and *retired* = 11).

Control Variables

Age. JHS study participants needed to meet attained age criteria at date of recruitment (Fuqua et al., 2005). For this study, age is operationalized as 35–64 age attained at time of data collection and measured on a scale level.

Sex. Study participants identifying as male or female. This variable was a nominal level measurement with male and female as assigned attributes with values of 1 and 2 respectively (see Appendix B).

Table 1

Summary of Variable Measurement Levels

Variable	Measurement
DV- CVD	Continuous
IV- Fast-food zoning	Continuous
IV- Fast-food availability	Ordinal
IV- SES	
Income	Ordinal
Education	Ordinal
Occupation	Nominal
IV- Built environment	Continuous
IV- Residential density	Continuous
CV- Age	Continuous
CV- Participant sex	Nominal

Note. DV = dependent variable; CVD = cardiovascular disease; IV = independent variable; CV = control variable.

Data Analysis Plan

RQ1: Will variations in local fast-food zoning policies predict a statistically significant percent change in R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location?

$H_0$1: There is no statistically significant contribution of variations in local fast-food zoning policies to the percent R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location.

$H_1$1: There is a statistically significant contribution of variations in local fast-food zoning policies to the percent R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location.

RQ2: Is there a difference in incidence rate of CVD across three zoning areas when controlling for number of FFRs?

$H_0$2: There is no difference in incidence of CVD across three zoning areas when controlling for number of FFRs.

$H_1$2: There is a difference in incidence of CVD across three zoning areas when controlling for number of FFRs.

To investigate the research question, a multiple linear regression analysis was conducted to assess the relationship between prevalence of CVD and fast-food availability. Multiple linear regression analysis is a method that estimates the effects of several variables concurrently (Schroeder et al., 2017). Using the equation $y = mx + b$, more formally written as $y = a + bx + \in$, estimates are made to observe the change in y when x changes (Silvestrini & Burke, 2018). The dependent variable Y is represented as prevalence of heart disease, and x, the independent and moderating variables, fast-food availability, and SES. $\in$ accounts for error, a for intercept and b for slope. Using linear regression analysis also allowed me to hold independent variables constant while isolating the effect of one variable on the dependent variable, according to Schroeder et al. (2017). Given that there were multiple independent variables, and the hypotheses sought to assess the relationship between the variables, multiple regression analysis was the appropriate statistical measurement.

The coefficient of multiple correlation, R, measures the degree to which variation in the dependent variable is associated with variations in several independent variables taken simultaneously (Arrenberg, 2020). Cohen's standard was used to evaluate the correlation coefficient with association between variables and was represented as 0.2, 0.5, and 0.8, weak, moderate, or strong, respectively. Version 27 of SPSS statistics provided

eight assumptions required to be met when analyzing data using regression models. To start, the dependent variable should be either a ratio or interval; there needs to be two or more independent variables; independence of observations should exist; a linear relationship, homoscedasticity, and multicollinearity should be present; no significant outliers should exist; and finally, errors should be normally distributed. Assumptions can be checked using SPSS, with #1 and #2 being checked first. If any assumptions are violated, Laerd statistics (2018) noted that there are a number of solutions in SPSS such as transforming data and ignoring outliers or running alternative statistical tests.

Statistics play a key role in achieving valid research results in terms of measurement, causal validity, and generalizability (Stockemer, 2018). After statistical data are entered, they must be checked carefully for errors, a process called data cleaning (Bachman & Schutt, 2018). Using frequency tables for data cleaning I was able to identify any values entered in error (Meyers et al., 2013). For example, if a variable was assigned a value between 1 and 7, a value of 8 would render an error in the analysis program. After the anticipated data ranges were specified, as in the previous example, the standard necessary variables and primary outcome variables were outlined. At this point I determined if any variables needed reviewing. The cleaning stage included checking for continuous and categorical variables outside of expected range, missing values, duplicates, and for proper calculations of calculated variables.

SPSS can also be used for addressing any anomalies found in the data (Weinberg & Abramowitz, 2016). By using a series of SPSS procedures, raw data can be transformed into usable and informative datasets. During the screening stage, I saved

spreadsheets in a separate folder named data cleaning. The spreadsheets contained column headers such as variable, variable modifications, and completion dates. This folder contained consistent identifying variables that were documented onto the screening log.

To analyze continuous variables in the study such as age in H_1, descriptive statistics were calculated using SPSS. Confounders, or covariates, which are measured variables that influence treatment and are predictive of the outcome, are often shown as a common cause pathway between treatment and outcome in studies (Sauer et al., 2013). In prior research, SES correlated with food resource availability which made it an appropriate variable to include in this study when looking at it with a zoning policy lens (Costa et al., 2019; National Research Council, 2009; Pechey & Monsivais, 2016). Drewnowski et al. (2016) noted that built environment is said to influence local obesity rates, a common contributor to heart disease, and built environment and obesity are likely to involve food consumption. As previously mentioned, the age variable was selected based on research stating the most affected age group. Selecting the sex demographic as a covariate was in alignment with the original study and supplemental studies that investigated diet and heart disease.

In keeping with statistical analysis methods conducted by Gebreab et al. (2017) and Hixon et al. (2011), descriptive statistics (mean ± SD and percentage) were used to compare the distribution of individual-level characteristics in participants with and without CVD. I examined distributions of selected covariates across categories of FFR availability and estimate *p* values for trends across ordered categories by the inclusion of

FFR availability categories as an ordinal variable in the model. To compare associations for neighborhood characteristics that had different zoning units, I planned to estimate calculations corresponding to differences between the 90th and 10th percentiles of the net residential density. The models created by Hickson et al. and Gebreab et al. utilize a 95% confidence interval.

Threats to Validity

Nonexperimental studies that compare the effectiveness of treatments are often strongly affected by confounding and is the central threat to external validity (Sauer et al., 2013). This can be addressed by adjusting for all known potential confounders; however, it is still possible that results could be affected by residual confounding and unmeasured time-varying factors (Handy et al., 2016). Because my research studied the African American population in a single site of Jackson, Mississippi, results might not be generalizable to other geographic areas (Hickson et al., 2011). By applying probability theory, predictions about the larger population exposed to similar variables can be made (Garcia-Alexander et al., 2017). The original study by Hickson et al. in 2011 included self-reported data, such as age, SES status and medical history, which may have introduced measurement error. However, by validating the original data this increased internal validity (Taylor, 2005).

According to Messick (1995), construct validity can be conceptualized as an integration of "content, criteria, and consequences into a construct framework for the empirical testing of rational hypotheses about score meaning and theoretically relevant relationships, including those of an applied and a scientific nature" (p. 741). A goal of the

JHS is to educate the community and study population on healthy lifestyles to reduce disease risk burden (JHS, 2020a). The result of this interaction of treatments on the proposed study could pose a potential threat to construct validity.

Ethical Procedures

To gain access to the JHS study data, an account must first be created. Following the creation of the account, a JHS data request form must be submitted (See Appendix A). The request form made inquiries about the JHS variables and archetypes needed. In addition, a manuscript proposal, which outlined study relevance to the African American population, needed to be submitted. I did not collect any identifying information therefore, posing no potential harm to individual subjects (Tripathy, 2013). Data was anonymous as the study is only analyzing geographic location and prevalence of heart disease within specified ZIP codes. Additionally, Walden University Institutional Review Board (IRB; 06-14-21-0532331) review of this study also helped to ensure ethical behavior.

Summary

In summary, the purpose of my research was to quantitatively investigate CVD health disparities affecting African Americans by using a cross-sectional design and linear regression models to analyze the relationship between FFR zoning and the prevalence of CVD. The JHS research provided a robust dataset of variables regarding sociocultural, physical activity measures, and an array of other variables collected from a cohort of 5,302 African American participants in the Jackson, Mississippi area. Utilizing

secondary baseline JHS data and SPSS software, specific variables from JHS participants aged 35–64 was analyzed. In Chapter 4, the results of the JHS data collected is discussed.

Chapter 4: Results

The purpose of this quantitative, multiple linear regression study was to examine the relationship between FFR zoning policies, by proxy of FFR availability (independent variable), and prevalence of CVD (dependent variable) in African American communities of Jackson, Mississippi. This chapter restates the research questions and hypotheses and includes data collection, characteristics of the population, data analysis results, and summary of the findings.

Research Questions and Hypothesis

The following research questions directed this study:

- Will variations in local fast-food zoning policies predict a statistically significant percent change in R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location?
- Is there a difference in prevalence rate of CVD across three zoning areas when controlling for number of FFRs?

The corresponding hypotheses were as follows:

- $H_0$1. Local fast food zoning policies are not a statistically significant contribution of variations to the percent R^2 variance in CVD rates of African Americans more than socioeconomic status and built environment when controlling for age, sex, and residential location.
- $H_1$1. Local fast-food zoning policies are a statistically significant contribution to the variations into the percent R^2 variance in CVD rates of African

Americans more than socioeconomic status and built environment when controlling for age, sex, and residential location.

