CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

THE TOPOGRAPHY OF RESIDENTIAL BURGLARIES

IN

ATLANTA, GEORGIA

A thesis submitted in partial fulfillment of the requirements
For the degree of Master of Arts in Geography, GIS Program

By

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DEDICATION

For Mom, Nina, Alix, Ashley, and Abigail

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ABSTRACT

THE TOPOGRAPHY OF RESIDENTIAL BURGLARIES
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Atlanta, Georgia experienced a spike in its residential burglary rate in 2008, peaking at nearly twenty-four and a half percent above the rate of 2007. This study identifies clusters of residential burglaries in Atlanta, temporal frequencies of the crimes and analyzes potential environmental factors that increased criminal activity using a mixed methods approach. A series of quantitative analyses focused on clusters of reported residential burglaries across twelve police beats, spanning both urban and suburban regions of Atlanta. Regression analyses and kernel density tests suggested strong relationships between burglary rates and the socio-economic conditions and neighborhood types in Atlanta. Additional qualitative approaches revealed important environmental attributes influencing the frequency of crime trends and patterns, including neighborhood design and land use. Design elements such as *cul-de-sacs*, curvilinear streets, and reduced access points appeared to lower rates of burglary, whereas locations with grid-patterned streets experienced higher burglary rates. Furthermore, proximity to schools and railway yards were identified as having a negative impact on burglary rates. Temporal patterns of burglary were found to be consistent across the study area.

CHAPTER I

INTRODUCTION

1.1 Overview

Crime researchers have discussed the notion that prosperous times bring higher rates of property crime (Devine, Sheley and Smith, 1988; Oster and Agell, 2007). It is therefore reasonable to believe that considering from 2007 to 2009 the United States experienced the worst recession since the Great Depression, property crimes would have declined.

That was not the case for the City of Atlanta, Georgia. In 2008, the city experienced its highest rate of residential burglaries, up twenty-four and a half percent from the previous year– a figure that would seem to contradict the aforementioned assumption (Table 1.1). The steady increase in reported burglary rates occurred over a three-year period from 2006 to 2008. Also occurring during that time was a significant increase in population, when compared to the previous three years. The increase in population for 2006 may be attributed to the relocation of refugees from Hurricane Katrina, which made landfall in the Gulf region the previous summer. However, that event alone does not fully explain the burglary increases in 2007 and 2008, even with a higher population base.

The citywide reported financial impact of residential burglaries for the year was estimated at $8.93 million (Table 1.2) in losses. May exhibited the most residential burglaries with more than $1 million in losses. It should be noted that although February had the lowest number of reported incidents, it had the third highest losses at just under $920,500.

Table 1.1. Selected Part I offenses reported to the Command Staff of the Atlanta Police department from 2004 to 2010.

Year	Population[a]	Pop. Change	Offence[b]	Prev. YTD	Curr. YTD	Difference	% Change	Direction
2004*	430,066	-977	Residential Burglary	5663	4939	-724	-12.78%	▼
			Aggravated Assault	4360	3884	-476	-10.92%	▼
			Homicide	149	106	-43	-28.86%	▼
			Auto Theft**	7235	3478	-3757	-51.93%	▼
			Thefts from Vehicles	7881	7184	-697	-8.84%	▼
2005	430,666	600	Residential Burglary	4939	4927	-12	-0.24%	▼
			Aggravated Assault	3884	3392	-492	-12.67%	▼
			Homicide	106	80	-26	-24.53%	▼
			Auto Theft	3478	3460	-18	-0.52%	▼
			Thefts from Vehicles	7184	6606	-578	-8.05%	▼
2006	485,804	55,138	Residential Burglary	4927	5610	683	13.86%	▲
			Aggravated Assault	3392	3531	139	4.10%	▲
			Homicide	80	106	26	32.50%	▲
			Auto Theft	3460	3436	-24	-0.69%	▼
			Thefts from Vehicles	6606	7277	671	10.16%	▲
2007	497,290	11,486	Residential Burglary	5610	6867	1257	22.41%	▲
			Aggravated Assault	3531	3389	-142	-4.02%	▼
			Homicide	106	117	11	10.38%	▲
			Auto Theft	3436	4612	1176	34.23%	▲
			Thefts from Vehicles	7277	7526	249	3.42%	▲
2008	533,016	35,726	Residential Burglary	6867	8554	1687	24.57%	▲
			Aggravated Assault	3389	3264	-125	-3.69%	▼
			Homicide	117	106	-11	-9.40%	▼
			Auto Theft	4612	4299	-313	-6.79%	▼
			Thefts from Vehicles	7526	9629	2103	27.94%	▲
2009	552,901	19,855	Residential Burglary	8554	7350	-1204	-14.08%	▼
			Aggravated Assault	3264	2612	-652	-19.98%	▼
			Homicide	106	78	-28	-26.42%	▼
			Auto Theft	4299	3387	-912	-21.21%	▼
			Thefts from Vehicles	9629	8796	-833	-8.65%	▼
2010	536,472	-16,429	Residential Burglary	7350	6670	-680	-9.25%	▼
			Aggravated Assault	2612	2567	-45	-1.72%	▼
			Homicide	78	84	6	7.69%	▲
			Auto Theft	3387	2774	-613	-18.10%	▼
			Theft from Vehicles	8796	7288	-1508	-17.14%	▼

