EXPLORING THE EFFECTS OF URBAN SPRAWL ON LOW-INCOME NEIGHBORHOODS IN BIRMINGHAM, AL

by

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ABSTRACT

Urban sprawl has led to poorly planned cities that spread out over large distances of land, creating unequal distribution of resources and blocking access to opportunities for low-income residents who remain in the central city (Squires, 2002) . While sprawl does provide the opportunity to live a quiet life outside of the city, the lasting impacts of sprawl are beginning to be seen in inner city communities. Two of these communities are Birmingham, Alabama's North and East neighborhoods. This study explores the possible causes of Birmingham's sprawl and residents' opinions of how urban sprawl impacts them socially, economically, and environmentally. Using geographic information system (GIS) technology and a comparison case study approach, it analyzes Birmingham's history and census tracts within the North and East neighborhoods in order to: determine if low-income households are increasing in fringe suburbs while simultaneously decreasing in the inner city; ascertain whether or not being in close proximity to an economic hub has any effect on household income; establish if property values are an indicator of upward mobility for communities; and confirm the historical causes of the city's sprawl. In doing so the research was able to determine how residents in North and East Birmingham perceive the potential effects of sprawl. Similar methodology can be applied to other mid-sized American cities hoping to gain more insight into how sprawl affects their citizens.

DEDICATION

This thesis work is dedicated to my family and many friends. A special feeling of gratitude to my loving husband, Nathan Mays, who's words of encouragement and constant source of support during graduate school and life have been much appreciated. This work is also dedicated to my mother, Becky Blankenship, who has always loved me unconditionally and encouraged me to pursue my graduate studies. Thank you to my friends who cheered me on through each milestone in the writing process. You all have encouraged me to work hard for the things I aspire to achieve.

LIST OF ABBREVIATIONS AND SYMBOLS

ALDOT	Alabama Department of Transportation
ACS	American Community Survey
BMPO	Birmingham Metropolitan Planning Organization
CDC	United States Centers for Disease Control and Prevention
EPA	United States Environmental Protection Agency
FHA	Federal Housing Administration
GIS	Geographic Information System
I-22	Interstate-22
I-59	Interstate-59
I-65	Interstate -65
IHA	Interstate Highway Act
NIMBY	Not In My Backyard
NPL	National Priority List
OPM	Official Poverty Measure
PEP	Planning, Engineering and Permits
RPCGB	Regional Planning Commission of Greater Birmingham
SCP	Social Capital Project
SVI	Social Vulnerability Index
UAB	University of Alabama at Birmingham

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RESEARCH BACKGROUND

Introduction

The term urban sprawl was coined in 1937 by Earle Draper, a planner with the Tennessee Valley Authority (Franz, Maier, and Schrock, 2006). Today it is used to describe the expansion of poorly planned cities that spread out over large tracts of land. The trend of urban sprawl in urban planning became apparent in post-World War II (WWII) America when cities began expanding outward. The main influences on urban sprawl were the 1956 Interstate Highway Act (IHA) and subsequent dependence on the automobile, Federal Housing Administration (FHA) mortgage financing for suburban housing developments, deindustrialization of central cities, urban renewal and racial segregation (Squires, 2002). Originally the IHA funded 41,000 miles of road network systems as a defense measure to evacuate major U.S. cities from a nuclear attack. The implementation of the interstate system led to a nationwide dependence on automobiles as the interstate system became utilized by commuters. Workers began relying less and less on public transportation and more on personal vehicles to get to work. Proximity to employment was no longer as important, people could live and work further distances and conveniently commute. FHA loans combined with the GI Bill for WWII veterans made owning a home possible for middle class workers.

Levittown, Pennsylvania was one of the first suburban housing developments to come on the scene in the North East. Levittown offered cheaply manufactured homes with new

appliances that could be built in a day if everything went according to plan (Dianne Harris, 2010). Levittown influenced the way the suburban lifestyle was marketed and became the archetype for American suburbs. Today, Levittown is the largest suburb of Philadelphia. As population began shifting from the city center to the suburbs the city also went through deindustrialization. The working class moved away from factory jobs and transitioned into white collar jobs with suburban offices. Urban renewal reached its height in the 1940s, while the white population were fleeing to the suburbs, municipalities were trying to address urban decay and blight by building public housing developments to replace slums. The majority of public housing dwellers were African American until the Fair Housing Act of 1968 went into effect. The Fair Housing Act nationally outlawed housing discrimination and neighborhood segregation, allowing middle class African Americans to also migrate to the suburbs. This left the poorest of the poor isolated in the central city (Jargowsky, 2001).

Urban sprawl created low-density cities with high concentrations of poverty (Resnik, 2010). The growth of cities led to businesses relocating to the more profitable suburbs. Suburban dwellers were geographically distant from the urban core, and the remaining city population was too isolated and too poor to make use of the new amenities in the suburbs. This expansion process led to concentrations of poverty that physically and socially isolated the urban poor from the suburbanites. This isolation has generated generational deficits in educational and employment opportunities for people growing up in communities with concentrated poverty (Jargowsky, 2001).

Early Birmingham

Birmingham was incorporated by the Elyton Land Company on June 1, 1871. The Elyton Land Company was created by James Powell and Josiah Morris, two business partners who were the sole shareholders of Elyton Land Company. Powell and Morris raised $200,000 and hired John T. Milner, chief engineer of South and North Alabama Railway to select a suitable plot of land to build a city on (Morris, 1989). Milner based his site off of the already existing Alabama and Chattanooga Railway that ran east and west, and the future development of the South and North Alabama Railway. Milner's original site, present day Ensley, fell through because South and North Alabama Railway was unable to secure necessary right of ways for construction (Webb, 2007). This led to Birmingham being established several miles to the east on 4000 acres of what is known today as Jones Valley. The 4000 acres was divided into blocks and lots and public utilities were established (Figure 1). The Elyton Land Company began marketing Birmingham as the new southern industrial city (Morris, 1989).

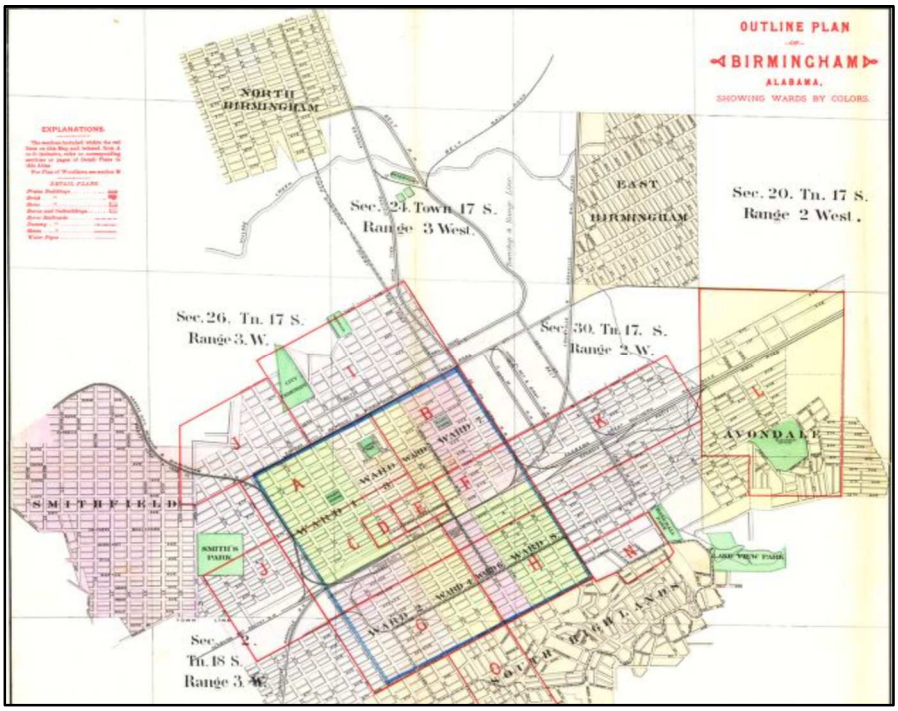

Figure 1. The first outline plan of Birmingham, 1887 (University of Alabama Map Library)

William Barker, an engineer, was tasked with rudimentarily designing Birmingham's first master plan. Barker designed the city's transportation network to include streets and avenues laid out in a grid pattern (Figure 2). Along these thoroughfares he designated certain parcels to be for churches, parks, and cemeteries (Morris, 1989). The most notable feature of Barker's design was the new South and North Alabama Railway lines and all of the associated infrastructure that came along with it. Birmingham quickly became Alabama's largest city in 1891 with a population of 50,000. The combination of Birmingham's railway hub, industrial success, and booming new urban lifestyle allowed the city to experience prosperity for several decades (Morris, 1989).

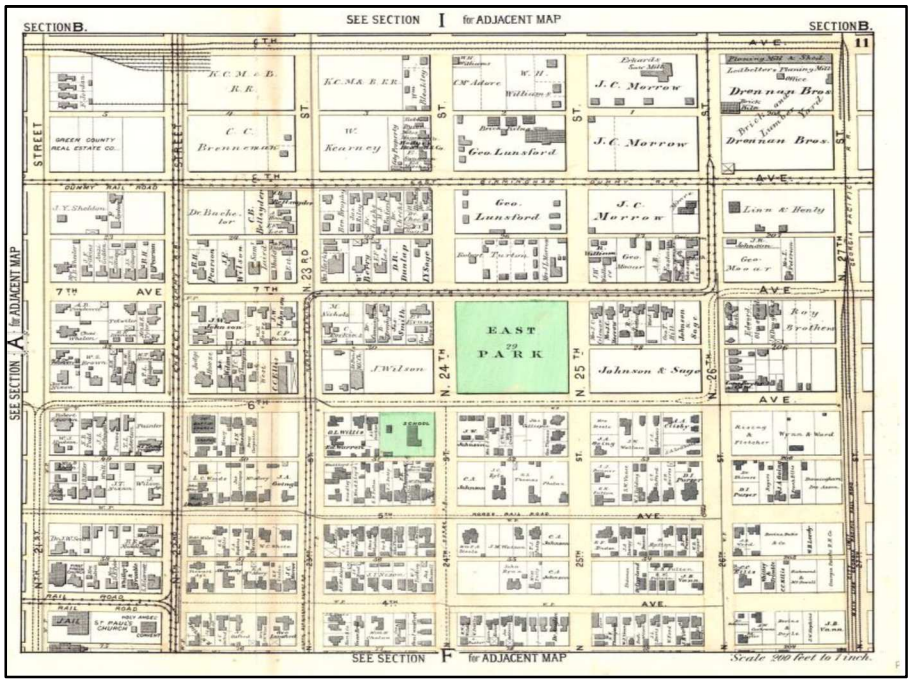

Figure 2. Birmingham's grid system designed by William Barker, 1887 (University of Alabama Map Library).