- $H_0$2: When controlling for number of FFRs there is no difference in prevalence of CVD amongst individuals across three zoning areas.
- $H_1$2: When controlling for the density of FFRs there is a difference in prevalence of CVD amongst individuals across three zoning areas.

Data Collection

Methods, response rates, and sample description of African American recruitment for the JHS can be found elsewhere (Fuqua et al., 2005). To summarize the methods reported, the JHS study sample was drawn from several different sources and initially targeted adults aged 35–84 years (Fuqua et al., 2005). The first source was participants from the Jackson Field Center of the ARIC Study. The second was a community sample recruited using random sampling and volunteers. The final study sample consisted of 5,302 residents of the tri-county Jackson, Mississippi: Hinds, Madison, and Rankin Counties. A total of 5,236 (98.8%) of JHS participants were successfully geocoded (Robinson et al., 2009) and have generally been shown to be geographically representative of the underlying African American population in the Jackson MSA (Hickson et al., 2011).

The baseline data for my research was retrieved from the JHS, where I had to first create an online account on their research portal. Following the creation of the account, I submitted a JHS data request form (see Appendix A), where I selected the JHS variables and archetypes needed. In addition, I was required to submit a manuscript proposal,

outlining study relevance to the African American population. After approval of my manuscript proposal, I received baseline data that JHS investigators collected from September of 2000 to March of 2004. Initially, my plan was to analyze data from the more recent exams, Exams 3 and 4, which were conducted between 2009–2013 and 2020–2022, respectively. However, after consulting with the JHS social determinants of health work group and considering intervention outcomes of the JHS study, I chose to focus on baseline data, also known as Exam 1, for analyses. By doing so, the requested variable dates changed to only focus on Exam 1. An additional discrepancy existed in the number of participant records available for study. At the outset of my research, the number of participant records was estimated at $n = 2{,}749$. The number of identified participant records selected as the sample was $n = 3{,}744$, exceeding the minimum sample size. These 3,744 records were retained for statistical analyses.

Another discrepancy in data collection occurred when the environmental data sheet was received. As a security layer, participant records were found to contain mock census tract IDs to support participant anonymity. Given this JHS coding convention, I was unable to gain access to participant ZIP codes as an external researcher of the JHS agency. The absence of ZIP code data and real census tract IDs prohibited the analysis to include built environment and zoning in my proposed RQ1 and RQ2 in its entirety; therefore, this independent variable was dropped from data analyses. It is worth noting that a large percentage of the study area (67%) contained 213 of the 317 block groups that were classified urban, with the rest roughly equally classified as mixed urban ($n = 29$, 9.1%), rural ($n = 40$, 12.6%), and mixed rural ($n = 35$, 11%; Robinson et al., 2010). Over

4,000 (n = 4,033, 77.0%) of JHS participants resided in urban block groups and roughly 500 participants resided in rural block groups (n = 504). Mixed rural blocks contained n = 446 JHS participants, and n = 254 in block groups classified as mixed urban.

Other data that I expected to receive were marital status, diet, and chronic kidney disease variables. However, these variables were not received and were thus excluded from statistical analyses. Collected demographic information included age, gender, educational attainment, occupation, income level, and geographic area. All JHS participants self-identified as African American and resided in Jackson, Mississippi. The remainder of this chapter includes a discussion regarding univariate and multivariate analysis, descriptive statistics, assumptions testing, and finishes with regression analysis.

Descriptive Statistics

A summary of the sample's descriptive characteristics is shown in Table 2. Most subjects were female (63.1%), and the sample population had a mean age of 51. Nearly 70% of subjects attended vocational or trade school or college, and 38.5% worked in management or as a professional. The median household income was between $25,000 and $49,000 and, while not listed in the table and not included in multivariate analysis, mock census tract 66 was the most populated with roughly 10% of participants residing in that area. FFR availability was based on the summed density of fast-food stores, convenience stores, and other "unfavorable" food stores to create a summary measure of density (Gebreab et. al, 2017). Within the 0.5-mile kernel, roughly half of the participants had a low density of unfavorable food stores, whereas at the 3-mile kernel, roughly half

of the sample had a moderate density. The 1-mile kernel showed an almost equal density of low and moderate at 40.5% and 39.7%, respectively.

Table 2

Selected Descriptive Characteristics of Sample Population at Baseline

Baseline characteristics	*N*	Mean (*SD*)	Valid percent
Gender			
Female	2361		63.1
Male	1383		36.9
Total	3744		100.0
Age			
Female	2361	51.3(8.4)	
Male	1383	50.5(8.4)	
Median Household Income			
< $25,000	889		23.7
$25,000–$49,999	2186		58.4
≥ $50,000	666		17.8
Unknown	3		.1
Educational Attainment			
Less than high school	413		11.0
High school or GED	736		19.7
Vocational/trade/college	2583		69.2
Missing	12		.3
Occupation			
Management/Professional	1440		38.5
Service	811		21.7
Sales	703		18.8
Farming	5		.1
Construction	218		5.8
Production	536		14.3
Military	7		.2
Sick	7		.2
Unemployed	11		.3
Homemaker	-		-
Retired	1		.0
Student	1		.0
FFR density by participant			
0.5-mile buffer			
Low density	2186		51.4
Moderate density	1036		27.7
High density	518		13.9
1-mile buffer			
Low density	1515		40.5
Moderate density	1484		39.7
High density	741		19.8
3-mile buffer			
Low density	1097		29.3
Moderate density	1762		49.1
High density	881		23.6

A purposive sample was drawn from the JHS dataset. Purposive sampling, according to Etikan et al. (2016), "is the deliberate choice of a participant due to the qualities the participant possesses" (Section 2.2). I identified 3,777 subject records where participants were aged 35–64 at Exam 1, which exceeded the G*Power 3.1 calculated 179 minimum records needed for linear regression with an established statistical power of .80 and alpha of $p = .05$. In post hoc analysis using G*Power 3.1, the achieved power was 1.0 with the parameters of effect size equaling 0.15 medium, an alpha $p = .05$, $N = 3{,}744$, and 26 predictors. Thus, there was sufficient power to support analysis results and data interpretations. JHS participants were successfully geocoded and have generally been shown to be geographically representative of the underlying African American population in the Jackson MSA (Hickson et al., 2011). By applying probability theory, predictions about the larger population exposed to similar variables can be made (Garcia-Alexander et al., 2017). Seven of the baseline characteristics were included for analyses: age, sex, population density, educational attainment, median household income, occupation, and unfavorable food store availability within 0.5, 1.0, and 3.0-mile kernels.

Statistical Assumptions

When testing for normality of the scale level control variables of age and population density, the literature stated that the criterion for skewness and kurtosis *z*-scores should be increased from +/-1.96 to +/-2.58 or +/-3.29 (Ghasemi & Zahediasl, 2012; Kim, 2013). Field (2018) and Orcan (2020) advised that significance tests of normality should not be used in large samples because, as the sample size increases, so do the discrepancies in skewness and kurtosis values. There is consensus amongst these

authors that a visual representation of the data by plots or histograms is acceptable. See Figures 1 and 2 where normality of distribution is observed. What follows is a summary of the bivariate and point biserial correlations matrices, which is essential for assumptions testing when analyzing continuous and dichotomous variables in multiple regression.

Figure 1

Normality Distribution of Age

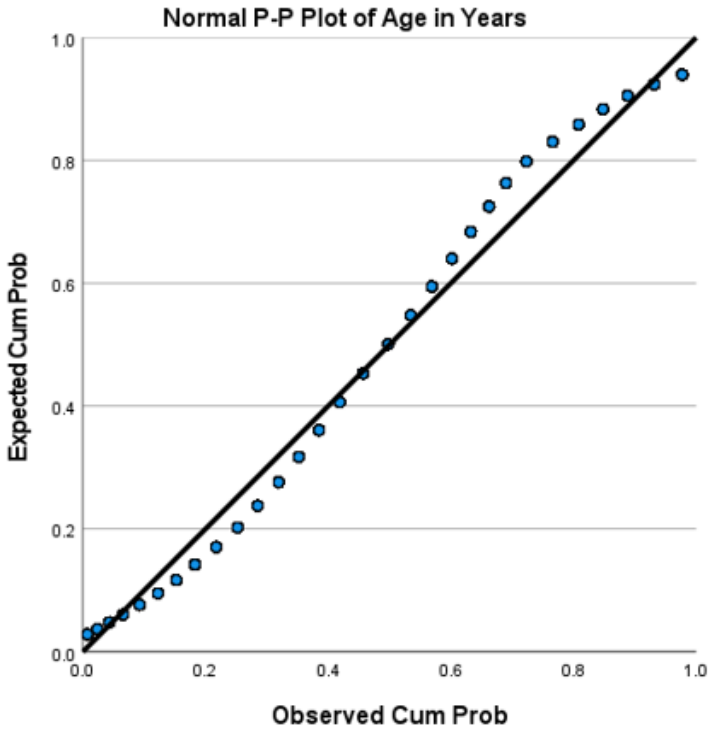
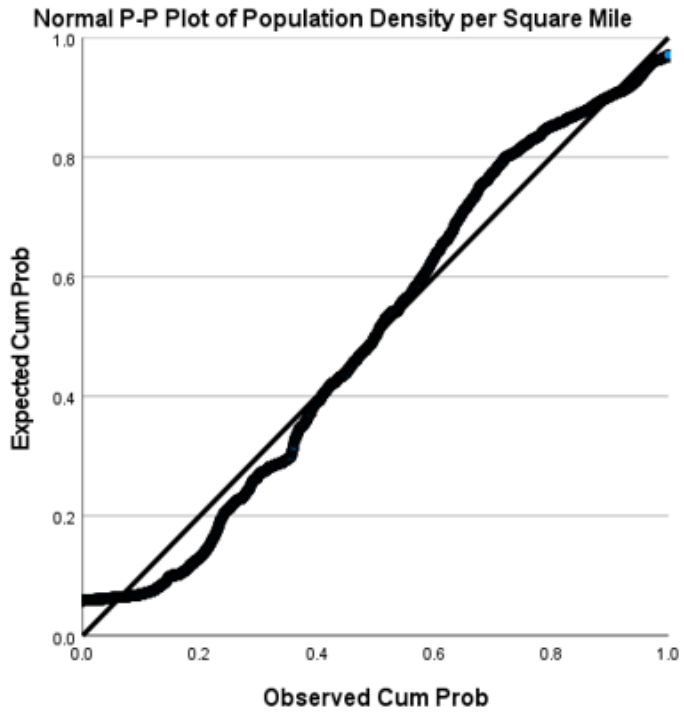