* The figures for 2003 to calculate % Change for 2004 Offenses were collected from the Atlanta Uniform Crime Report.

** The figure for Auto Theft appears to be unusually high; however, it is consistent with reported incidences for 2002, which were 7,222.

a. Population figures are estimates for the City of Atlanta reported in the FBI Uniform Crime Reports. The estimated population for 2003 was 431,043.

b. Offenses include Attempts.

Table 1.2. Atlanta 2008 UCR estimated monthly property losses[c].

Month	Count	Loss Value	Difference	% Change	Direction
JAN	591	$512,851.00	-$332,457.00	-39.33%	▼
FEB	432	$920,454.00	$407,603.00	79.48%	▲
MAR	566	$523,285.00	-$397,169.00	-43.15%	▼
APR	636	$647,249.00	$123,964.00	23.69%	▲
MAY	675	$1,075,840.00	$428,591.00	66.22%	▲
JUN	656	$642,377.00	-$433,463.00	-40.29%	▼
JUL	773	$601,563.00	-$40,814.00	-6.35%	▼
AUG	853	$789,994.00	$188,431.00	31.32%	▲
SEP	757	$942,252.00	$152,258.00	19.27%	▲
OCT	757	$848,185.00	-$94,067.00	-9.98%	▼
NOV	771	$808,193.00	-$39,992.00	-4.72%	▼
DEC	1073	$614,935.00	-$193,258.00	-23.91%	▼
Totals:	***8540***	***$8,927,178.00***			

c. Difference calculation for January used December 2007 property losses.

1.2 Purpose

Emerging from the field of criminology has been a greater emphasis on geography and understanding the *place* where crime occurs. That is the context in which this study is framed; to analyze the topography of residential burglary in both high- and low-frequency areas of the city. In doing so, the aim of the research was to determine where clusters of burglaries were occurring, temporal frequencies of the offenses and what, if any, environmental factors were influencing increased criminal activity. Additionally, Crime Pattern Theory and topographic principles were applied to the data to ascertain what attributes may have accounted for the significant rise in property crime while other violent offenses remained relatively consistent (Table 1.1), given increased population estimates and the economic downturn. Moreover, the study focused specifically on geographic location, neighborhood design, and land use to determine if those attributes had the greatest direct influence on the spatial distribution of residential burglary.

1.3 Topography of Crime

This study places great emphasis on topographic explanatory factors. Topography in its application for this study is defined more broadly than how geographers normally use the term. In the discipline of Geography, topography is generally focused on the relative elevation of terrain. As used here, topography is defined as, “a detailed description of a particular place, city, county, region, or tract of land” (Felson, 2002). Where detailed descriptions are intended to capture the relative placement of features in the physical environment, and how these elements interact with and form the shape social and behavioral landscape of activity occurring at the place. Additionally, topography provides a more focused approach than the strict analysis of the spatial properties of crime (Felson, 2002) allowing for the use of localized area knowledge to mete out the specifics of crime incidences beyond place and time. Furthermore, Felson points out that topography and geography are interdependent, and as a science, they should be used together to arrive at a complete picture of the dispersion of crime.

In sum, emerging from the field of criminology has been a greater emphasis on understanding the *place* where crime occurs. While in several previous studies of crime the term "ecological" has been used to describe the surrounding elements that may be affecting crime rates, topography will be the term used for this study.

1.4 Focus

This study focused primarily on residential burglary. This was due to the nature of the events, in that the reported incidents always contained individual address points that could be geocoded. In turn, those geocoded points provided a way to conduct spatial analyses. Additionally, with associated times, further analyses could be performed to ascertain any relationships between places and temporal occurrences. While other crime categories could have been used for this study, they did not offer the same relative certainty of positional and temporal data.