Birmingham's First Suburbs

Following the success of Birmingham' s industrial economic upswing many people began settling land further out from Birmingham's city limits. Small industry and mining operations began taking over traditional farmland. Success was dependent on proximity to the railway, and by 1900 Birmingham had more than ninety fringe settlements within sixteen miles of the city center (Webb, 2007). These settlements varied in population size from a few hundred to a few thousand (Morris, 1989). The first notable industrial suburbs were Pratt City, Thomas, Ensley, and Bessemer, with the latter two being the furthest away and accumulating the highest population. Being further away from the city center became more desirable because the air was cleaner, there was more space, and houses had amenities such as gutters, fences and sidewalks (Webb, 2007). In response to losing

population to its suburban competition Birmingham began absorbing fringe settlements to maintain growth.

Efforts to annex neighboring communities began in 1898 with the Greater Birmingham Movement. The movement was orchestrated by city officials wanting to market Birmingham's growth potential to investors and businesses. Officials complained that Birmingham was "standing before the world, belittled by its cramped confines" (*Birmingham Age-Herald*, 1900). There were several failed attempts to pass annexation and it was not until the individual communities came across difficulties over agreeing for the area-wide sewer system that annexation was seriously considered as a solution (Morris, 1989). On January 1, 1910 the City of Birmingham annexed East Birmingham, Woodlawn, East Lake, North Birmingham, West End, Pratt City, Ensley, and Wylam. The population growth from the Greater Birmingham Movement was reflected in the 1910 U.S. Census, with the city's population reaching 133,000 (Henley, 1969). Around this time the over-the-mountain suburbs of Mountain Brook and Homewood were beginning to grow. Later Hoover and Vestavia Hills would be established as new suburbs. These suburbs resisted annexation into Birmingham , causing Birmingham's city proper rapid growth trend to slow and become stagnant after 1940 (Webb, 2007).

Suburban Growth In Birmingham

As automobile culture took hold of America the need for a modern, multi-laned road network increased. With the passage of the FHA in 1956 the Alabama Highway Department began drawing up plans for Interstate 59, a modern interstate highway that would connect New Orleans, Birmingham, and Chattanooga (Connerly, 2002). The route was intentionally

altered to bisect Smithfield, one of Birmingham's first wealthy black suburban style neighborhoods. This resulted in residents having to relocate to other parts of the city, a task that was no easy feat for wealthy African Americans (Connerly, 2002). Because of previous zoning laws there were very few neighborhoods for African Americans that were zoned for single-family housing and not near industrial sites (Connerly, 2002). Many well off African Americans left Birmingham all together.

As was to be expected following the construction and utilization of I-59, Birmingham experienced its first wave of white flight to the suburbs. Shortly after the first wave of white flight the city experienced a very unanticipated second wave, brought on by the desegregation of public schools (Webb, 2007). African Americans were no longer confined to certain school districts for their children. Affluent and middle class African American families left Birmingham in favor of adjoining new suburbs with better school systems. With wealthier African Americans now gone from the city this meant that Birmingham's core inhabitants were primarily those dependent on government subsidized housing and provisions (Webb, 2007). This further eroded the city's tax base because the people with the most tax revenue were choosing to leave (Webb, 2007).

Residential growth surrounding Birmingham continued to increase as the suburbs to the southeast of Birmingham, Hoover, Homewood, Vestavia Hills, and Pelham, competed for population growth (Figures 3 and 4). Jefferson County as a whole has seen stunted population growth compared to Shelby, Blount, and St. Clair counties. U.S census data from 1990-2000 confirms that Jefferson County is continually losing Caucasion households to more rural counties (Webb, 2007). This population loss is largely attributed to the region's choices in transportation projects over the last decade. The Birmingham metro favors

automobile-orientated public works concepts, such as Interstate 22 over mass public transportation pursuits. The construction of I-22, known as Corridor X connects Birmingham to Memphis, TN and passes through multiple small, rural towns. Corridor X was completed in 2016 and serves as Birmingham's latest contribution to urban sprawl (Webb, 2007).

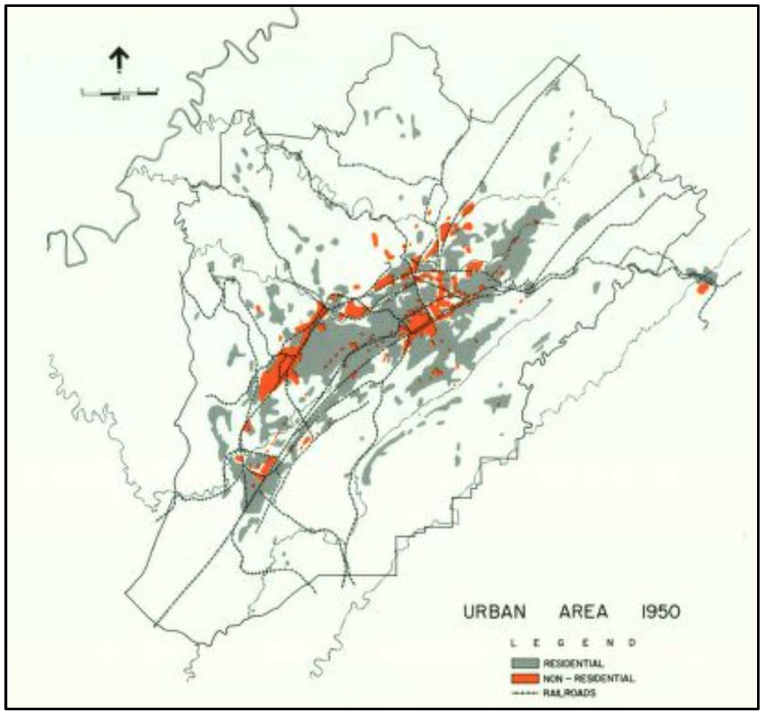

Figure 3. Residential versus non-residential growth for Birmingham, 1950. Source: Regional Planning Commission of Greater Birmingham.

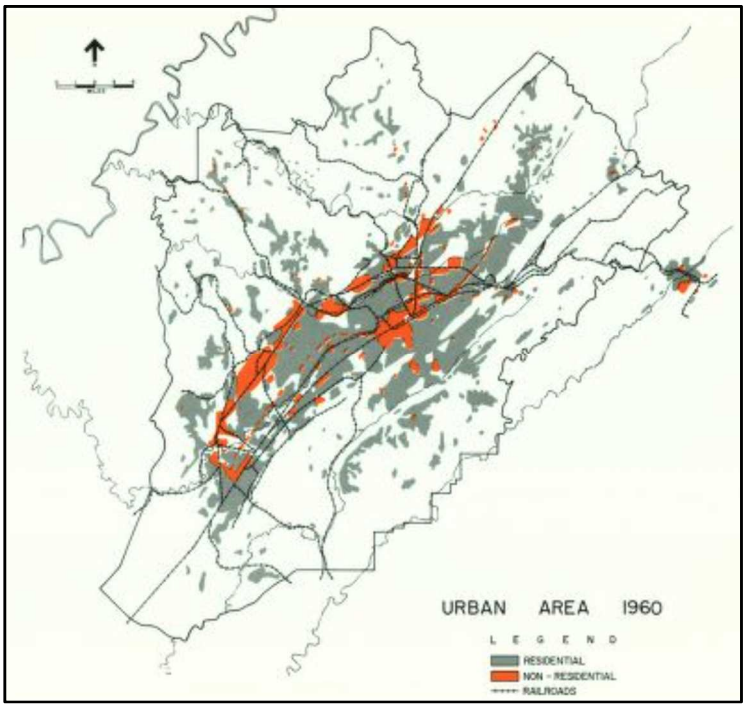

Figure 4. Residential versus non-residential growth for Birmingham, 1960. Source: Regional Planning Commission of Greater Birmingham.

Birmingham's sprawl problem expands beyond the barriers of interstates and population loss. Urban sprawl affects a city's pollution levels, infrastructure budget, and available open land. It also leads to increased racial segregation and concentrations of poverty within the city center (Burnley, 2015). Just like sprawl itself, the problems it creates will continue spreading, potentially impacting not only the people living in these vulnerable communities, but the surrounding suburbs as well. As cities increase in geographic area the resources available to citizens becomes strained and geographically difficult to access. The effect sprawl has had on Birmingham residents needs to be investigated in order to ascertain the level of impact people living in these inner-city communities feel regarding sprawl and what can be done to alleviate those perceived impacts.

RESEARCH METHODOLOGY

Introduction of the Research Problem

The larger part of research regarding urban sprawl focuses on the negative environmental impacts caused by the increasing use of automobiles. Most specifically how automobile reliance has contributed to air and water pollution. The inevitable need for the car is continually exhausted by the attraction of cheap, unincorporated land that is outside of city limits. As a result most American's are commuting into a city that is different from the one where they reside (Benefield, 1999). This has driven urban sprawl to be seen primarily as a sustainability issue that must be addressed in cities nationwide. Correspondingly most urban sprawl studies are devoted to studying environmental degradation caused by sprawl, such as habitat fragmentation brought about by roads and fossil fuel depletion caused by crude oil production (Duerksen, 1997). Presently there are not many studies that have looked at the direct implications sprawl has on people's opportunities, much less how people interpret these effects within their neighborhood.

It has been found that areas with sprawling communities are more likely to have clusters of socioeconomic homogeneity, similar income, occupation, and education demographics (Garrido-Cumbrera, Galvez, Ruiz, Brace, Lopez Lara, 2018). In regards to the built environment that causes urban sprawl, sprawling infrastructure has not been significantly associated with higher levels of psychological stress. However the socioeconomic homogeneity that results from sprawling cities is a direct indicator of psychological stress (Garrido-Cumbrera, Galvez, Ruiz, Brace, Lopez Lara, 2018). The situation of socioeconomic homogeneity can lead to large disparities in income between

those living in the inner-city versus those living in the suburbs, subsequently causing concentrations of poverty (John Iceland and Erik Hernandez, 2017). Without a proper understanding of the perceived impact sprawl has on persons living in these inner city neighborhoods poverty clusters and inequity of resources cannot be addressed from a geographic planning perspective. Low-income neighborhoods will continue to feel the effects of exponential urbanization as opportunities advance further and further away from the core city (Iceland and Hernandez, 2017). Birmingham's sprawling city limits are not unique, conducting this study in Birmingham has practical benefits for other mid-sized American cities who are eager to address how residents interpret sprawl.