Figure 2

Normality Distribution of Population Density



To understand the strength and direction between prevalence of CVD, age, and population density, I performed a Pearson's correlation coefficient analysis using IBM SPSS (Version 27). All five assumptions of the Pearson's correlation test were met. The continuous variables were paired, and a linearity was established with no significant outliers as seen in Figures 3 and 4. Due to the number of participant records being analyzed in my study (see Table 2), the Shapiro-Wilk test, which is better suited for sample sizes from 20 to 50 (Alva & Estrada, 2009; Laerd Statistics, 2013; Shapiro & Wilk, 1965), was not an appropriate indicator of normality. Instead, I used the Kolmogorov-Smirnov test, $p < .001$, along with Normal Q-Q plots (see Figures 5 and 6) to assess normality of distribution.

Figure 3

Distribution of Normality for Females

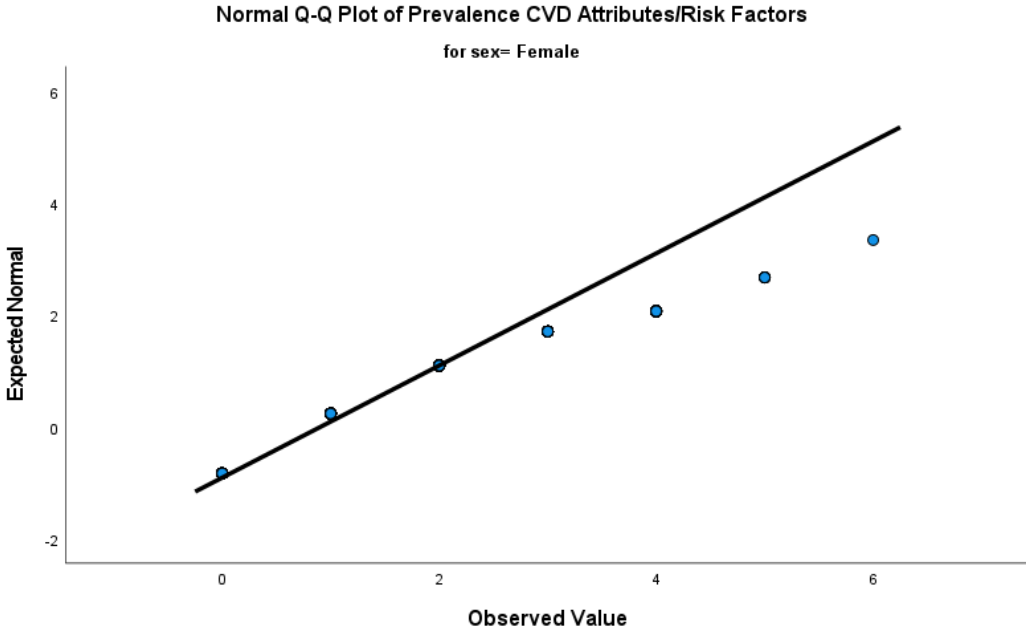
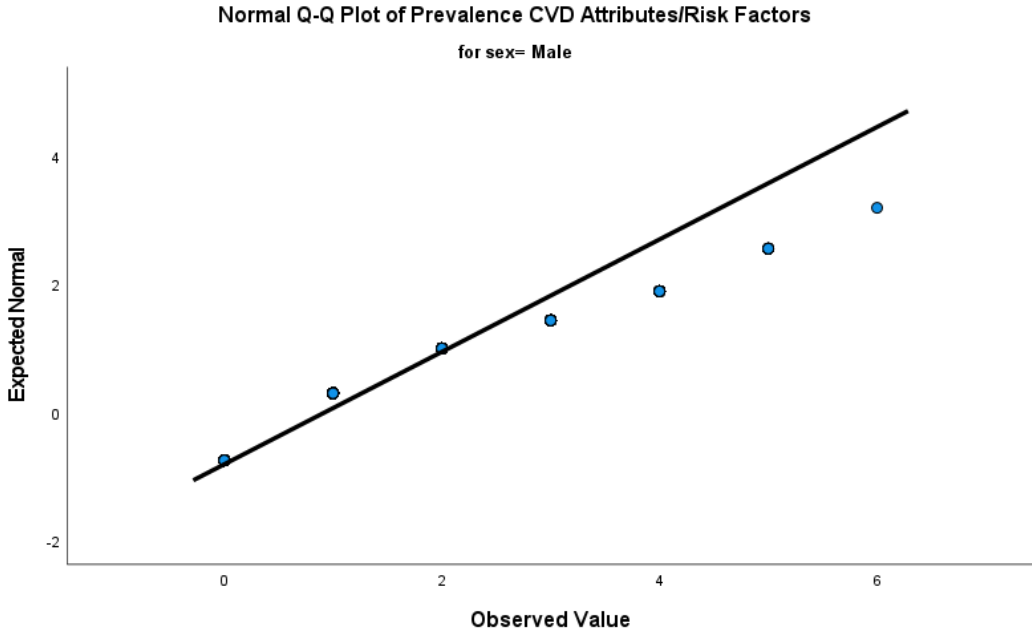


Figure 4

Distribution of Normality for Males



Pearson's Correlation

After meeting test assumption requirements, the Pearson's correlation coefficient analysis was run using a two-tailed bivariate test that was set to flag significant correlations (see Table 3). I found that there was a statistically significant, moderate positive correlation between CVD prevalence and age, $r = .356$, $n = 3737$, $p < .001$, with age explaining 12.7% of the variation in prevalence of CVD risk factors and attributes. There was also a statistically significant, small positive correlation between prevalence of CVD risk factors and attributes and population density, $r = .106$, $n = 3734$, $p < .001$, with population density explaining 1.1% of the variation in prevalence of CVD risk factors and attributes. It is worth highlighting the strength of these relationships as its significance is noted in the output analysis of regression assumptions discussed later in the chapter.

Table 3

Correlations Coefficients of Scale Level Study Variables

		Prevalence CVD attributes/risk factors	Age in years	Population density per square mile
Prevalence CVD attributes/risk factors	Pearson correlation	1		
	Sig. (2-tailed)			
	N	3737		
Age in years	Pearson correlation	.356**	1	
	Sig. (2-tailed)	.000		
	N	3737	3744	
Population density per square mile	Pearson correlation	.106**	.100**	1
	Sig. (2-tailed)	.000	.000	
	N	3734	3741	3741

**. Correlation is significant at the 0.01 level (2-tailed).

Point Biserial Correlation

To conduct a point biserial correlation, six assumptions had to be met: (a) one of the two variables should be continuous; (b) the second variable should be dichotomous; (c) the two variables should be paired; (d) there should be no significant outliers in either category of the dichotomous variable; (e) the continuous variable should be normally distributed; and lastly, (f) the continuous variable should have equal variances for each dichotomous category (Cohen, 2013).

When testing for the fourth assumption using the Explore procedure in SPSS, my continuous variable, CVD prevalence (dependent variable), produced extreme outliers marked with asterisks (female = 5; male = 4). Two of these data points corresponded to the only participants with a CVD risk score of six (male = 1; female = 1), and seven of the data points corresponded to participants with a CVD risk score of five (male = 3 and female = 4). Twelve other unusual points observed corresponded to participants with CVD prevalence scores of three and four (male = 6; female = 6). I performed a comparative point-biserial correlation excluding the observed outliers. The output of this analysis resulted in seven new extreme outliers (male = 4; female = 3) and 14 new unusual outliers (seven in each category) that corresponded with participants having CVD risk scores of three and above. I repeated this process four times and continued to observe new outliers corresponding with participants with a CVD risk score of three or above. I decided not to exclude any observed outliers as they were neither the result of a measurement error or data entry error. Additionally, the continued removal of participants with CVD risk scores of three and above could impact the study's outcome.