1.5 Definition of Terms

It is important to establish a common lexicon that allows for a smoother transitional understanding of the more commonly used criminological and geographic terms found within this study.

1.5.1 Criminology

Burglary: The unlawful entry of a structure to commit a felony or a theft (FBI-UCR, 2004). The three classifications are Forcible Entry, Unlawful Entry-No Force, and Attempted Forcible Entry.

Records Management System (RMS): A database management system used by a law enforcement agency to input calls for service and other reporting data.

Calls for Service (CFS): Any calls to a police department that require an officer, investigator or report writer to respond to an incident.

Environmental: A term used interchangeably with the term *ecological*, meaning the science of relationships between human groups and their physical and social environments.

1.5.2 Geography

Suburban: A post-WWII neighborhood design plan typically indicated by curvilinear street patterns and single-family detached homes with large lawns. These areas are generally located outside of the city center, and in the United States resemble socio-economic affluence. Suburbs were created to ease the inner-city housing crisis caused by the rapid population growth of returning WWII veterans.

Urban: A grid-patterned neighborhood design plan typically located within an inner-city. Homes are generally attached dwellings, like duplexes and apartment buildings, with smaller lawns, if space is available. These areas are generally located in or near the city center and are densely populated, representing a mixed land use of residential and commercial properties.

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

The application of a geographic framework to analyzing crime patterns in the United States is generally attributed to August Vollmer, Chief of Police in Berkeley, California. In the 1900s, Vollmer developed the technique using recorded calls-for-service "to perform beat analyses", and used the maps "for visually identifying areas where crime and calls were concentrated" (Gottlieb, et.al. 1994, p. 2). His colleague O.W. Wilson later enhanced the work by including weighted values to crime categories, providing a systematic approach to the allocation of police resources (Gottlieb, et.al. 1994, p. 3).

Since then, as law enforcement agencies and academics have attempted to explain the causations of crime and the psychology of criminal offenders, various theories were constructed based upon several methods of analyses. Those theories include Social Disorganization Theory and several interrelated theories considered to be under the topic of Environmental Criminology – Routine Activity Approach, Rational Choice Perspective, and Crime Pattern Theory. These explanations of crime events were designed to provide law enforcement agencies with concepts to better understand not only how incidences of crime occurred, but also where they tended to happen and the factors leading to repeated events. While Crime Pattern Theory was fundamental to conceptualizing topography in this research, the other aforementioned theories are discussed to strengthen the theoretical foundations of this study.

2.1.1 Crime and Geography

Few advances in the analysis of crime and crime patterns within the field of geography have occurred since criminologists first began considering geography when analyzing criminal incidences. In fact, the researchers attributed to leading this innovative charge were not from the discipline of geography, but in the field of criminology – an equally important area of study. Even scholars in departments of Sociology, Mathematics, and Psychology have continued to move forward in the refinement of established theories and the development of new ones to apply to crime analysis. However, those approaches are often difficult to understand or mired in complicated mathematical computations that are generally unattainable to the "lay person" needing to utilize a different or new approach to solve a crime-related issue.

The span of research has examined many social aspects of an urban community and related them to the causations of crime. Lowman (1986) sought to "[separate] crime from the control of crime." He also argued that "geographers have been unjustifiably selective in their use of criminological theory in developing geographic prospective on crime." In the years following, geographers seem to have made little headway in the rectification of that observation. Such studies have had a tendency to lean towards the generalized conceptions of minorities living in low-income urban centers as possessing a greater predilection towards the commission of crime than those living in middle-class and upper class communities. They also tend to follow the theory of delinquency developed in the Chicago School of Sociology (Shaw, Zorbaugh, McKay, and Cottrell, 1929). Unfortunately, as Lowman stated, "If geographers were to produce maps of crime including white collar, governmental, and corporate offenses, they might find that the classic central city-to-suburb criminal residence gradient was quite different (1986)." At this time, there has been little research available on the analysis of white-collar crime from the field of geography – an area of study, which can no longer remain ignored.

2.2 Criminal Research Theories

Theoretical mainstays in the fields of criminology and geography for the analysis of crime and criminal behavior are: Social Disorganization, Rational Choice Perspective, Routine Activity Theory, and Crime Pattern Theory. The latter was used for this study.