Birmingham's most pronounced problem with sprawl is the socioeconomic and environmental disparities that prolonged, uninhibited sprawl leads to. The perceived impact of sprawl on Birmingham's urban residents needs to be investigated to understand the level of impact sprawl has on urban residents' quality of life. It must be known whether or not this level of impact is significant or insignificant. Depending on the significance urban neighborhoods could benefit economically, environmentally and socially once planners shift from a strategy of prioritizing and accommodating suburban commuters to one focused on improving the quality of life for urban residents.

Research Objectives and Questions

The goal of this research is to identify causes that have influenced Birmingham's sprawling development and to gain knowledge on the general public's attitude regarding sprawl. When serving the public in sectors such as municipal planning it is important to

have an established record of communication to assist in targeted community improvements that promote the safety, health, and welfare of its inhabitants. The popular activist slogan "Nothing about us, without us, is for us" established by the South African Disability Rights group applies to any vulnerable population when making plans. This study serves as a current account of Birmingham resident's opinions on urban sprawl. In order to achieve this goal the following research objectives were identified: (1) determine the factors that have caused urban sprawl in Birmingham, factors being circumstances that have led to urban sprawl, (2) assess the social impacts of urban sprawl in low-income neighborhoods, (3) assess the economic impacts of urban sprawl on low-income neighborhoods, (4) assess the environmental impacts of urban sprawl on low-income neighborhoods, (5) assess current residents intention to remain in the neighborhood, and (6) establish policy recommendations based on the results of the study.

Research Methods

This section discusses the methods and procedures used to identify the causes of Birmingham's urban sprawl and how people living in North and East Birmingham have perceived the effects sprawl has regarding their access to opportunities. The aim is to assess if residents living in Birmingham's traditional industrial neighborhoods interpret the impacts of sprawl as more or less significant compared to the city's transitional neighborhood. It uses data from the Social Capital Project (SCP), American Community Survey (ACS) and the Centers for Disease Control's (CDC) Social Vulnerability Index (SVI). Specifically, the report uses the following ACS variables for the year 2019: means of transportation to work, travel time to work, vehicles available to respondent, poverty

status in the past twelve months, and geographic mobility. Using geographic information system (GIS) technology and SVI data on poverty for 2014 and 2018 it analyzes Birmingham's census tracts by mapping the percent change in poverty for Birmingham households to determine if poverty rates are increasing or decreasing. Surveys were distributed with the assistance of the Regional Planning Commission of Greater Birmingham (RPCGB) in order to determine: (1) what residents view as the major cause of sprawl; (2) how sprawl affects residents access to education, healthcare, employment, retail, and other services; (3) how sprawl affects their commute to work; (4) how they currently view their neighborhood and what they think the future holds, and (5) provide recommendations on ways to mitigate possible side effects of urban sprawl on these neighborhoods based off responses. The study contains a historical content analysis for the years 1950-1970 and geographic analysis for certain years between 2012 and 2020. This eight-year period was selected due to data availability.

The two Birmingham case studies chosen were the communities of North Birmingham and East Birmingham. North Birmingham was chosen because it is a traditional, established low-income neighborhood dealing with current social, economic, and environmental impacts from sprawl. East Birmingham has been chosen because it represents the possible future development path of North Birmingham. East Birmingham is a transitioning community that has been slowly evolving through the process of gentrification (Fowlkes, 2019). Both of these communities are adjacent to the central city and were settled by industrial workers, North Birmingham is larger in geographic size.

This analysis utilized ArcGIS 10.8.1 to identify census tracts that were within the boundaries of North and East Birmingham respectively. Census tracts were chosen because

the majority of publicly available federal GIS data is tied to individual land tracts. An essential component of the GIS methods and data used consisted of normalizing and geoprocessing ACS and SVI data, spatially depicting the data to identify concentration trends within impoverished groups, and creating a similar city-block dataset for Birmingham's North and East neighborhood parcels. Graphs summarizing the non-spatial data from the 2019 ACS survey were created using Microsoft Excel, these were important in determining the percentage of respondents living in poverty, their mode of transportation, commute time to work, and geographic mobility within Jefferson County.

Historical Content Analysis

Charles Connerly's paper "From Racial Zoning to Community Empowerment'' was studied to determine the historical causes of Birmingham's sprawl, detailing how Birmingham's racist past contributed to its sprawling city limits. Connerly superimposed Birmingham's 1926 racial zoning boundaries onto a current map of I-65 and I-59, noting the primarily historic black neighborhoods that were in the interstates path. U.S. Census population data from the years 1950-1970 were used to determine the total population loss that occurred among census tracts as a result of the I-65 and I-59 construction. In addition to looking at total population loss the African American population was tracked separately from white households by assigning predominantly African American tracts to their corresponding highway or redevelopment project, these included: I-65, I-59, UAB, and the Red Mountain Expressway. This study revealed that the majority of Birmingham's 1960-1970 population loss came as a result of the poor planning of urban renewal projects and the interstate highway system implemented in the 1960's.

Surveys

To evaluate the social and environmental impacts of urban sprawl on North and East Birmingham residents an internet based ten question, yes or no, multiple choice closed response questionnaire was distributed by the Regional Planning Commission of Greater Birmingham (RPCGB) using *SurveyMonkey.com.* An online platform was chosen for ease of obtaining information from large samples of the population. The *SurveyMonkey.com* link was sent out through RPCGB to neighborhood officers of both communities. They then shared it with their neighbors. The survey was opened electronically on September 22, 2020 and closed on October 22, 2020, giving respondents thirty days to answer. The questions were organized into three thematic categories with urban sprawl being defined for participants at the start. The first question asked about the major drivers of urban sprawl, both current and historical. The second theme focused on how sprawl impacts respondents' access to opportunities. Questions from the third category asked about the future and cleanliness of the respondents neighborhood. The final questions asked which community the person lived in. Altogether thirty-one Birmingham residents completed the survey, 43.33% were from North Birmingham and 56.67% were from East Birmingham.

The Chi-Square statistical method was used to test for a statically significant relationship between the variable of home location, and had two possible categorical answers, in this case North or East Birmingham. Chi-Square tests answer whether or not the value of one categorical variable depends on the value of other categorical variables using the formula: $^{2} = \sum \frac{(\quad - \quad)^{2}}{}$. C= degrees of freedom, O= observed value, E= expected value, and N= sample size. If the effects of sprawl do not depend on the

neighborhood then; $_0$: $> 0.05$where results are not significant. If $_1$: < 0.05 then results are significant and neighborhood does impact perception. The survey results were coded and analyzed using the CHISQ.TEST function in Microsoft Excel. A significance level of p<.05 was used to determine whether or not there was a significant difference in how the two communities interpreted sprawl effects. It is important to note when looking at the CHISQ.TEST results only thirty responses were able to be used because one respondent chose not to report which community they reside in, thus N=30.

ARCGIS

ARCGIS was used to determine the percent change of people living in poverty within the Birmingham Metropolitan area. SVI data from 2014 and 2018 were used to map percent changes in poverty out to the fringe suburbs of McCalla, Gardendale, Calera and Trussville. Because the SVI measures data by census tracts, each tract is ranked based on the fifteen social factors of poverty, lack of vehicle access, and crowded housing. Each tract is then grouped into four related themes. Each tract receives a separate ranking for each of the four themes, as well as an overall ranking. Birmingham's tract twenty-four was used as the center of the radius. The outer ring suburbs of McCalla, Gardendale, Calera, and Trussville were included because past these city limits the built environment changes from suburban to rural. Using the SVI variable of: estimated number of people living under the poverty line, a heat map in ArcGIS was created that illustrated an accurate mapping of percent changes in poverty from 2014 to 2018. The purpose of determining geographic percent changes in poverty was to help assess the economic impact of sprawl on the Birmingham metropolitan area by investigating the spatial distribution of poverty and

assessing how poverty is increasing or decreasing in the Birmingham metropolitan areas between 2014-2018.

Using existing data from the 2020 ACS a map of North and East Birmingham was created to map median household income increases and decreases in relation to an economic hub. For this study UAB was used as the hub because it is the largest single employer in the state of Alabama (Kristin Stoller, 2021). UAB's Campus Green was represented as a one block parcel and income levels were geocoded using corresponding census tracts. Census tracts along with UAB were converted to points and the point distance tool measured UAB's proximity to tracts within a five mile straight line distance. Household income was then displayed for each point. A CORREL test was completed in Excel to determine the correlation coefficient between income and distance. This map displayed whether or not being geographically close to UAB had any effect on a household's income.

Property values were analyzed to see the percent change in owner occupied housing units that have a value from less than $50,000 to more than one million. This allowed any increase or decrease in Birmingham housing units to be assessed. Communities with high property values tend to face less adversity brought on by extenuating circumstances, like sprawl, while low property values are indicative of less opportunities for residents (Urban Institute, 2020). Overly restrictive or exclusionary zoning contributes to sprawl by maintaining low property values around certain districts, spurring people to move elsewhere (Talen, 2013). Zoning is also responsible for low-income communities having a disproportionate amount of industry that leads to hazardous environmental conditions.

Low-income African American households are 1.5 times more likely to be exposed to environmental hazards than any other race (Brennan, Peiffer, and Burrowes, 2019).

Social Capital Project

The Social Capital Project (SCP) measures a range of variables involving social, economic, demographic, health, and religion at the county and state level and examines the relationship between these variables and the county sprawl index. The 2018 SCP data was used to determine the social capital of Jefferson County. The SCP looked at indicators related to family structure, interaction, civil society, community cohesion, volunteerism, social organization, and involvement with institutions (Social Capital Project, 2018). The values of the indicators were given standard scores by subtracting the indicators distribution and dividing by the standard deviation (SCP, 2018). Combining the county's known geographic SCP index with survey data from the study gives insight into how residents gauge their social wellbeing, specifically among education, heath, employment, and retail situations. Urban sprawl has been linked to a decrease in social activities due to the travel and time constraints that come with sprawling cities (Nguyen, 2010). The purpose of the SCP was to determine the social health of residents living in Jefferson County in regards to urban sprawl.

Limitations

The survey data produced in this analysis should be interpreted with caution because the sample size represents a small portion of North and East Birmingham residents. Furthermore, the combined responses were biased because the majority of

responses were from East Birmingham residents. Because of the SARS-CoV-2 virus in-person surveys were not an option, thus survey data was dependent on people's willingness to answer questions online. Though the survey had thirty-one respondents one respondent preferred not to answer which community they resided in and their responses could not be included in the statistical data analysis. The other limitation was depending on ACS data for spatial analysis. The ACS data is geocoded to Census tracts, not specific neighborhoods. The maps produced should be interpreted with caution on a neighborhood level because they do not represent individual neighborhoods, but broader census tracts. Because census tracts cross municipality boundaries it was decided to conduct the study at the neighborhood level despite this known limitation.