In testing for homogeneity of equality variances, the data was found to be heteroscedastic ($p = .000$), where P should be > .05 (Mishra et al., 2019). To adjust for this discrepancy, I applied a Log10 transformation by first adding a constant of one to the dependent variable to replace the variables zero values (log = Prevalence CVD + 1). I then performed the log transformation which also rejected homogeneity ($p = .000$). Other available testing options when dealing with heterogeneous variances include nonparametric tests such as a Kendall's tau-b or a rank-biserial correlation (Laerd Statistics, n.d.). While these tests are a measure of strength and direction of association existing between two variables, they require ordinal or ratio level measurements of variables, which was not an appropriate measurement for the study's dichotomous variable of gender (IV). Therefore, I decided to proceed with the untransformed data. When testing for normality, no significant departure was found in CVD prevalence scores for each level of gender, as assessed by Normal Q-Q Plots; however, the Kolmogorov-Smirnov test rejected normality ($P = .000$).

After testing for assumptions, a point-biserial correlation was run between gender and CVD risk score (see Table 4). Data are mean ± standard deviation, unless otherwise stated. There was no statistically significant correlation between gender and CVD risk score, $r_{pb}(3735) = .012$, $p = .46$, which indicated a small association (Cohen, 2013), with males having higher CVD scores than females, $M = .94$ ($SD = 1.14$) vs. $M = .91$ ($SD = 1.00$).

Table 4

Point Biserial Correlations Coefficients

		Prevalence CVD attributes/risk factors
Participant sex	Pearson correlation	.012
	Sig. (2-tailed)	.462
	N	3737

**. Correlation is significant at the 0.01 level (2-tailed).

Treatment of Data

The data files from JHS were sent via multiple spreadsheets. Using IBM SPSS, the files were merged to incorporate all study variables onto one spreadsheet, creating one main file. Participant records whose age was outside of the inclusion criteria (35–64) were deleted (n = 1562). In keeping with the methods described in Chapter 3, all CVD attributes were manually counted for each participant, creating a total CVD prevalence score that ranged from 0-6. For example, a participant record indicating the presence of myocardial infraction (MI) and stroke would have a CVD prevalence score of 2. In replicating the statistical methods of Hickson et al. (2011), FFR availability was categorized into three groups with the lowest 25% (< 25th percentile) = low availability; next 50% (25th–75th percentile) = moderate availability; top 25% (> 75th percentile) = high availability. This quartile was based on the JHS reported density of unfavorable food stores within each circular buffer (.5-mile, 1-mile, 3-miles) centered at each participant's residential location.

Next, dummy variable codes were assigned to the non-dichotomous nominal and ordinal variables (income, education, occupation, FFR availability) for inclusion into the

regression model. Dummy coding is used when categories of a variable have no obvious order or when there are more than two categories and there is no assumption of equality in differences between them (SAGE Research Methods Datasets, 2015). No other treatments were performed on the data.

Assumptions

As previously stated, I excluded participants not within the age inclusion frame of 35–64 (n = 1562) and analyzed descriptive statistics for socioeconomic characteristics, residential location, age, and availability of fast food at the 0.5, 1, and 3-mile buffer. Socioeconomic characteristics included education (categorized as less than high school, high school or GED [General Educational Development Test], and vocational school trade school and college), occupation (categorized as management/professional, service, sales, farming, construction, production, military, sick, unemployed, homemaker, retired, student, and other) and median household income (categorized as < $25,000, $25,000–$49,999, ≥ $50,000, and unknown for "refused" or "don't know" responses). Residential location was based on the given population density (per square mile), and FFR availability was categorized as lowest 25% (<25th percentile) = low availability, 50% (25th–75th percentile) = moderate availability, top 25% (>75th percentile) = high availability). Availability was defined by JHS as the density of FFRs within a 0.5, 1, and 3-mile buffer centered at each participant's residential location.

Descriptive statistics are included in Table 2. The mean age of both men and women participants was $\bar{x}$ = 50.5 and $\bar{x}$ = 51.3, respectively, with 58.4% of the sample population having a median household income between $25,000–$49,999, and 69.0%

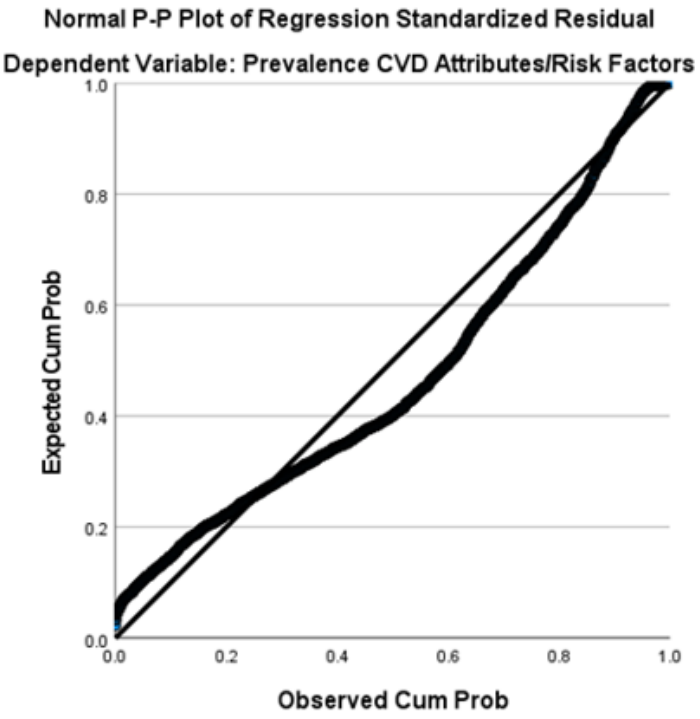
having attended high school/GED or vocational/trade/college. The most frequently reported occupation was management/professional which represented 38.5% of the sample population. It may be worth noting that the mock census tract ID that had the highest frequency was tract 66, n = 363. Average population density was $\bar{x}$ = 1997.3 per square mile. The 0.5 and 1.0-mile buffer both had the highest population in the low FFR density category, n = 2,186 and n = 1,515, while moderate availability in the 3-mile buffer was the most populated, n = 1,762. Lastly, the highest frequency rate of CVD prevalence was 0 (n = 1,561) but showed a median value of 1 (n = 1,359).

In order to run a hierarchical multiple regression, I first had to meet eight basic assumptions before testing if the addition of SES characteristics improved the prediction of prevalence of CVD risk factors and attributes over and above FFR availability alone. In summary, there was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.94. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. The significant associations found in the Pearson's correlation matrix did not significantly influence the regression steps based on the assessed tolerance levels not being violated, meaning there was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were 58 identified values of studentized deleted residuals (SDR) greater than 3 standard deviations (SD) and 25 values with no SDR data that I did not remove so that all measures could be considered together. Additionally, after further inspection, the participant records with outliers greater than 3 SDs had a

higher CVD prevalence score that ranged from 4-6. There were five leverage values greater than 0.2 and two greater than 0.5 that I did not remove, and no values for Cook's distance above 1 were presented. The assumption of normality was met, as assessed by P-P Plot (see Figure 5).

Figure 5

Point Biserial Correlations Coefficients



Results

Hierarchical multiple regression was used to test the null hypothesis which states that there is no statistically significant contribution of variation in local fast-food zoning policies to the percent of variance in CVD prevalence in African Americans more than SES when controlling for age, gender, and residential location. A hierarchical approach is characterized by the predetermined order in which the predictor variables enter the

equation as specified by the researcher (Polit & Beck, 2020). I standardized my approach in each regression step placing the control variables of age, sex, and population density in Step 1, followed by the control variables combined with the primary predictor variable(s) being tested in the research question (Step 2), and then the predictor variable(s) being tested in the research question (Step 3). For the collection of control variables entered into Step 1 of the model (age, gender, population density) *p* was recomputed to assess one-tailed significance (*p*/2; Huizingh, 2007). All control variables had significance in a one-tailed output, but gender only trended towards significance at the two-tail level (*p* = .027; .058).

For the first block analysis, the control variables age, sex, and population density were analyzed. The results of the first block hierarchical linear regression analysis revealed a model to be statistically significant ($p < .05$). Additionally, the R^2 value of .133 associated with this regression model suggests that age (β = .044, 95% CI [.040, .048], $p < .05$), sex (β = .064, 95% CI [-.001, .130], $p > .05$), and population density (B = 6.069E-5, 95% CI [.000, .000], $p < .05$) account for 13.3% of the variation in CVD risk scores, which means that 86.7% of the variation in CVD risk scores cannot be explained by the control variables alone. A similar outcome was found from the second block analysis.