2.2.1 Social Disorganization

Social disorganization theory, as mentioned, was developed in the Chicago School of Social Sciences. Shaw and McKay updated the theory (1942), and made it well known by applying it to juvenile delinquency in urban centers of Chicago. The two authors built upon much of the work of Park and Burgess (1924), who defined social disorganization as "the inability of a group to engage in self-regulation." They also developed the Concentric Zone Theory (1925), which stood as the pillar of the Chicago School for decades. Social disorganization theory using a concentric application has failed when used by any urban area not developed in the mid-west or the east. The design of neighborhoods following the push west changed with the availability of more land, or urban sprawl. The theory is also not applicable to any area outside of the United States. For example, Dear and Flusty (1998) criticized the continuance of Chicago School theories, though with a bit of derision, because of its "beguiling simplicity and the enormous volume of publications produced by adherents of [the school] (Dear and Flusty, 1998). It was not feasible to apply this theory to crime in Atlanta given the unique occurrences of residential burglaries and the design of neighborhoods throughout the city.

2.2.2 Rational Choice Perspective

Rational Choice Perspective, developed in the United Kingdom, focuses mainly upon the offender's decision-making process. Its main assumption is that offending is purposive behaviour, designed to benefit the offender in some way (Felson and Clarke, 1998, p. 7). In basic terms, offenders are thought to consider the immediate characteristics of possible targets in light of the perceived situational conditions surrounding the targets. These conditions include the likely risks, efforts and potential rewards associated with committing the crime in that particular place and time based upon prior experience tempered by their current motivation. Testing this explanation generally involves surveys and interviews with offenders to get a sense of the rationale that led them to offend in the first place. It also uses interviews with repeat offenders to analyze the psychology behind their recidivism.

Two fundamental assumptions must be met if this information is to meet the validity threshold for research. First, the offenders identified and interviewed must be able to articulate what place attributes they considered when deciding on a specific target. Second, a large enough sample group of offenders must be identified to develop credible results. As interviews with active offenders was not possible at the time the data for this study was gathered, it would be implausible to use this perspective to account for observed burglary patterns in Atlanta.

2.2.3 Routine Activity Theory

In 1979, Cohen and Felson presented an approach to analyzing crime, which they called "routine activity approach." They argued that "structural changes in routine activity patterns can influence crime rates by affecting the convergence in space and time of...three minimal elements of direct-contact predatory violations: (1) motivated offenders, (2) suitable targets, and (3) the absence of capable guardians against a violation" (Felson and Clarke, 1998, p. 589). It is currently one of the more widely used theories.

During the 1960s and 1970s burglary rates and patterns changed dramatically, leading Felson to argue that social disorganization was not a likely explanation for variations in property crime. Alternatively, he reasoned that widespread changes in routine behavior, in this case the influx of women into the paid workforce and away from home during the day, offered a better explanation (Felson and Clarke, 1998). While it seemed a plausible rationale, given the broad changes in employment patterns that occurred in Atlanta, Georgia from 2006 to 2008 unemployment was considerably higher than in previous years. This would have decreased residential burglary as it could be presumed that more people were at home providing a greater guardianship in the respective neighborhoods.

2.2.4 Crime Pattern Theory

Crime Pattern Theory argues that crime concentrations reflect the aggregate patterning of individual activity preferences shaped by social networks, economic forces, and political and legal influences. It is the reason "crimes do not occur randomly or uniformly in time or space or society" (Brantingham and Brantingham 2002, p. 79). The term "pattern" in this context was used "to describe recognizable inter-connectiveness of objects, rules and processes" (Brantingham and Brantingham 2002, p. 79). Crime pattern theory also asserts that patterns can be detected "only through an initial insight...that is embedded within the environment as a whole" (2002, p. 79).

Not only does it look at individual patterns, it establishes heuristics that outline the probability of interaction between an offender and his/her target within the same space and time. For example, Per-Olof Wikström (1991) illustrated the geographic distribution of selected police-recorded offenses in Stockholm, Sweden. In keeping with earlier work by Bottoms and Baldwin (1976), Wikström was able to show that offenses tended to be clustered around the city center. What later studies revealed was that crime patterns could be drastically altered by changing the environment, or in the case of one particular study (Wiles and Costello, 2006, p. 46), adding the development of a large shopping mall, which reduced crime by 14 percent. This means land use, roads, and the socio-economic status of residents and workers (2002, p. 87) need to be considered when analyzing criminal activity.