To that end, this analysis of this study has provided a first step into understanding how North and East Birmingham residents perceive sprawl and what some of the economic and geographic differences are between these two communities. The City of Birmingham can begin to consider strategies and plan for a future that maximizes compact, walkable spaces. The research methods initiated in this study could be applied to all individual neighborhoods throughout the city, providing planners with a quick overview of which neighborhoods are most vulnerable to urban sprawl.

RESEARCH FINDINGS

Factors Contributing To Urban Sprawl In Birmingham

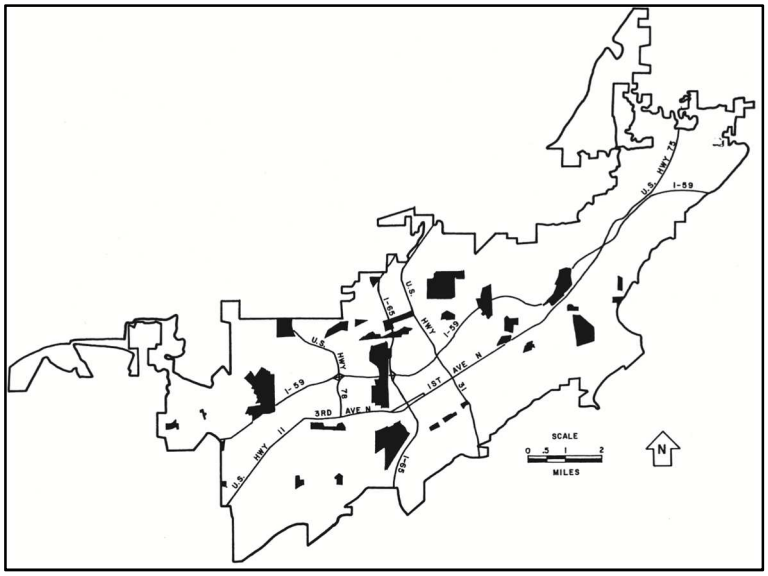

Figure 5. Areas zoned for black households in Birmingham in 1926. Source: Wilson (1977). Courtesy of Southeastern Geographer. Connerly (2002).

The historical content analysis of Connerly's paper found that Birmingham's sprawling present-day conurbation is a direct result of the city's choices in urban renewal and federal highway projects during the fifties and sixties. The University of Alabama At Birmingham (UAB) was the first large displacement project funded through the federal government's urban renewal program that cleared a sixty block African American neighborhood under the guise of slum clearance. Following the construction of UAB the Alabama Highway Department used I-65 and I-59 as a racial buffer between white and black neighborhoods. I-65 was deliberately routed through a low-income black neighborhood, completely eliminating all of the housing units. I-59 was routed to bisect

middle class, suburban style African American neighborhoods in Smithfield (Figure 5) (Connerly, 2002). This forced middle class black residents to look for housing elsewhere, causing a racial shift in neighborhood makeup. Between the construction of UAB, I-65, and I-59 Birmingham had lost nearly 40,000 residents by the 1970 census (Connerly, 2002). Using the interstate to maintain racial boundaries backfired because seventy-five percent of these residents were white households that relocated to adjacent suburbs, such as Homewood and Mountain Brook. By 1980 Birmingham was primarily a low-income African American city. Connerly concludes that this drastic migration of white households out of Birmingham created the circumstances for sprawl to begin by decentralizing the city and isolating the poor (Connerly, 2002).

The survey asked respondents "Which of the following is the major cause for sprawl in your Birmingham neighborhood?". The choices were: (1) availability or access to highways, (2) white flight from city centers, (3) easy access to home loans by a section of the population, (4) desire to live close to nature, (5) ineffective urban planning, and (6) greedy developers. 25.81% of respondents said white flight from city centers was the main cause, followed by 22.58% respectively answering that access to highways and ineffective urban planning were the main cause. 19.35% said greedy developers were to blame, and 9.68% said access to home loans. None of the respondents answered that the desire to live close to nature was a major cause. The majority of respondents answering that white flight is the main cause of urban sprawl echoes the patterns that Charles Connerly found in his research. Research expectations were met with most residents agreeing that white flight was the main cause of sprawl, closely followed by the construction of the interstate system.

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During 2020 the neighborhoods situated closer to UAB did not appear to have an economic advantage. The tract UAB is located in has an annual median household income of $15,001-$30,000. North Birmingham has a higher median household income within the community earning $45,000. What does seem to increase earning potential is living in the areas of Birmingham that border Homewood and Mountain Brook, suburbs to the south of Birmingham. A CORREL test in Excel returned a correlation coefficient of -0.7, suggesting that there is no relationship between income and straight line distance to UAB. The concluding results show that North Birmingham households as a whole have a slightly higher income than East Birmingham. These results were not expected based on the amount of revitalization activity in East Birmingham as compared to North Birmingham. Results indicate that being closer to an economic hub has no correlation to earning a higher income for Birmingham residents.

Survey respondents were asked "Does urban sprawl affect your travel to work''? The chi square test results for travel to work yielded a p-value of <0.03. This determined that there is a significant relationship between community and travel to work, with North Birmingham residents responding that sprawl does affect their travel to work. The following results reveal that expectations were met for North Birmingham, residents travel to work is impacted by sprawl. When responses were combined together (not separated by community) 58.06% of respondents said no, and 41.94% responded yes. ACS data from 2019 indicates that 67.7% of Birmingham residents commute less than twenty-five minutes to their place of employment (Appendix 3). As far as transportation to work is

concerned ACS data shows that African American's heavily rely on public transportation to work (Appendix 4). Reviewing the opinions from the perspective of both neighborhoods it does not appear that sprawl affects travel time to work. When comparing the two case study communities urban sprawl has an increased impact on North Birmingham residents traveling to work. Respondents were asked "does urban sprawl affect your access to employment opportunities''? 58.06% responded no, and 41.94% responded yes. There was no significant relationship between either community and access to employment opportunities.

Median home value results reveal that Birmingham has experienced a decrease in owner occupied units under $199,999 from 2012 to 2019. Housing units valued more than $200,000 have increased. Areas with higher property value follow the same pattern as household income. Birmingham's housing units are not tied to census tracts, making these results applicable to the city as a whole. Survey respondents were asked "How promising is the future of this neighborhood"? 41.94% responded that their neighborhood was somewhat promising, it is okay for now, 25.81% responded that their neighborhood is not so promising, they would like to move, 19.35% responded their neighborhood is very promising and they intend to stay. 6.45% responded that the future of their neighborhood was extremely promising and they intended to stay, while 6.45% responded that the future is not at all promising and they are trying to move now. These survey results reveal that the majority of the sample size was content with their current neighborhood at the time of the survey. Since 56.67% of the sample size was from East Birmingham these results did meet research expectations of the majority of residents being content with their current neighborhood.

It should be noted that poverty thresholds are updated each year by the Census Bureau and are adjusted for inflation, using the official poverty measure (OPM) (U.S. Census Bureau, 2021). The OPM calculates the federal poverty threshold using three variables: (1) income, (2) threshold, and (3) family size. The threshold is set at three times the cost of a minimum food diet in 1963 and is adjusted for household size. These calculations estimate what percentage of the population is poor (U.S. Census Bureau, 2021). In 2014 the federal poverty threshold for a family of four was $23,230, in 2016 it increased to $24,300, and in 2018 it increased to $25,100.

Percent changes in poverty was mapped for each tract in the Birmingham metropolitan area for 2014 to 2018 (Appendix 8). Results indicate that poverty levels are increasing in fringe suburbs up to twenty percent and decreasing in certain tracts in Birmingham. Gardendale and McCalla have experienced as much as a twenty percent increase in poverty levels while Trussville and Calera have experienced a five to ten percent increase. The 2019 ACS measured geographic mobility for Birmingham residents and found that 7.40% of residents in owner occupied housing and 23.50% in renter occupied housing that moved in 2019 remained in Jefferson County (Appendix 5). The following results reveal that research expectations were met, poverty levels are increasing in fringe suburbs and Birmingham has seen a five percent decrease within the city.

Data from the 2018 Social Capital Project scored Jefferson County as ranking 56 out of 62 counties in Alabama, scoring in the bottom twenty percent (Appendix 14). Nationally Jefferson County ranked in the seventh percentile for social capital. The RPCGB survey respondents were asked five questions to determine their view on how sprawl affects their access to social opportunities. 54.84% of respondents said that urban sprawl does not

affect their access to educational institutions. 61.29% of respondents said that urban sprawl does not affect their access to healthcare. 58.06% of respondents said that urban sprawl does affect their access to other places in the city. 60% of respondents said that urban sprawl does affect their access to shopping malls. Results of the Chi-Square test yielded a p-value of <0.03 for access to educational institutions. Residents in North Birmingham are disproportionately impacted by sprawl when it concerns access to educational institutions over East Birmingham residents. The remaining social impact variables did not have a significant impact on one community versus the other.

The survey responses revealed that urban sprawl has the greatest combined impact on North and East Birmingham residents' access to shopping malls and other places in the city. Because Birmingham's only large shopping center is The Summit North and East Birmingham residents would need to travel further for retail shopping. The sample size survey responses combined with the Social Capital Project data did meet research expectations that urban sprawl has impacts on residents' social opportunities.

Environmental Impacts Of Sprawl

The Environmental Protection Agency's (EPA) environmentally contaminated sites in North and East Birmingham reveal that North Birmingham has thirty-seven brownfields and East Birmingham has twenty four brownfields. North Birmingham also has the 35th Avenue Superfund Site that has been put on the National Priority List (NPL). Survey respondents were asked "does sprawl affect the air quality and sanitation in your neighborhood"? 41.94% of respondents said no, not all; 22.58% of respondents said yes, both; 19.35% of respondents said yes, only air quality; and 16.13% of respondents said yes,

only sanitation. Results of the Chi-Square test yielded a p-value of <0.003 determining that a relationship exists between environmental pollution and North Birmingham. East Birmingham residents did not have a significant relationship with environmental impacts.