For the second block analysis, the predictor variables, availability, were added to the analysis. The results of the second block hierarchical linear regression analysis revealed a model to be statistically significant ($p < .05$). Additionally, the R^2 change value of .003 associated with the addition of availability to the first block model accounts

for 0.3% of the variation in CVD risk scores, which means that 99.7% of the variation in CVD risk scores cannot be explained by availability alone. Controlling for age, sex, and population density, the regression coefficient (B = .100, 95% CI [-.260, -.051], $p < .05$) associated with the 1-mile moderate availability suggests that with each additional percentage of FFR availability within this buffer, CVD risk scores increase by approximately .100 points. The regression coefficient (B = -.156, 95% CI [.001, .199], $p < .05$) associated with the 3-mile moderate availability suggests that with each additional percentage of FFR availability within this buffer, CVD risk scores decrease by approximately .156 points. A similar outcome was found from the third block analysis.

The full model of participant sex, age, and population density (Step 1), and FFR availability (0.5, 1.0, 3.0-mile kernel; Step 2), and occupation, education, and median household income to predict CVD prevalence (Step 3) was statistically significant, R^2 = .150, $F(14, 3607) = 28.365$, $p < .0005$; adjusted R^2 = .145. The regression coefficient (B = .105, 95% CI [.016, .194] $p < .05$) associated with the sales occupation suggests that this profession increases CVD risk scores by approximately .105 points. While similar results were found with the production occupation (B = .197, 95% CI [.133, 1.84], $p < .000$), a greater increase was found with the farming occupation (B = .987, 95% CI [.016, .194], $p < .05$).

In summary, the addition of FFR availability to the prediction of CVD prevalence (Step 2) led to a statistically significant increase in R^2 of .003, $F(6, 3711) = 64.936$, p = .037 (significant confidence intervals presented above). Sex alone did not show significance in either of the steps (p = .053, .057, .223), nor did high FFR availability at

the 0.5,1.0 and 3-mile kernel. Moderate FFR availability was also not significant at the 0.5-mile kernel; however, significance was seen in Step 2 at the moderate levels for the 1.0 and 3.0-mile kernels, p = .048 and .004 respectively. Moderate availability was also significant in the 3.0-mile kernel, p = .011. For the SES variables, higher income was statistically significant, p = .003 and .002, as was production, sales, and farming occupations. An education level of less than high school also showed significance in Step 3, p = .005. See Table 5 for full details on each of the regression steps. The scatterplot in Figure 6 shows the standardized predicted values of the full model.

Figure 6

Full Model Standardized Predicted Values

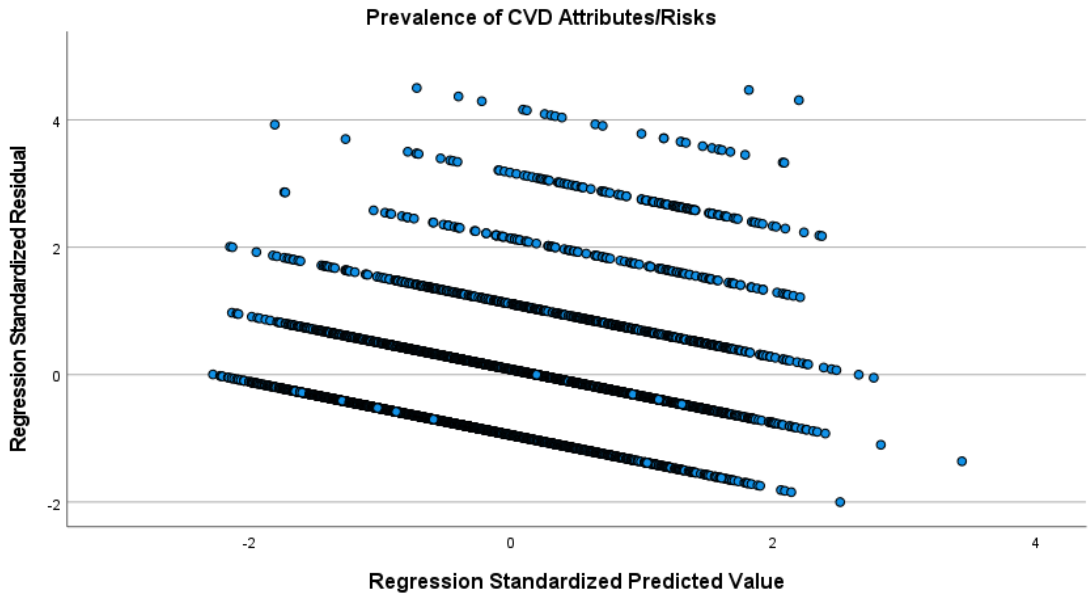


Table 5

Results of Hierarchical Regression Analysis with SES and Availability Measures as Predictors of CVD Risk

	Standardized betas in final equation	R^2	Change R^2
Step 1- Constant		0.133***	0.133***
Age in Years	.335***		
Gender	.020		
Population Density per Square Mile	.059*		
		0.136	0.003***
Step 2- Availability			
0.5-mile Moderate Availability	-0.003		
0.5-mile High Availability	0.010		
1.0-mile Moderate Availability	0.042		
1.0-mile High Availability	0.035		
3.0-mile Moderate Availability	-0.067*		
3.0-mile High Availability	-0.064		
		0.150	0.014***
Step 3- SES			
Median HH Income			
$25,000 - $49,999	-0.064*		
> $50,000	-0.066*		
Occupation			
Service	0.032		
Sales	0.039*		
Farming	0.034*		
Construction	0.010		
Production	0.066***		
Military	0.029		
Sick	-0.004		
Unemployed	-0.10		
Retired	0.009		
Student	0.007		
Education			
< High School	0.050*		
High School or GED	0.002		

Overall Regression:
$F(14, 3607) = 28.365$***
Multiple $R = 0.387$
Multiple $R^2 = 0.150$

*$p < .05$; **$p < .01$; ***$p < .001$

Summary

The purpose of these data analyses was to determine if variations in local fast-food zoning policies (proxied by FFR availability) predicted a statistically significant percent change in R^2 variance in CVD prevalence in African Americans more than SES when controlling for age, sex, and residential location. Hierarchical multiple regression was used to test the research question and hypothesis. Statistical analysis assumptions were tested and met.

The analyses revealed that the addition of SES ($R^2 = .150$) to the prediction of CVD prevalence (Step 3) explained 1.4% of the increase in variance versus 0.3% with the addition of FFR availability (Step 2; $R^2 = .136$) when controlling for age, sex, and residential location. All three regression steps exhibited significance ($p < .001$), however, not all predictors illustrated significance in the predictive model. Sex, for example, showed no significance in either step ($p = .053, .057, .223$) nor did select occupations (service, construction, military, sick, unemployed, retired, student) in Step 3. Less than high school or GED exhibited significance as did median household income of $25,000 or greater. In Chapter 5, I will interpret the findings and discuss study limitations, implications, recommendations, and conclusions related to this study.

Chapter 5: Discussion, Conclusions, and Recommendations

The aim of the study was to evaluate the predictive relationships between FFR zoning policies, SES, and prevalence of CVD among African American men and women participating in the JHS, in Jackson, Mississippi. I used baseline data from the JHS, collected between 2000–2004, to analyze the prevalence of CVD. Based on recommendations made by JHS researchers, I opted to use baseline data from JHS collected between 2000–2004 due to availability. The CDC reports that heart disease, and associated conditions, can happen at any age and those 35–64 years of age are experiencing increased risk earlier in life due to high blood pressure and obesity (National Center for Chronic Disease Prevention and Health Promotion, n.d.). This is the JHS sample used for analyses. Key regression model findings showed that when controlling for age, participant sex, and residential location, SES significantly predicted a greater percent change in R^2 variance for the prevalence of CVD attributes and risk factors than fast food restaurant availability predicted. In this chapter, I will cover interpretation of the findings, and discuss the study's limitations, recommendations, and implications for positive social change before offering concluding thoughts. I will begin with my interpretation of covariate findings and then focus on SES and FFR availability.

Interpretation of Findings

Heart disease among African Americans is a major public health concern in the United States with the high burden of mortality weighing heavily on this population (Graham, 2015; JHS, 2020b). Although individual-level risk factors contribute to the occurrence of the disease and associated conditions (Gebreab et al., 2017), growing

evidence suggests that built environments should be considered as a contributing factor to CVD incidence and contributory mortality (Bhatnagar, 2017; Fitzpatrick & Willis, 2020; Nixon et al., 2015). It is important to restate that a large percentage of the literature investigating health disparities in the United States was found to be centered around built environment, BMI, Type 2 diabetes, or obesity (Gebreab et al., 2017; Mitchell et al., 2011; Nixon et al., 2015). An exception to this is the JHS's longitudinal study as JHS researchers have yet to explore relationships between zoning and CVD prevalence. My findings, where applicable, are aligned with BMI and obesity rates discussed elsewhere in the literature and illustrate similarities between Jackson, Mississippi residents and other residential locations.