Since this research involved residential burglary and the search for underlying influences for increased rates to include geographic and temporal patterns across the data, crime pattern theory was the most appropriate choice for the theoretical approach of this study.

2.3 Crime and the Economy

Considering that socio-economic status is a component of crime pattern theory, it is important to address crime as it relates to the economy. A strong correlation between unemployment and its effects on higher rates of property crimes remains inconclusive (Koinis and Yearwood, 2009). However, it could be argued that the economic downturn could in fact be an influence on the fluctuation of criminal offenses. Moreover, based upon statistical observations using the available crime data sets, December and the summer months of July and August were prime months for the offenses of residential burglary. In fact, based upon the previous seven years with a three-year monthly and quarterly trend shown here in this study, December 2008 had the highest monthly count of residential burglaries citywide by more than 200 when compared to August of the same year.

It must also be noted that for this study area, reporting of residential burglary that generated calls for service was consistently low for affluent areas and high for less affluent neighborhoods.

2.4 Topographic Indicators of Vulnerability

Factors that influence neighborhood vulnerability to increased crime rates expand well beyond population density and race. For this study, race had very little influence in the statistical models used for analysis, as the neighborhoods were either predominantly Black or predominantly White. Other considerations include politically driven economic decisions, such as whether to engage in revitalization of a specific area (Kubrin and Weitzer, 2003) and deindustrialization of inner-city areas, which could lead to the loss of blue-collar jobs thus increasing economic hardship (Shihadeh and Ousey, 1998).

Residential instability, the percentage of female heads of households and the percentage of young males and children under five are additional factors to consider when addressing neighborhood vulnerability (Kubrin, et.al., 2011). Although such indicators lean toward Routine Activity Theory and guardianship, for the current study, there was still the question of whether more people would be at home during the day rather than away from the home during traditional working day due to the high rates of unemployment.

Yet another indicator of vulnerability lies in whether the neighborhood contains a higher level of mixed-use locations (Stark, 1987). Stark defined mixed use as “urban areas where residential and commercial land uses coexist [and] where homes, apartments, retail shops, and even light industry are mixed together.” Although Stark referred to land use within the context of Social Disorganization, Crime Pattern Theory also argues that land use is one of the most critical influences on criminal activity patterns in a given space.

Two indicators are common to most major theories of crime, public housing and the percentage of owners and renters in a given area. While each has some merit in indicating vulnerability to certain crimes, there are also problems with incorporating them into an analysis model.

2.4.1 Public Housing and Neighborhood Decay

According to the literature, public housing has presented itself as the core to issues of criminality in inner-city neighborhoods (Bauman, Hummon and Muller, 1991; Bickford and Massey, 1991; Bursik, 1989; Newman, 1972; Sampson and Wilson, 1995). The correlation between public housing and crime has often been articulated within the theory of social disorganization with race and economic disadvantage as variables of informal social control (Bursik and Grasmick, 1993a; Shaw and McKay, 1942). However, as McNulty and Holloway point out in their study of crime and public housing, “the race-crime relationship is geographically conditioned by the presence or predominance of public housing in the residential structure of neighborhoods” (2000). They found that the closer a neighborhood was to public housing projects, the higher the rate of crime. On the other hand, the further away a community was from public housing projects, the lower the crime rate, regardless of race (2000).

Public housing projects were most often constructed in poor, disadvantaged minority communities; those who were least likely to resist politically driven placement decisions (McNulty and Holloway, 2000). Later, with the rise in violent crime and the lack of structural resources to reduce neighborhood decay that often stigmatized public housing and its residents (Stark, 1987), the Atlanta Housing Authority (AHA) along with the Department of Housing and Development (HUD) stepped in to make drastic changes. Backed by federal funding via the Home Ownership for People Everywhere (HOPE) VI grant program (AHA, 2011 p. 14), more than thirty major public housing projects were demolished across the city of Atlanta beginning in 1995. By the time of this study, less than half had been reconstructed to create mixed-income housing communities (AHA, 2011 p. 41). Although the revitalization may improve social and economic outcomes of disadvantages communities, with renewal at such a scale, it is reasonable to infer that land-use change and displacement of families added to residential instability.

2.5 Summary

There has been much research in the theory of Social Disorganization. There have also been studies that addressed race and violent crime (McNulty and Holloway, 2000; Sampson and Wilson, 1995; Shaw and McKay, 1942; and, Shihadeh and Ousey, 1996). Understanding residential burglary in the context of Crime Pattern Theory, has advanced the theoretical aspects of crime and place. Researchers have been looking much closer at what is happening in and around the geographic areas of criminal activity, rather than ending a study at correlates and generalized inferences.