Summary

The results of the study indicate that residents in North and East Birmingham do experience some adverse effects brought on by urban sprawl. Respondents were asked which neighborhood they live in with 56.67% of survey respondents answering East Birmingham, and the remaining 43.33% North Birmingham. East Birmingham began transitioning from a low-income, industrial neighborhood to a gentrified, redeveloped area in 2010 largely due to Birmingham's beer scene (Free The Hops, 2021). North Birmingham has not seen any significant redevelopment at present. Research expectations were that East Birmingham residents would have less experience with sprawl's effects and North Birmingham residents would be impacted more by sprawl. The Chi-Square test results for education, work commute, and environmental pollution confirmed these expectations.

In regard to the historical causes of sprawl 48.39% of residents surveyed agree that Birmingham's urban sprawl was brought about by white households fleeing the city and the construction of interstate highways, these results did match research expectations. The economic research done in the study indicates that property values are rising in East Birmingham, these results match East Birmingham's current state of redevelopment. Results also indicate that fringe suburbs are experiencing a rise in low-income households, while certain tracts in Birmingham are seeing a decrease. Being close to an economic hub

did not increase median household income, however being near a wealthier suburb did. Results indicate that urban sprawl impacts social capital the most. Aside from the social impacts of sprawl East Birmingham residents did not perceive sprawl impacting their access to employment, healthcare, or education. East Birmingham residents do not perceive sprawl as affecting their environment.

DISCUSSION AND POLICY IMPLICATIONS

Policy Recommendations and Strategies

Urban sprawl has been described as a failure in modern American planning to provide engaging, sustainable communities (Silliman, 2016). Urban sprawl has increased traffic congestion, oil consumption, and inner-city blight. At the same time, it has decreased natural habitats, time with family, and the ability to live in close proximity to work (Swilling, 2016). In the 21st century sprawl has led to more urban planning issues. Cities like Birmingham that have been decentralized from the original core are now facing the issues of gentrification. This problem is the exact opposite of sprawl. Instead of leaving the city, young people in the millennial demographic are returning to the city because they want to be within walking distance of home, work, and new amenities. This in turn pushes out generational populations that can no longer afford the redeveloped area. Unless solutions for urban sprawl are implemented into current planning practices the side effects of sprawl will continue to plague the most vulnerable populations. To this end, this study includes a list of policy recommendations and strategies to ensure the city of Birmingham prioritizes sustainable, compact development that mitigates sprawl and promotes equitable access to opportunities.

1. **The Application of Growth Management Techniques.**

Strategy: Create an urban growth boundary around the City of Birmingham that limits urban expansion onto undeveloped lands. Having a growth boundary in place limits the amount of commuting and infrastructure cost and promotes dense, compact cities. Boundaries also alleviate poor long-term planning as they ensure that developers and citizens know exactly where future development will occur. Having a growth boundary could help stabilize property values as it limits the availability for new construction.

2. **Close the Education Gap**

Strategy. Provide equity funding to public schools across all districts and reduce the reliance on property tax funding. Equity funding provides proportional funding for inner city districts like Birmingham City Schools, who do not receive adequate funding from local property taxes alone. Property taxes for Jefferson County could be pooled together and distributed based on a proportionate need and the amount of low-income students. This would help close the education gap between urban and suburban school districts. In addition to fixing funding gaps, extra state funds and community resources could be targeted to help low-income children with things like school supplies, weekend food, and clothes.

3. **Carpool Lanes and Ramp Metering**

Strategy. Decrease commute time and vehicle congestion through traffic calming. Adding in high occupancy vehicle lanes for carpoolers would decrease the amount of cars on the road during peak times. Decreasing the amount of cars on the interstate would also decrease the air pollution that is created by cars. Ramp metering controls the frequency

with which cars enter the interstate. It would allow the flow of traffic to be consistent, reducing commute time and cutting down on traffic accidents.

4. **Public-Private Partnerships for Environmental Cleanups**

Strategy. Combine the EPA's resources with private companies to help cleanup contaminated areas of Birmingham. Early completion bonuses and developer incentives could be used to reduce the costs of mitigation and increase the cleanup process. This would relieve the burden of funding cleanups that the city incurs.

5. **Additional Resources for Suburbanization of Poverty**

Strategy. Put in place resources that are easily accessible to suburban households living in poverty. These would include satellite offices for help with food stamps, medicaid, housing resources, and employment opportunities. Establishing community outreach groups that provide low-income suburbanites with education on the resources available to them helps make up for the spread out nature of suburban communities.

CONCLUSION

The case study of North and East Birmingham demonstrates the differences in how residents interpret the impacts of urban sprawl within the same municipality. Planners need to be made aware of how residents perceive the impacts of sprawl because it allows planners to meet the individual needs of each neighborhood. Because urban sprawl arose out of white flight it has created racial and economic disparity among people still living within the urban cores of cities. When wealthier people move out of the city, they take their tax dollars with them, this further erodes economic funding for education, maintenance, and crime prevention. Birmingham, like other mid-sized sprawling cities, has begun to experience the long-term effects sprawl has on a city's trajectory for sustainable growth. This study focused on answering how North and East Birmingham interpret the impacts of sprawl, specifically for the social, economic, and environmental aspects of their community; and what were the historical factors that have contributed to Birmingham's sprawling city limits.

North and East Birmingham were chosen as the two case study communities to use in the comparative study because prior to 2010 these adjacent communities had very similar demographics (U.S. Census Bureau, 2021). East Birmingham has experienced an urban revitalization that can be traced back to the opening of Avondale Brewery in 2010 (Williams, 2010). The Brewery became an anchor on 41st Street South, breathing new life into an area that was economically stagnant. Today East Birmingham has the trendy neighborhoods of Avondale, Crestwood, Woodlawn and East Lake. The neighborhood demographics have changed, increasing in young, white college graduates (Fowlkes, 2019).

North Birmingham represents East Birmingham's not so distant past with the neighborhoods of Acipco-Finley, Collegeville, Fairmont, Harriman Park, and Hooper City. In the 2015 North Birmingham Community Framework Plan designed by RPCGB the community was described as having "severe blight, a declining population, and a lagging workforce". The plan called for a 'stabilize and sustain' strategy that would reduce blight and ideally increase property value. Since 2015 none of the strategies laid out in the framework plan have been implemented. For that reason this allowed the study to compare North and East Birmingham resident's responses and determine if revitalization of an area lessens the perceived impact of urban sprawl.

Understanding the historical factors that have contributed to sprawl played an important role in recognizing how Birmingham's racially segregated past influences the city's perimeters today. In examining these historical factors, it was determined that white flight and the federal interstate highway system are largely seen as responsible for Birmingham's sprawl problem. The Alabama Department of Transportation (ALDOT) had the chance to rectify the original poor placement of Interstate 59/20 by redesigning the I 59/20 bridge that was demolished,reconstructed, and reopened within a fourteen month timeline. Instead of opting for a cohesive design that would have opened up the north side of the city to downtown ALDOT maintained the original footprint of the bridge, choosing instead to widen it to eight travel lanes, auxiliary lanes, and ten foot shoulders. Infrastructure choices such as this have major implications on neighborhood sustainability. Birmingham's inability to challenge ALDOT's design maintains the disconnect between communities that is often seen with sprawl (Caitlin Dewey, 2020).

Residents' opinions of the economic, social, and environmental impacts of sprawl were likewise important in understanding how urban sprawl affects communities. Mapping income distribution in relation to an economic hub made it able to ascertain whether or not being in close proximity to a hub has any influence over an individual's income. The results of the geographic analysis showed that being near UAB did not correlate to a higher earning potential. UAB is the largest employer in the state of Alabama, but it is also a college campus. It is possible that the households surrounding UAB are largely unemployed college students, therefore skewing the census tract figures. Regardless of this it is still important to know if large institutions have an effect on neighborhood earning potential. Using this type of analysis allows planners to determine the overarching economic benefit of a facilities location and whether that location has significant economic consequences.

Due to the nature of sprawl it is possible UAB's employees are working at UAB and commuting in from neighboring suburbs, thus their income would not be calculated into the adjacent tracts. An internal study focusing on UAB employee commuting habits would need to be conducted to determine this. The ACS has already determined that the majority of Birmingham residents live and work within a twenty-five-minute commute. This has been documented in North Birmingham through interviews done by GASP, a local environmental justice non-profit. GASP has found that many workers in North Birmingham are employed in the very factories that are responsible for the long-standing environmental contamination (GASP, 2021). It needs to be considered that though living and working within the same community does drastically shorten commute times, it does not alleviate all of the burdens of sprawl.

The environmental impacts of Birmingham's sprawl can be traced back to the industrial sites, or not-in-my-backyard (NIMBY's) that occupy the North and East Birmingham communities. The south, south east quadrant of the city has historically been the wealthier, whiter neighborhoods in Birmingham. This is also reflected in the mapping of median household income and property value, thus NIMBY's were located in the north, northeast sections of the city that were historically zoned for African Americans (Appendix 6)(Soloman Crenshaw, 2018). The close proximity of the interstate systems further elevates levels of air pollution in these communities, the I 59/20 bridge alone is expected to serve 225,000 vehicles a day by 2035 (ALDOT, 2020).

Residents' opinions of the environmental impacts of sprawl are an important consideration because their perspective relies on the level of knowledge they have regarding environmental pollution. In low-income communities this knowledge is typically acquired from environmental advocacy groups and city councilors (GASP, 2021). In the case of North Birmingham, residents were influenced by Oliver Robinson, a former member of the Alabama House of Representatives. Robinson was bribed to use his influence over North Birmingham residents and encourage them to oppose any environmental mitigation plans proposed by the EPA. Robinson downplayed the environmental contamination at the 35th Avenue Superfund Site and took advantage of residents' ignorance regarding pollution. Educating citizens about the environmental risks associated with sprawl and NIMBY's in their communities builds the skills and attitude needed for people living in the community to advocate for themselves.

In 2017 the City of Birmingham rezoned 863 acres worth of North Birmingham properties from heavy industrial to light manufacturing (Erin Edgemon, 2017). This

rezoning is reflected in the geographic analysis of median home value prepared in the study. The rezoning was done in the hopes that it would spur economic development for North Birmingham. Zoning ordinances are an essential part of a community's economic mobility. Determining how zoning affects property values is paramount for planning purposes. It allows for planners to strategize projects based on current and future community needs. For North Birmingham, rezoning parcels did not result in an increase of property value or community development, the median home value for 2020 continues to stay flat. Planners should instead focus on public works projects that have been shown to increase property value, such as sidewalks and green space (Discover, 2021).