Covariates

Age

Age is a well-known fundamental predictor and traditional risk factor of CVD (Dhingra & Vasan, 2012; Rodgers et al., 2019; Taylor et al., 2005). The National Center for Chronic Disease Prevention and Health Promotion (n.d.) reported that persons 35–64 years of age are at an increased CVD risk earlier in life due to obesity and high blood pressure than heart disease and comorbidities at any age in the absence of obesity and high blood pressure. The JHS baseline sample dataset included 3,744 participants ages 35–64 whose mean age was 51.3 years for females and 50.5 years for males, statistically reflective of the larger JHS population (JHS, 2008).

The results of the Pearson's correlation coefficient matrix to assess for multicollinearity revealed that age was statistically significant, showing a moderate

positive correlation with CVD risk factors and attributes. Age was a significant predictor in the full model and a steady increase in CVD risk was observed as age increased in Normal Q-Q Plot for age. These findings affirmed the existing literature on age which states that age is positively correlated with increased risk of CVD (Petoumenos et al., 2014; Rodgers et al., 2019; Wang et al., 2020).

Sex

In heart health literature, sex, defined by JHS as biological sex assigned at birth, and categorized as male or female (NHLBI, 2008), and gender, which is shaped by societal constructs (Connelly et al., 2021; Hammarström et al., 2014), are increasingly being recognized as critical determinants of cardiovascular health (Havranek et al., 2015; O'Neil et al., 2018b; Ventura-Clapier et al., 2020). Research evidence illustrates that both sex and gender influence the incidence and prevalence of CVD, with greater pathophysiology evident in women (Ventura-Clapier et al., 2020). Consistent with these findings, Rodgers et al. (2019) contend that biological sex is a potential risk factor for aging adults and older women are at greater risk than men of the same age.

Like age, sex was entered into Step 1 as a control variable. There were more females (n = 2361) than males (n = 1383), which produced unequal sample groups. Despite this inequality, my findings for sex were contrary to previous studies that illustrated higher rates of CVD in women than men (Min et al., 2017; Ventura-Clapier et al., 2020). In my research, the output of the unstandardized beta revealed that males had a higher CVD score than females, which aligned with other evidence (Peters et al., 2019;

Mozaffarian et al., 2015b). However, in the regression model, sex was not significant in the model predictions.

O'Neil et al. (2018) noted that, since 1984, there has been a greater absolute number of CVD deaths for women, but the number of men who live with and die of coronary heart disease is greater. According to Mosca et al. (2011) there has been an increase in reported CVD deaths of women potentially linked to improved public health campaigns increasing awareness of CVD in women and improved clinical data capture. Despite the differences in CVD risk between both groups, most studies investigating the extent that each risk factor contributes have traditionally focused on male subjects (Connelly et al., 2021). Moving forward, coronary heart disease and CVD outcomes may require different approaches for men and women (Backholer et al., 2017; DeFelippis & Van Spall, 2021).

Residential Location

In trying to better understand the epidemiology of CVD, Xiao and Graham (2018) recognized a shift from investigating individual level risk factors to studying the physical characteristics of neighborhoods. Aligning with this shift, Malambo et al. (2016) confirmed a positive relationship between attributes of neighborhood environment, such as fast-food, and CVD risk and CVD outcomes. Furthermore, at baseline of the JHS study, Type 2 diabetes was most prevalent in women who were likely to reside in neighborhoods with higher favorable food stores than men (Gebreab et al., 2017).

Because I did not have access to participant ZIP codes or census tract data, population density served as an alternative for residential location and was measured per

square mile by JHS. The average population density in my research was 1997.3 persons per square mile. The stated purpose of Hinds, Rankin and Madison land use county zoning ordinances is to, in part, preserve public health through the regulation of population density and distribution (Hinds County Board of Supervisors, 2013; Madison County, 2019; Rankin County, 2020). This is accomplished through permitted land use elements such as commercial structures, residential usage, and green spaces. Residential usage further expands into districts which are characterized as high, moderate, medium, low-density housing, manufactured housing, and rural housing. In sum, population density provided a pathway to evaluate the predictive correlations between prevalence of CVD without having exact residential locations of participants.

According to Carnegie et al. (2022), high population density appears to be associated with higher mortality rates of CVD, along with a range of cancers, and chronic obstructive pulmonary disease (COPD). Contrary to these results, Carnegie et al. also reported that low population density was found to be associated with diabetes incidence. The highest populated areas in my study were within the 0.5- and 1.0-mile buffer where low FFR density was observed, whereas the moderate availability category in the 3-mile buffer was the most populated. Without precise residential locations, I was not able to designate residential district levels to the mile buffers. Despite this restriction, my results supported previous research findings and revealed that population density was significant in the regression steps but accounted for a small percentage of the variation in prevalence of CVD risk factors and attributes. Examination of the correlation coefficient illustrated the presence of weak, statistically significant positive correlation between prevalence of

CVD risk factors and attributes and population density, thus a contributing factor to prevalence of CVD attributes can be made. Given these well-supported findings of the covariates in the literature, using them as constants in my regression steps seemed necessary. Each covariate demonstrated significant correlations with the dependent variable and were grouped in Step 1of the regression analysis.

Independent Variables

SES

In prior research, SES correlated with food resource availability, making it an appropriate variable to include when evaluating zoning policy (Costa et al., 2019; National Research Council, 2009; Pechey & Monsivais, 2016;). My study contained three common measures of SES: (a) education, categorized as less than high school, high school or GED, and vocational school, trade school, and college; (b) occupation, categorized as management/professional, service, sales, farming, construction, production, military, sick, unemployed, homemaker, retired, student, and other; and (c) median household income, categorized as < $25,000, $25,000–$49,999, ≥ $50,000, and unknown for "refused" or "don't know" responses. Over half of the participants were low to moderate income earners, a majority of whom have a high school/GED or vocational/trade/college, and fewer than half reporting a professional career. These SES findings suggest that this population is likely to experience an increased burden of CVD risk that is attributable to those who are socially disadvantaged and more likely to experience poorer health outcomes (Kucharska-Newton et al., 2011; Mosquera et al., 2016; Schultz et al., 2018).

Consistent with previous research (see Boone-Heinonen et al., 2011; Davis & Macinko, 2008; Vaughan et al., 2017), median household income was statistically significant at all variable levels. A difference occurred in directionality among the levels, which was also supported by the literature. Where the median household income was greater than $25,000, a negative association with CVD risk was found. These findings illustrate that households with higher income experienced decreased CVD risk scores, while lower income households experienced the opposite. Given the widely recognized association between health and income, there are emergent methodologies that can be implemented on an individual, population, or community basis, to reduce disparities in outcomes (Schultz et al., 2018). The same is said about the association between education, occupation, and health.

As a specific driver in determining health, education has been shown to be inversely correlated with prevalence of CVD risk (Degano et al., 2017; Frank et al., 1993; Rosengren et al., 2022;). This supports the hypothesis that higher educational attainment results in decreased prevalence of CVD and associated risks. When applying these empirical findings to my study, sufficient evidence existed to support the inverse relationship between educational attainment and prevalence of CVD risk for participants who had attended vocational school, trade school, or college. It should also be stated that JHS defined this level of education as *attended*, whereas other educational level options were specified as *attained*. These differing outcome measurements could impair accurate outcomes reporting. High school diplomas as the achieved education level were not statistically significant contributors in the model. Results suggest that varied prevention

strategies should be provided to individuals based on educational attainment to account for the CVD risk disparities among lower educated groups.

A link to CVD incidence and mortality, and occupation has been shown (Fujishiro et al., 2011); however, the National Institute for Occupational Safety and Health (NIOSH; n.d.) reported that much is undetermined about how occupational risk factors contribute to CVD. According to Fujishiro et al. (2011), the workplace can serve as an important location for management, control, and prevention of CVD risks. They found that low levels of job control and blue-collar jobs, typically characterized as work requiring strength or physical skill, were associated with the development of CVD risk factors. In my study, production work was found to be the most significant predictor of CVD risk, consistent with extant literature along with farming and sales. Sales occupations are typically classified as white-collar jobs associated with deadlines, high pressure demands, and quotas, each of which bring a natural stress state to the individual potentially contributing to CVD risk factors such as high blood pressure.

Where people live and their association with health is often associated with SES (Arpey et al., 2017; U.S. Department of Health and Human Services, 2014). On a micro level, Diez-Roux et al. (2017) and Chum and O'Campo (2015) found increased odds of CVD associated with reduced access to parks/recreations, food stores, and increased access to FFRs when examining predictive relationships between neighborhood socioeconomic factors and prevalence of coronary heart disease and associated risk factors. My investigation showed that educational attainment, occupation industry, and income contributed to the prevalence of CVD risk factors and attributes. For this study,

SES did explain an increase in variance to the prediction of CVD. These connections along with discoveries made in previous works demonstrate that SES is a fundamental cause of health disparities, and the development of health interventions which minimize the influence of an individual's SES should be prioritized (Phelan & Link, 2015).