Topography is critical when examining influential variants of crime; and it is what makes the analysis of residential burglary a key topic for research. Since these types of crimes happen in a qualified place and time, it allows other place-time data to be examined in context of the crimes themselves. This in turn enables the research to create snapshots of study areas, which can lead to translatable advances beyond the theory crime to practical use policies.

CHAPTER III

STUDY AREA AND DATA

3.1 Study Area

The City of Atlanta is located in the mid-section of Fulton County in the southern state of Georgia (Figure 3.1). It played host to the 1996 Summer Olympic Games and is the longstanding corporate headquarters for the Coca-Cola Company, and Cable News Network (CNN). Atlanta was founded in 1837 at the end of the Western and Atlantic railroad line. It was recognized in 1868 as Georgia's premier city, after which the state's capital was moved to the fast-growing city (Wortman, 2009). Atlanta endured two citywide burnings in its early years of development during and after the Civil War. It was first christened Marthasville to honor the daughter of the former governor, Wilson Lumpkin. Two years later, in 1845, the name was changed to Atlanta, supposedly the feminine version of the word Atlantic (Wortman, 2009).

3.1.1 Fulton County, Georgia

Fulton County was formed from DeKalb County in 1853, and then consolidated with Milton and Campbell Counties in 1932, thus creating an unusual, elongated shape. Fulton was named in honor of Robert Fulton, the inventor who built the Clermont, the first commercially successful steamboat, in 1807.

Fulton County lies in north-central Georgia in the foothills of the Appalachian Mountains. The warm southern climate produces plentiful hardwood and pine forests, making the area a beautiful place to live. The County encompasses 528.7 square miles, and stretches over 70 miles from one end to the other. North Fulton includes the cities of Sandy Springs, Alpharetta, Roswell, and Mountain Park. South Fulton includes the suburban cities of College Park, East Point, Fairburn, Hapeville, Palmetto and Union City (Fulton County).

3.1.2 City of Atlanta

The city of Atlanta (Figure 3.1) is located in the mid-section of Fulton County. It encompasses an area of approximately 132 square miles, and is bordered on the north by the suburban city of Sandy Springs; DeKalb County makes up the eastern border of the city; Cobb County is west, and the southern border is Clayton County (Fulton County GIS). The city is comprised of 25 Neighborhood Planning Units, consisting of 240 neighborhoods. With an estimated population of 537, 958 people, the city of Atlanta ranks as the 33rd largest in the United States (U.S. Census Bureau, 2008).