Shifts in poverty concentration are an important component of studying urban planning. As cities see the reverse of white flight, instead of leaving the city people are returning, there is an influx of wealthier individuals looking for luxury condos (Fowlkes, 2019). This in turn displaces low-income households who relocate out to the suburbs where the cost of living is inherently cheaper. Suburban poverty is quickly becoming sprawl's biggest complication. Low-income suburban households are further away from government assistance programs that are typically located downtown and overall suburbs are ill equipped to handle widespread poverty (Patton, 2010). Urban sprawl has now caused two geographically different paths to poverty; urban and suburban. Tracking the concentration of poverty can help suburban municipalities initiate programs that help aid households living in suburban poverty.

Sprawl not only impacts physical resources but social resources as well. As people live further away from each other their bonds are weakened over time, taking a toll on their social wellbeing (Puttnam, 2000). Understanding how people interpret the impact

sprawl has on their social life is important in deducing how people prioritize being near social amenities over employment, health, and education institutions (Vera Toepoel, 2012). Combined responses from North and East Birmingham residents indicate that compared to the economic and environmental impacts of urban sprawl the social impacts were the most noticed. This provides an opportunity for a future study to be conducted by RPCGB to ascertain which social variables are most pressing, and initiate land use policies that help mitigate sprawls' effect on social health. Being made aware that social wellbeing is perceived as the largest drawback of sprawl helps planners draft plans to soothe feelings of urban isolation, loneliness, and vacancy (Toepoel, 2012).

The future of urban sprawl's impact on North and East Birmingham will depend on the City of Birmingham's Planning, Engineering and Permits (PEP) Department, RPCGB, city council, and Birmingham Metropolitan Planning Organization (BMPO). These organisations are responsible for the city's zoning ordinances, developer incentives, and land use policies. This preliminary study can be used as a guiding foundation for Birmingham and adjacent suburbs to come together and alleviate some of the impacts of sprawl through an urban-suburban alliance. If a similar project was undertaken researchers should consider looking at the effect regionalism would have on the Birmingham Metropolitan Area. Regionalism involves urban, suburban, and rural areas banding together to achieve a common goal for the region. In the case of urban sprawl that would provide much needed economic, social, and environmental solutions for a decades old problem that would benefit all residents, urban and suburban, affected by urban sprawl.

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APPENDIX 1. Chi-Square test result

H_0: $p > 0.05$, H_1: $p < 0.05$

Which of the following is the major cause for sprawl in your Birmingham neighborhood?

$X^2(1, N = 30) = 1.1538$, $p = .885638$ *Results are not significant at p <.05*

Results						
	Availability or access to highways	White flight from city centers	Easy access to home loans	Ineffective urban planning	Greedy developers	***Row Totals***
North Birmingham	2 (2.60) [0.14]	4 (3.47) [0.08]	1 (1.73) [0.31]	3 (2.60) [0.06]	3 (2.60) [0.06]	13
East Birmingham	4 (3.40) [0.11]	4 (4.53) [0.06]	3 (2.27) [0.24]	3 (3.40) [0.05]	3 (3.40) [0.05]	17
Column Totals	6	8	4	6	6	**30 (Grand Total)**

Does urban sprawl affect your access to educational institutions?

$X^2(1, N = 30) = 4.693$, $p = .030287$ *Results are significant at p < .05*

Results						
	Yes	No				***Row Totals***
North Birmingham	9 (6.07) [1.42]	4 (6.93) [1.24]				13
East Birmingham	5 (7.93) [1.08]	12 (9.07) [0.95]				17
Column Totals	14	16				**30 (Grand Total)**

Does urban sprawl affect your access to healthcare?

$X^2(1, N = 30) = 0.362$, $p = .547403$ *Results are not significant at p < .05*

Results						
	Yes	No				***Row Totals***
North Birmingham	6 (5.20) [0.12]	7 (7.80) [0.08]				13
East Birmingham	6 (6.80) [0.09]	11 (10.20) [0.06]				17
Column Totals	12	18				**30 (Grand Total)**

Does urban sprawl affect your access to any other places in the city?

$X^2(1, N = 30) = 0.8145$, $p = .366799$ *Results are not significant at p < .05*

Results						
	Yes	No				***Row Totals***
North Birmingham	9 (7.80) [0.18]	4 (5.20) [0.28]				13
East Birmingham	9 (10.20) [0.14]	8 (6.80) [0.21]				17
Column Totals	18	12				**30 (Grand Total)**

APPENDIX 1 continued

Does urban sprawl affect your access to employment opportunities?

$X^2(1,\ N = 30) = 3.0964,\ p = .078467$ *Results are not significant at* $p < .05$

Results						
	Yes	No				***Row Totals***
North Birmingham	8 (5.63) [0.99]	5 (7.37) [0.76]				13
East Birmingham	5 (7.37) [0.76]	12 (9.63) [0.58]				17
Column Totals	13	17				**30 (Grand Total)**

Does urban sprawl affect your travel to work?

$X^2(1,\ N = 30) = 4.693,\ p = .030287$ *Results are significant at* $p < .05$

Results						
	Yes	No				***Row Totals***
North Birmingham	9 (6.07) [1.42]	4 (6.93) [1.24]				13
East Birmingham	5 (7.93) [1.08]	12 (9.07) [0.95]				17
Column Totals	14	16				**30 (Grand Total)**

Does urban sprawl affect your access to shopping malls?

$X^2(1,\ N = 30) = 0.2217,\ p = .637717$ *Results are not significant at* $p < .05$

Results						
	Yes	No				***Row Totals***
North Birmingham	8 (7.37) [0.05]	5 (5.63) [0.07]				13
East Birmingham	9 (9.63) [0.04]	8 (7.37) [0.05]				17
Column Totals	17	13				**30 (Grand Total)**

Does sprawl affect the air quality and sanitation in your neighborhood?

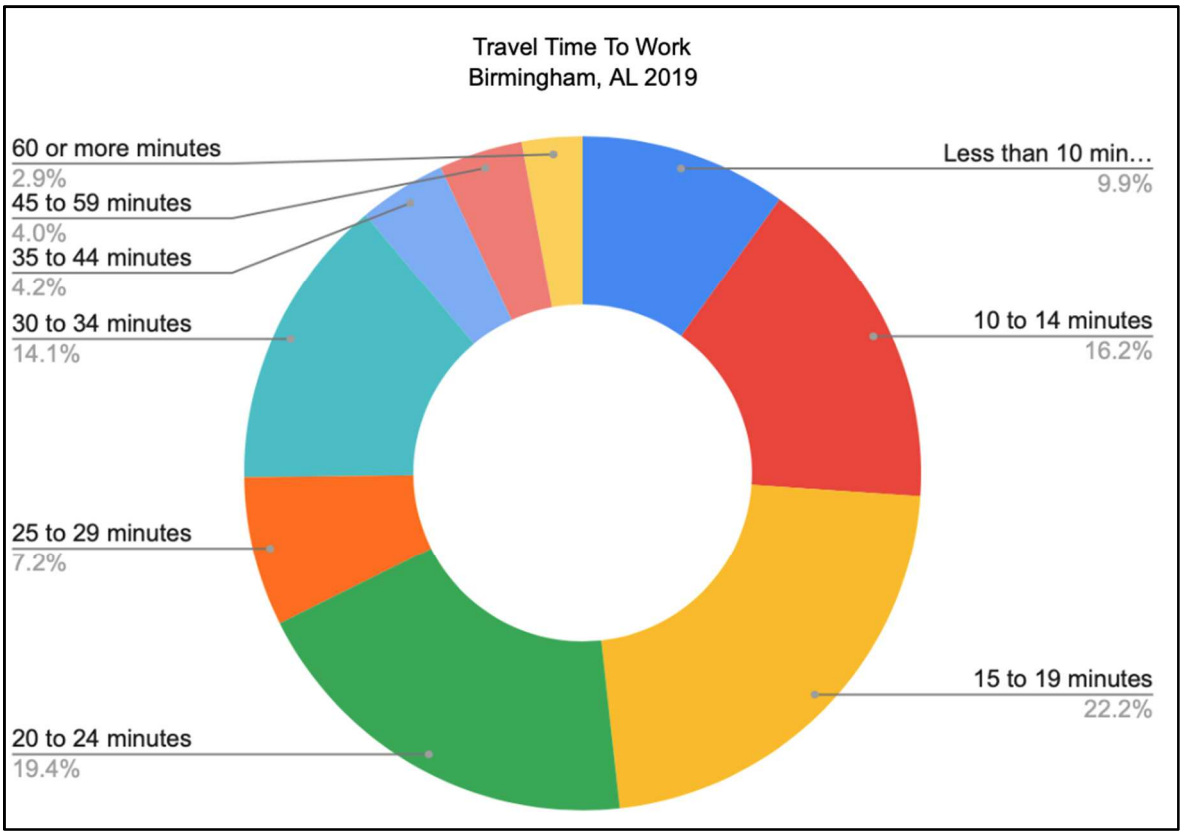
$X^2(1,\ N = 30) = 12.5305,\ p = .00577$ *Results are significant at* $p < .05$

Results						
	Yes, both	No, not at all	Yes, only sanitation	Yes, only air quality		***Row Totals***
North Birmingham	5 (2.60) [2.22]	1 (5.63) [3.81]	3 (2.17) [0.32]	4 (2.60) [0.75]		13
East Birmingham	1 (3.40) [1.69]	12 (7.37) [2.91]	2 (2.83) [0.25]	2 (3.40) [0.58]		17
Column Totals	6	13	5	6		**30 (Grand Total)**