FFR Availability

Discussion on how to mitigate the current health of the nation has often led to controversial strategies which involve the use of community infrastructure and zoning to improve community food environments (Nixon et al., 2015). It has been hypothesized that the community's food environment influences CVD and associated risk factors in its population (Poelman et al., 2018). Chum and O'Campo (2015) further noted that in partially adjusted models, the odds of CVD are increased in association with reduced access to food stores (Model 2 *OR* = 1.48; Model 3 *OR* = 1.12), and fast-food density (Model 2 *OR* = 0.9; Model 3 *OR* = 0.97); however, these odds associations were attenuated in the full model after adjusting for physical activity and BMI. With respect to the use of zoning as a possible mediator of CVD incidence, the literature presented three noticeable concepts. The first concept offered that utilization of land use policies to limit FFR density could potentially impact health (Cooksey-Stowers et al., 2017; Diez-Roux et al., 2017; Gebreab et al., 2017; Nykiforuk et al., 2018); the second indicated that land use policies to limit FFR density has a positive impact on food availability and health (Peng & Kaza, 2020; Thornton et al., 2016; Vaughan et al., 2017); and the third adversely proposed that there is no substantiating evidence supporting the implementation of

zoning policies to control an individual's food choice and health outcome (Sturm & Hattori, 2015; Xu & Wang, 2014; Zenk et al., 2017).

After examining whether fast food availability was associated with a change in CVD risk scores, it was found that FFR availability significantly predicted CVD prevalence, CI [1- mile moderate availability = .001 – .199; 3-mile moderate availability = -.260 – -.051] (Step 2). Availability, however, was only found to be significantly associated within the 3-mile buffer point in the full model (Step 3) at the moderate availability level while it trended towards significance at the 3-mile-high availability level. Both levels were negatively correlated with CVD risk scores, illustrating that increased distance along with increased availability at this distance led to a decrease in CVD risk scores. As availability within the 0.5- and 1-mile buffers did not exhibit predictive significance, these findings are contrary to those of Calling et al. (2016) who found that an increased, but small, odds ratio of coronary heart disease and stroke was associated with neighborhood availability of potentially unhealthy food. This outcome is supported by Zenk et al. (2017), who found no supporting evidence that suggested geographic accessibility to FFRs changed a person's BMI over time. Xu and Wang (2014) also found that the ratio of fast-food/full-service restaurants is not a significant factor in reducing rates of obesity.

I hypothesized that FFR zoning, by proxy of FFR availability, would significantly increase the percent change in R^2 variance in CVD rates of African Americans more than SES and built environment when controlling for age, sex, and residential location. My findings illustrated that the null hypothesis for FFR availability was retained. The

multiple regression analyses demonstrated that while FFR availability was significant in the proportion of variance, the changed proportion of variance in the dependent variable of CVD risk scores was not more than SES.

Overall, the study results supported existing knowledge that SES is an important indicator of health. Those with higher income and education exhibit better health than those with lower SES. Additionally, these findings add to the current literature by establishing that FFR availability is a predictor of CVD and associated risks, among the African American community. Conversely, my study results regarding sex and CVD incidence are inconsistent with some current literature (DeFelippis & Van Spall, 2021; Mosca et al., 2011) which found that females are prone to increased CVD risks more than men.

Theoretical Framework

The findings aligned with the social constructions of target populations theory, which explains a wide variety of social inequalities. The theory entails assessing how benefits and burdens, hypothesized as potentially being reflected in the socioeconomic impact of the availability of certain food choices as it relates to zoning policies, are distributed among target groups as a policy tool (Barbehön et al., 2020; Schneider & Ingram, 1993). Target groups are articulated by a matrix that includes four categories and are defined in terms that involve cultural characterizations: (a) advantaged (fare best in terms of benefitting from public policies); (b) contenders (unable to fully reap political or social benefits); (c) dependents (unable to make policy systems demands); and (d) deviants (largely excluded from political and societal bounties). Propositions of the

theory convey that systematically biased policy patterns are a result of incentivized policy makers who reward positively constructed groups and that are positively constructed and are compelled to develop arduous policies for groups with little power (Kreitzer & Smith, 2018).

Hoflund et al. (2017) ask the question of policy for whom, when evaluating social construction and power to identify how zoning is used. By applying Schneider and Ingram's theory, I was able to build upon the literature by investigating who gets what, when and how (Lasswell & Kaplan, 2017) within the Jackson's African American community. As a determinant of who gets what, SES presents as a characteristic in each quadrant of the target group matrix. My study showed that African Americans with lower SES (dependents) display poor health outcomes, and those with higher SES (advantaged) exhibit positive health outcomes. Being of middle class is regarded as advantaged and receives the most political and social benefits (Schneider & Ingram, 1997). There was a positive correlation observed between middle class ($25,000–$49,999) and low FFR availability in the 0.5, 1.0, and 3.0-mile buffer. All other availability levels for this class were inversely correlated. Conversely, a negative correlation was observed between lower class (< $25,000) and FFR availability within the same low availability buffers. Similarly, education follows this pattern, which is consistent with research that offers that food choices are based on SES (Gebreab et al., 2017).

In summary, FFR availability was reported and related to fundamental SES variables, which conforms with the social constructions of target populations reasoning. My study also showed that being advantaged or dependent is linked to FFR availability.

These outcomes are perhaps incentivized by politicians as the theory presents. While my study focused on a homogenous racial group in one metropolitan city in the south, taking a broader view to examine disparities in other homogenous and heterogenous communities throughout the United States is needed to further examine FFR's impact on African American communities across broad classifications of SES factors, age, income, and education levels. Local health care communities and policy leaders should guide efforts that decrease health inequalities and promote healthful opportunities for all persons at risk, particularly African Americans.

Study Limitations

This research is subject to key limitations due to the use of secondary data. These limitations included the inability to separate FFRs from JHS's summary measure of 'unfavorable food stores'. This summed density included bakeries, ice cream stores, convenience stores and fast-food stores. While these stores technically aligned with the definition of FFR, isolating this variable's more specific attributes would potentially produce more precise results.

Another limitation is that as an external researcher of the JHS agency, I was not allowed access to real census tract data or participant ZIP codes. This meant I was unable to investigate the physical zoning boundaries that I presented at the onset of my study as a potential predictor variable. Using a proxy variable, my results showed population density as a statistically significant contributing factor to prevalence of CVD risks and attributes. However, evaluating the association between FFR availability and residential districting could provide further information on the use of zoning and other built

environment regulations as potential tools to decrease incidence and prevalence of CVD in all residents.

A third potential limitation is related to unequal sample subgroups. My study contained 2,361 females and 1,383 males who were selected based on age characteristics. Statistical theory suggests that this could lead to a general loss of power, unequal variances, and issues with confounding unmeasured determinants that simultaneously and independently influence outcomes (MIT Critical Data, 2016; Rusticus & Lovato, 2014) and unmeasured time-varying factors (Gebreab et al., 2017). In my study, women represented 63% of the entire sample, which is a ration similar to the sex distribution in the larger JHS dataset. A 50:50 population ratio may lead to more accurate statistics and using matched case set in future research is recommended.

Recommendations for Further Studies

This study included African American adults, 35–64 years of age, living in Jackson, Mississippi. I recommend that research be conducted on African American communities in different geographic locations of the United States to explore associations between zoning practices within these communities and prevalence of CVD following the same guidelines for my selected IV's and control variables. Furthermore, I recommend that these studies consider a similar approach to JHS's longitudinal study to investigate incidence of CVD risks within these locations.

The JHS has collected a wide range of variables and presented significant health findings in predominantly African American communities at baseline. These variables included clinical and self-reported data, which may have introduced measurement error

(Hickson et al., 2011), and has been continuously collected via annual follow-ups and check-ins by JHS researchers. Longitudinal data collection may inadvertently introduce error through unstandardized data collection methods and variabilities in data recording (Caruana et al., 2015). Additionally, my research did not remove CVD risks and attributes that were a result of family history from evaluation. While my study examined baseline data, further examination of changes in zoning redistricting and its impact on health outcomes is warranted on more recent JHS participant data while controlling for educational interaction treatment at the community level.

Lastly, as stated at the onset of this study, generalizability of results to a larger population was narrow despite the statistical adequacy of my participant size. The participants were selected using purposive sampling and cross-sectional methods. Therefore, findings might not be generalizable to other geographic areas as the study was based on an African American population at a single site of Jackson, Mississippi.

Implications for Positive Social Change

Zoning is likely to be of increased interest to researchers and policy makers who are investigating interventions to increase access to healthy food and health equity promotion to reduce harm associated with areas with a high-density of establishments selling high-calorie fast-food, relative to healthier food options (Cooksey-Stowers et al., 2017). As a possible target for policy and prevention efforts, assessing neighborhood environments, and other built environment characteristics, are a promising but controversial strategy to improve community food environments. My study could provide further insight into health disparities experienced by African Americans by adding to the

JHS research on potential barriers, specifically the availability of fast-food. For policy makers, this study could provide insight into how land-use policy designs impact community health. Further, findings of this study may help to lower incidence rates of heart disease in African Americans.