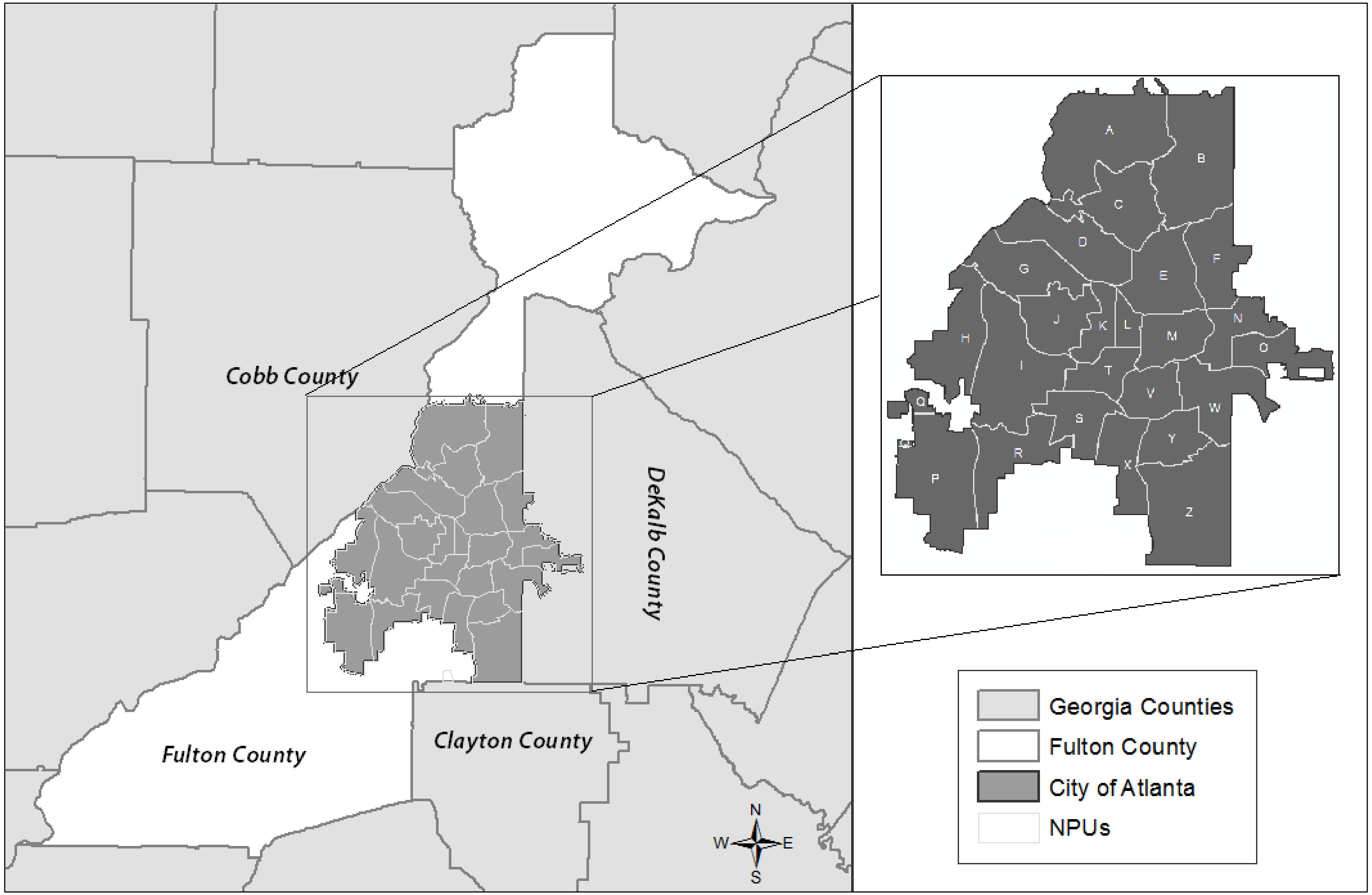


Figure 3.1. Fulton County showing Atlanta and NPUs

3.1.3 Demographics

According to 2000 U.S. Census estimates, the city of Atlanta was 61.4% Black, 33.2% White. With the 2010 Census, the estimated white population increased to 38%, while the black population decreased to just over 54% (U.S. Census). The majority of Blacks live in the South and West portion of the city (Figure 3.2), whereas Whites are more populous to the north and northeastern part of the city (Figure 3.3).

There was an overall population increase for the city by 9.7% from 2006 to 2008 (Atlanta PD UCR), accounting for an additional 102,350 persons. In the two years prior to 2006, the increases were relatively steady fluctuating within a 1000 person loss-gain. The growth of the population figures for 2006 could be contributed to displacement caused by Hurricane Katrina, which greatly affected the South in August 2005. According to a report released by Appleseed, "at least 100,000 people evacuated to Atlanta in the days before and after Hurricane Katrina made landfall last August. The vast majority of these evacuees remain in the Atlanta area today" (Arrington, et.al. 2006). The reason for continued growth in the city has been yet to be determined, especially when considering the economic crisis that occurred just two years later.

3.1.4 Socio-Economics

Aggregate median household incomes from 2006-2010 were about $45,171 for the city (U.S. Census). For 2008, the estimate was $48,967, compared to $69,239 for Atlanta MSA (U.S. Census). Much of the household wealth for Atlanta was concentrated in the north and northeast part of the city (Figure 3.4). Alternatively, the bulk of households with income at or below poverty level cut a path diagonally through the city from west to southeast.

The Community Tapestry Segments created by ESRI for their Business Analyst product, "divides US residential areas into 65 distinctive segments based on socioeconomic and demographic characteristics to provide an accurate, detailed description of US neighborhoods" (ESRI BIS, 2008). The top five segments accounted for 62.3% of total households.

For the city of Atlanta, the tapestry segment dubbed "Metro Renters" topped the listing at 22.2% of all households. The estimated median income was about $56,000, though the segment had an estimated median net worth was about $22,000. Nearly 80% of residents rented or shared housing, and they were just beginning their professional careers (Table 3.1).