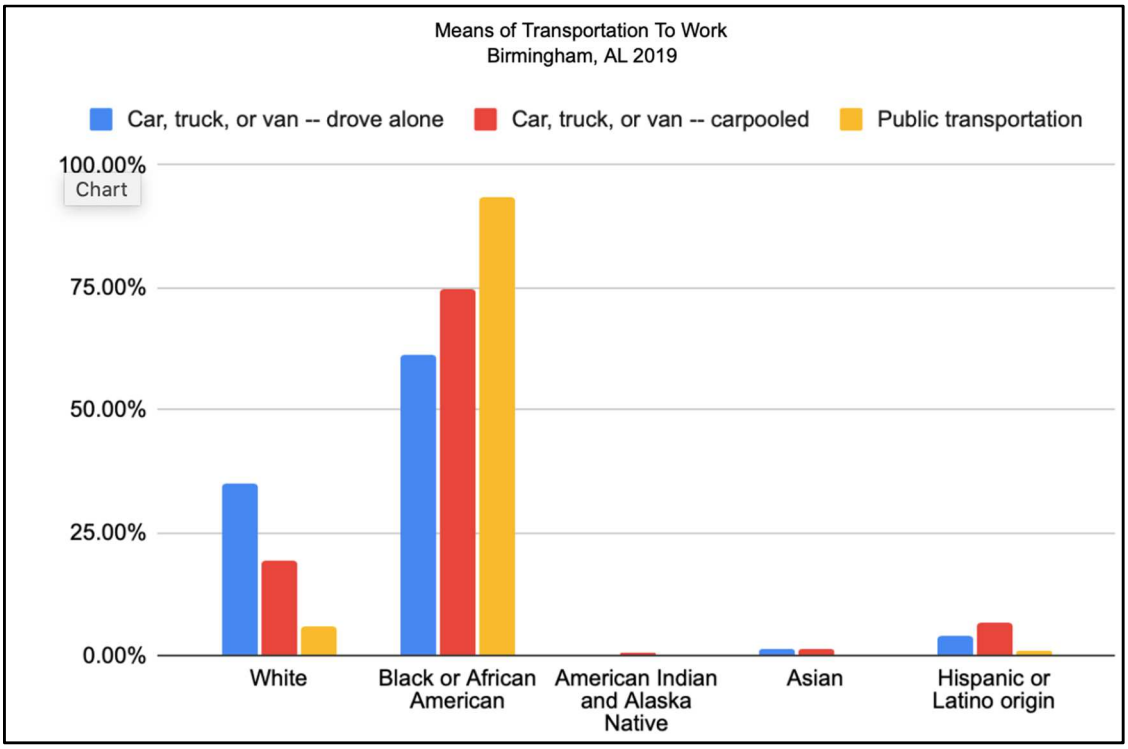
APPENDIX 2. Survey questions and results

Questions	Answers
1.Which of the following is the major cause for sprawl in your Birmingham neighborhood?	• Availability or access to highways (22.58%) • White flight from city centers (25.81%) • Easy access to home loans by a section of the population (9.68%) • Desire to live close to nature (0%) • Ineffective urban planning (22.58%) • Greedy developers (19.35%)
2. Does urban sprawl affect your access to educational institutions?	• Yes (45.16%) • No (54.84%)
3. Does urban sprawl affect your access to healthcare?	• Yes (38.71%) • No (61.29%)
4. Does urban sprawl affect your access to any other places in the city?	• Yes (58.06%) • No (41.94%)
5. Does urban sprawl affect your access to employment opportunities?	• Yes (41.94%) • No (58.06%)
6. Does urban sprawl affect your travel to work?	• Yes (45.16%) • No (54.84%)
7. Does urban sprawl affect your access to shopping malls?	• Yes (60%) • No (40%)
8. How promising is the future of this neighborhood?	• Extremely promising, I intend to stay here (6.45%) • Very promising, intend to stay here (19.35%) • Somewhat promising, it is okay for now (41.94%) • Not so promising, I would like to move (25.81%) • Not at all promising, I am trying to move now (6.45%)
9.Does sprawl affect the air quality and sanitation in your neighborhood?	• Yes, both (22.58%) • No, not at all (41.94%) • Yes, only sanitation (16.13%) • Yes, only air quality (19.35%)
10. Which neighborhood do you live in?	• North Birmingham Community (43.33% • East Birmingham (56.67%)

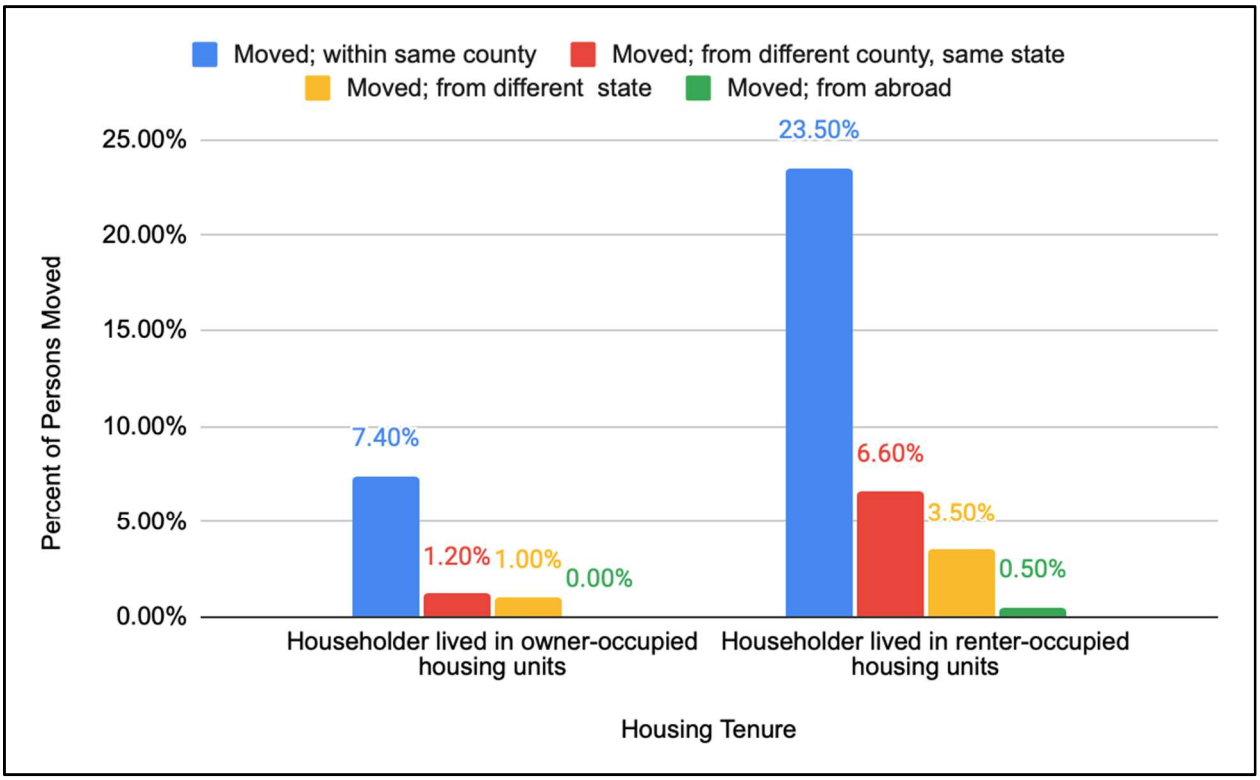
APPENDIX 3. Travel Time To Work For Birmingham, AL Residents. Source: 2019 ACS data.



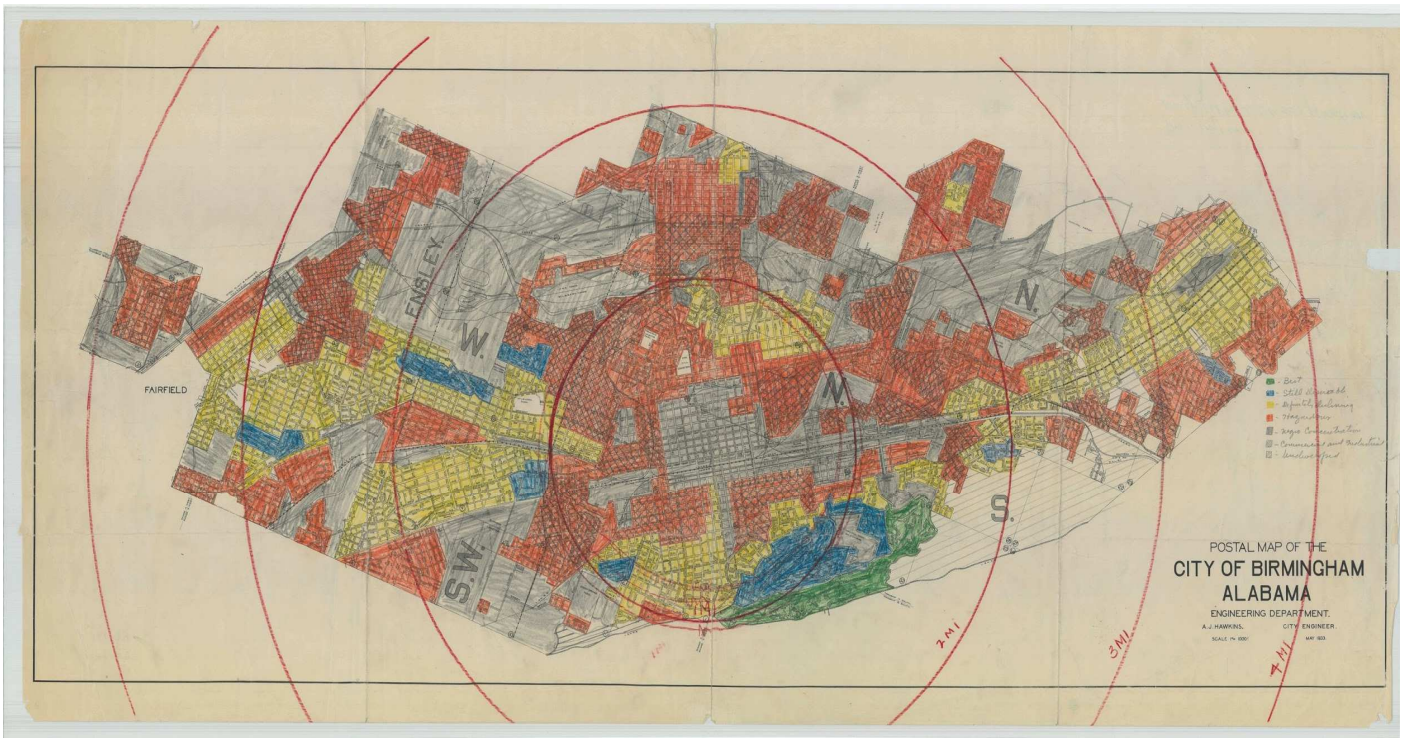
APPENDIX 4. Means of Transportation To Work. Source: ACS, 2019



APPENDIX 5. Geographic Mobility for Birmingham, AL Residents. Source: 2019 ACS data.