Conclusion

Baseline data from JHS's longitudinal study was used to determine the extent to which FFR availability and SES (median household income, education, and occupation) predicted CVD risk and attributes of African Americans aged 35–64 in Jackson, Mississippi. The results showed that SES (median household income, education, and occupation (sales, farming, and production) predict CVD risk and attributes more than FFR availability in this population. Study participants with lower SES exhibited poorer health more than participants with higher SES. FFR availability was found to be negatively correlated with CVD risk scores at the 3-mile moderate availability level. Statistical significance was shown within the 3-mile buffer at the moderate availability level and trended towards significance at the 3-mile-high availability level. The findings contribute to the literature and extends the knowledge on how zoning, by proxy of FFR availability, can predict health outcomes in the African American population and highlights the need for varied intervention efforts to be applied through policy development, health education, and community-led initiatives.

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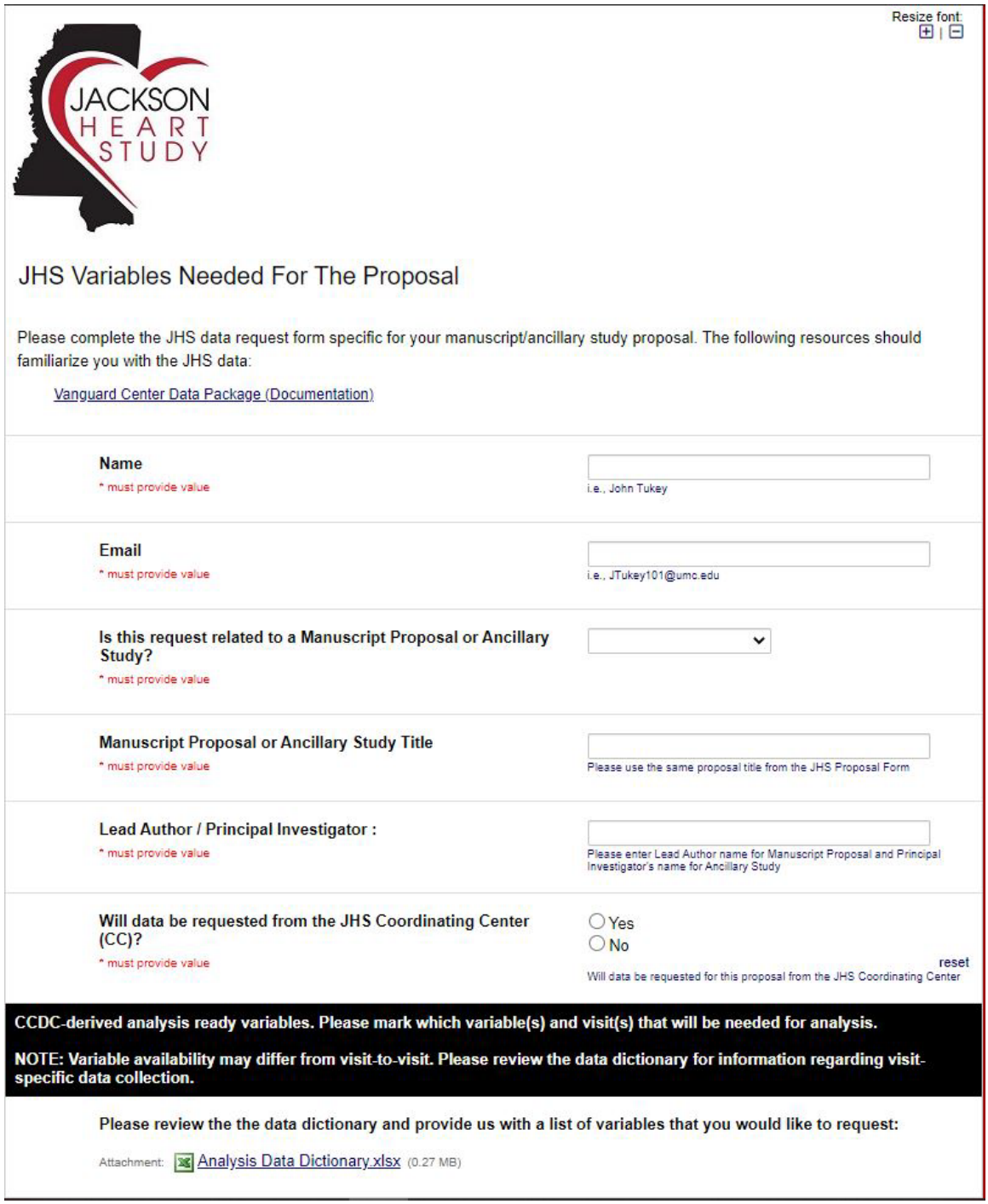
Appendix A: JHS Data Request Form



Resize font:

JACKSON HEART STUDY

JHS Variables Needed For The Proposal

Please complete the JHS data request form specific for your manuscript/ancillary study proposal. The following resources should familiarize you with the JHS data:

Vanguard Center Data Package (Documentation)

Name
* must provide value
i.e., John Tukey

Email
* must provide value
i.e., JTukey101@umc.edu

Is this request related to a Manuscript Proposal or Ancillary Study?
* must provide value

Manuscript Proposal or Ancillary Study Title
* must provide value
Please use the same proposal title from the JHS Proposal Form

Lead Author / Principal Investigator :
* must provide value
Please enter Lead Author name for Manuscript Proposal and Principal Investigator's name for Ancillary Study

Will data be requested from the JHS Coordinating Center (CC)?
* must provide value
Yes
No
reset
Will data be requested for this proposal from the JHS Coordinating Center

CCDC-derived analysis ready variables. Please mark which variable(s) and visit(s) that will be needed for analysis.

NOTE: Variable availability may differ from visit-to-visit. Please review the data dictionary for information regarding visit-specific data collection.

Please review the the data dictionary and provide us with a list of variables that you would like to request:

Attachment: Analysis Data Dictionary.xlsx (0.27 MB)

Please review the the data dictionary and provide us with a list of variables that you would like to request:

Attachment: Analysis Data Dictionary.xlsx (0.27 MB)

Data Sections
* must provide value

- [ ] Design, Study-Level and Other Items
- [ ] Demographics
- [ ] Anthropometrics
- [ ] Medications
- [ ] Hypertension
- [ ] Diabetes
- [ ] Lipids
- [ ] Biomarkers
- [ ] Renal
- [ ] Respiratory
- [ ] Echocardiogram
- [ ] Electrocardiogram
- [ ] CT Imaging
- [ ] Stroke History
- [ ] CVD History
- [ ] Healthcare Access
- [ ] Psychosocial
- [ ] Life's Simple Seven
- [ ] Nutrition
- [ ] Environmental
- [ ] Genetics
- [ ] Physical Activity
- [ ] Risk Scores

NOTE: All variables were not collected at each visit. Please review the variable(s) of interest in the 'JHS Variables Finder' to determine which exam cycles are available.

Other analysis data

Which, if any, of these archetypes would you like to request?

- [ ] AFU
- [ ] Ancillary Studies
- [ ] Cohort
- [ ] Events
- [ ] Supplementary
- [ ] Visit 1 "Raw" Data
- [ ] Visit 2 "Raw" Data
- [ ] Visit 3 "Raw" Data

Visit 1 "Raw" Data

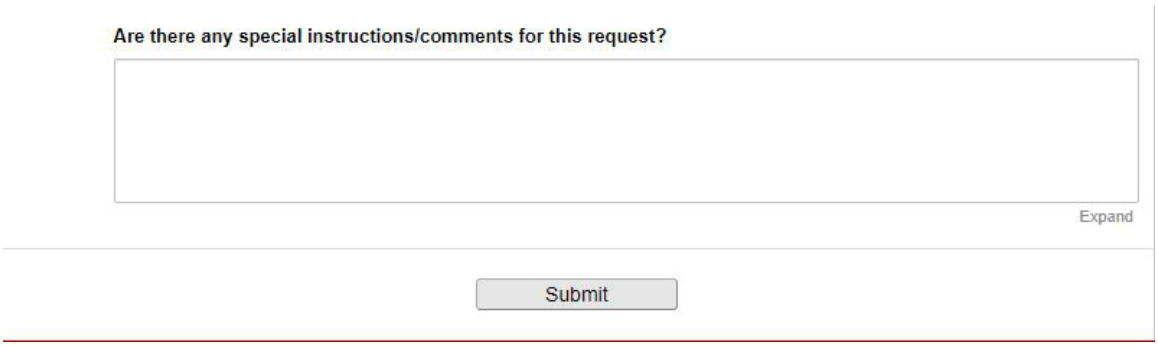
Other Non-VC-distribution Variables

With approval, the Coordinating Center may distrbute datasets and variables that are not readily-available in the Vanguard Center package.

Attachment: JHS proposal variable list template.xlsx (0.16 MB)

Which, if any, of these archetypes would you like to request?

- [ ] Genetics


Are there any special instructions/comments for this request?
Expand
Submit

Appendix B: JHS Data Collection Table

Data Collection Table									
Age	Sex	Income	Education	Occupation	ZIP	Zone	FFA	County	CVD