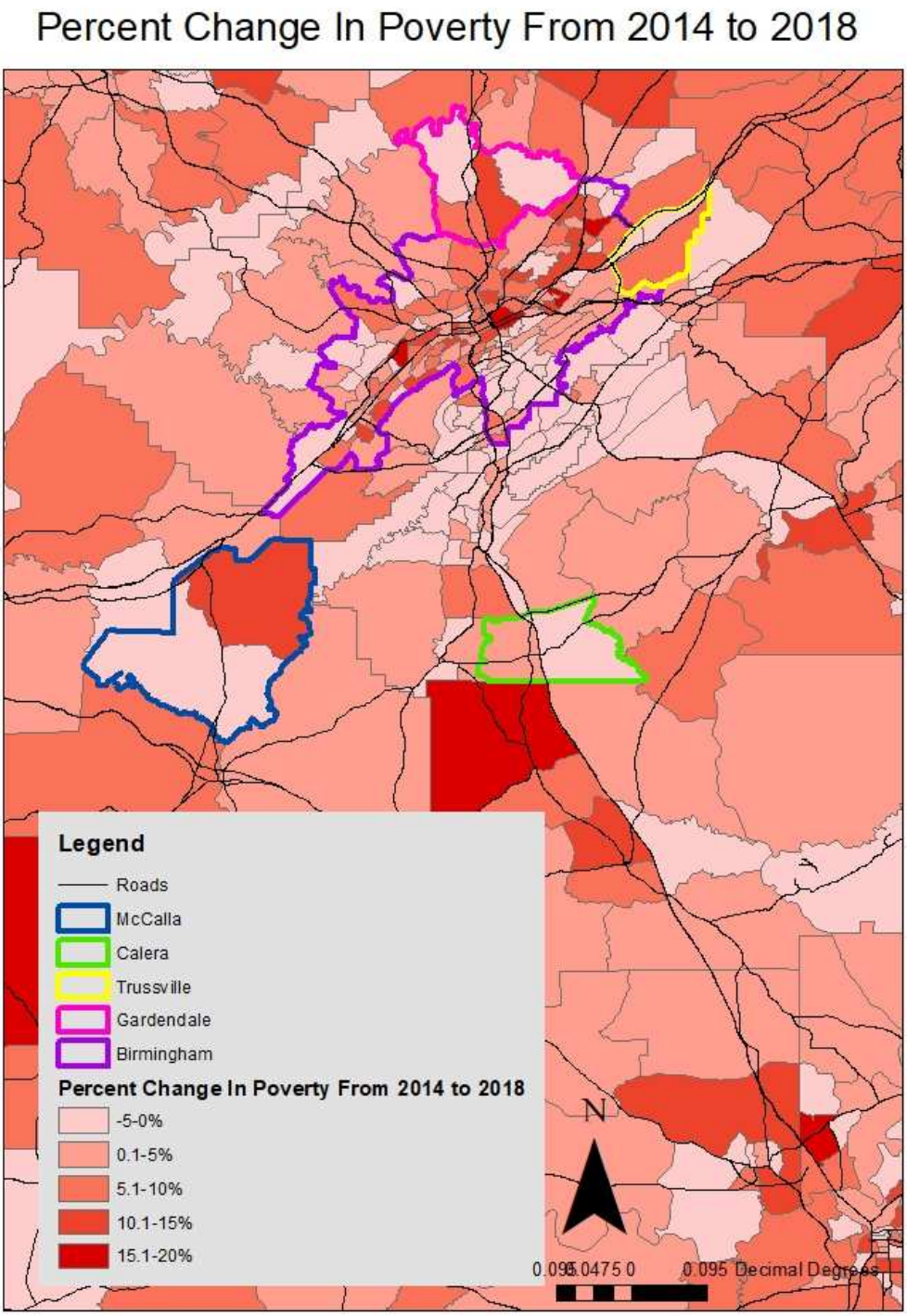
APPENDIX 6. Historical Zoning Map of Birmingham. Blue and green represents white neighborhoods and grey represents African American neighborhoods. Source: Randi Revill, 2016



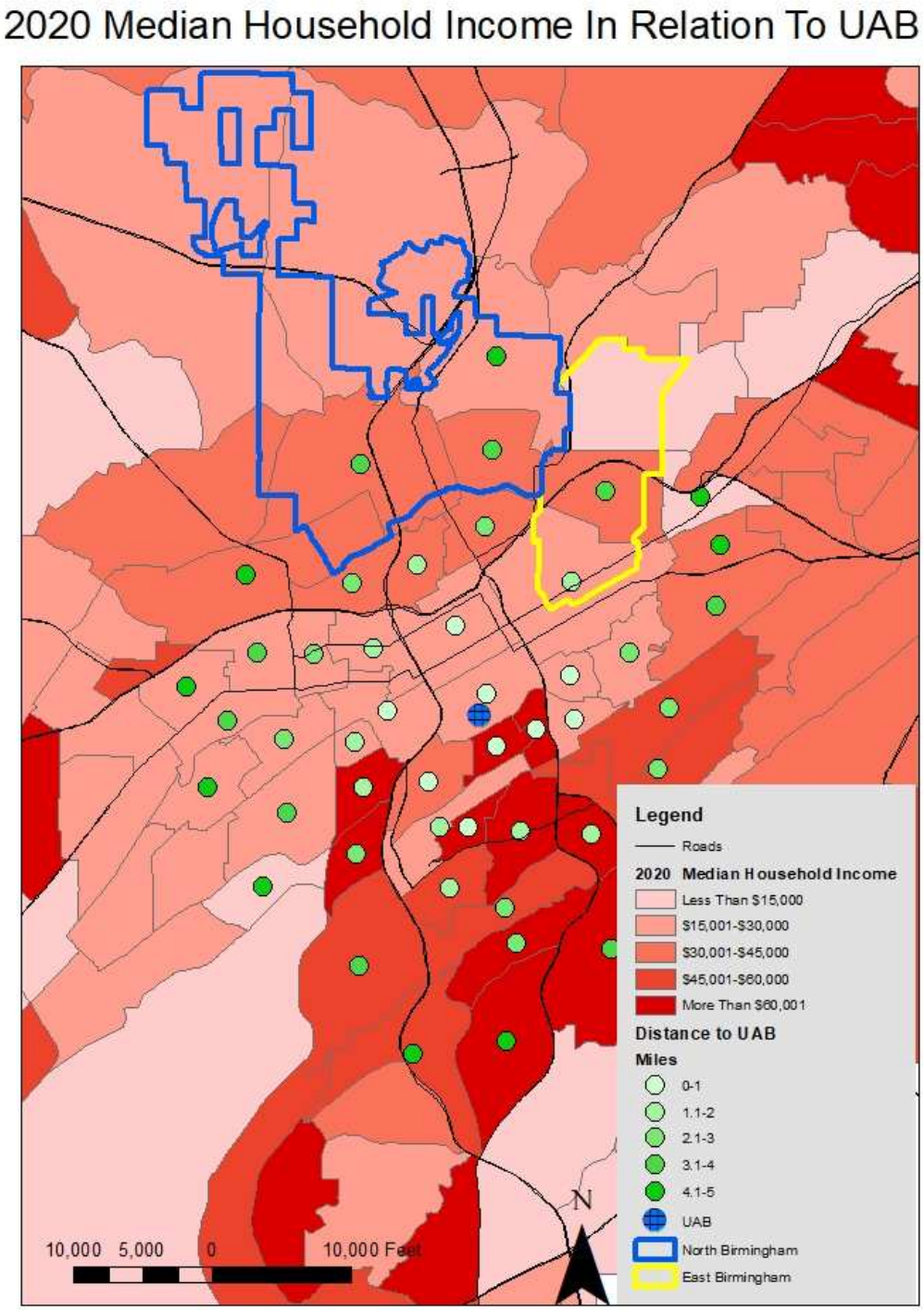
APPENDIX 7. Social Capital Project variables. Source: SCP, 2018.

Variable	Definition
SOCTRUST	Social trust: combines answers to questions of levels at which respondents trust different groups in society (people in the neighborhood, work colleagues, people at church or places of worship, people working in stores, local police). The index is standardized with respect to the national norms.
DIVRSITY	Diversity of friendship: counts the number of different types of personal friends the respondents has from the 11 possible types.
GRPINVLV	Number of formal group involvements: counts the number of different nonreligious groups the respondent has been a member of from 18 possible types.
FAITHBASED	Faith-based social capital: combines answers to questions that ask participants whether they are a member of a local church or other religious community, how often they attend religious services, whether they have taken part in any activity with other people at their church or place of worship other than attending services, and whether they have any affiliation with nonchurch religious organizations. Their levels of contributing and volunteering were recorded to calculate the index. The index was computed as the mean of the standardized variables obtained from the answers.
SCHMOOZ	Informal social interaction index: mean of standardized responses to the question asking the respondent to supply the estimate of the number of times he or she has undertaken certain social activities in the past 12 months. Those activities include times of playing cards with others, visiting relatives or having them visit, of having friends over, socializing with coworkers outside of work, and socializing with friend in public places.
ORGINTER	Organized group interactions: mean of the scores standardized against the national normal of a 3-item question. It asks how many times in the past 12 months the respondent has attended (1) any public meetings in which there was a discussion of town or school affairs, (2) a club meeting, and (3) a celebration, parade, or an event in his or her community.
CHARITY	Giving and volunteering: combines reversed polarity versions of volunteering for different types of organizations: arts, health-related, neighborhood, religious, youth groups, and those which help the poor or elderly; the total number of times volunteered, and contributions to secular charities and religious causes.
PROTEST	Nonelectoral political participation: signing petitions, attending political meetings or rallies, joining in any demonstrations, protests, boycotts, or marches; also, involvement in local reform efforts, membership of political groups, ethnic, national, or civil-rights groups, or labor unions.
ELECPOL	Electoral politics: combines past voting, voter registration, interest in politics and national affairs, political knowledge (of US senators), and frequency of newspaper reading.

APPENDIX 8. Percent change in poverty from 2014 to 2018. Source: SVI, 2014 & 2018.



APPENDIX 9. 2020 Median household income for census tracts in relation to UAB. Source: EPA and US Census.



APPENDIX 10. Percent change in owner occupied housing value from 2012 to 2019. Source: US Census.

2012		2019		
Value		Value		
Owner-occupied units	74,119,256	Owner-occupied units	78,724,862	Percent Difference
Less than $50,000	6,784,356	Less than $50,000	4,911,653	-28%
$50,000 to $99,999	12,100,148	$50,000 to $99,999	80,334,91	-34%
$100,000 to $149,999	12,245,474	$100,000 to $149,999	901,31,04	-26%
$150,000 to $199,999	11,370,120	$150,000 to $199,999	104,248,80	-8%
$200,000 to $299,999	13,393,416	$200,000 to $299,999	160,792,98	20%
$300,000 to $499,999	11,068,593	$300,000 to $499,999	168,707,33	52%
$500,000 to $999,999	5,696,677	$500,000 to $999,999	102,940,23	81%
$1,000,000 or more	1,460,472	$1,000,000 or more	3,097,680	112%

APPENDIX 11. Social Capital Project quality of life in relation to sprawl. Source: Social Capital Project.