The "City Commons" segment, described as having 31% of residents who work in the service industry, comprises 10.9% of the city. This segment was mostly young with single or single-parent households and an average age of 24.6 years. Its percentage of workers in the service industry was twice the national average and was predominantly Black (81%). The estimated median household income in this segment was just under $17,000 with a net worth slightly less than $10,000. Unemployment was at a rate of 30%, which was nearly three times the national average.

"Laptops and Lattes" represented the affluent segment with an estimated median household income of $93, 899. Their estimated median net worth was more than $285,000. These residents were highly educated, mostly single and predominantly White. More than 70% held college degrees and were 25 years and older with a median age of 38.7 years.

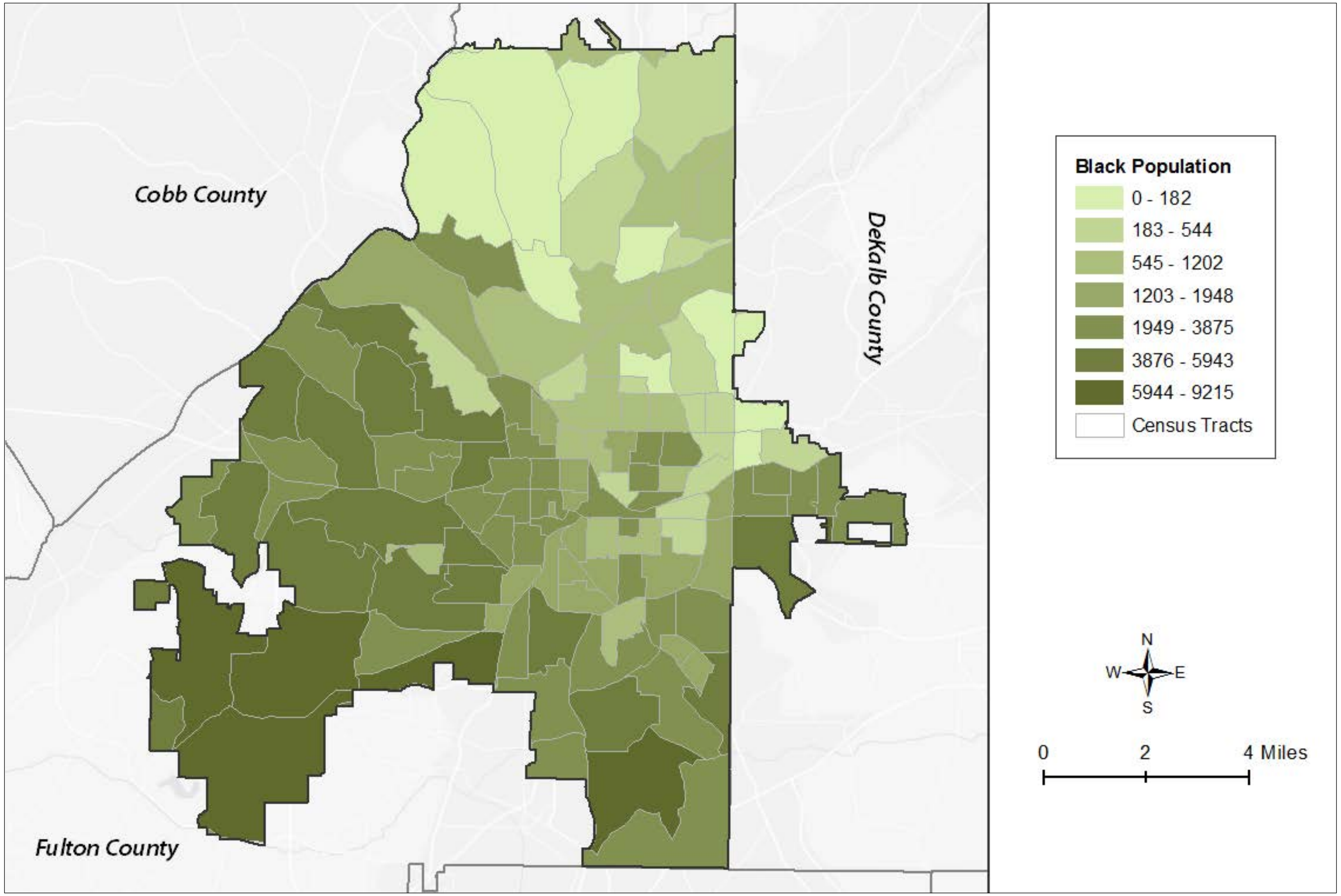


Figure 3.2. Atlanta Black Population

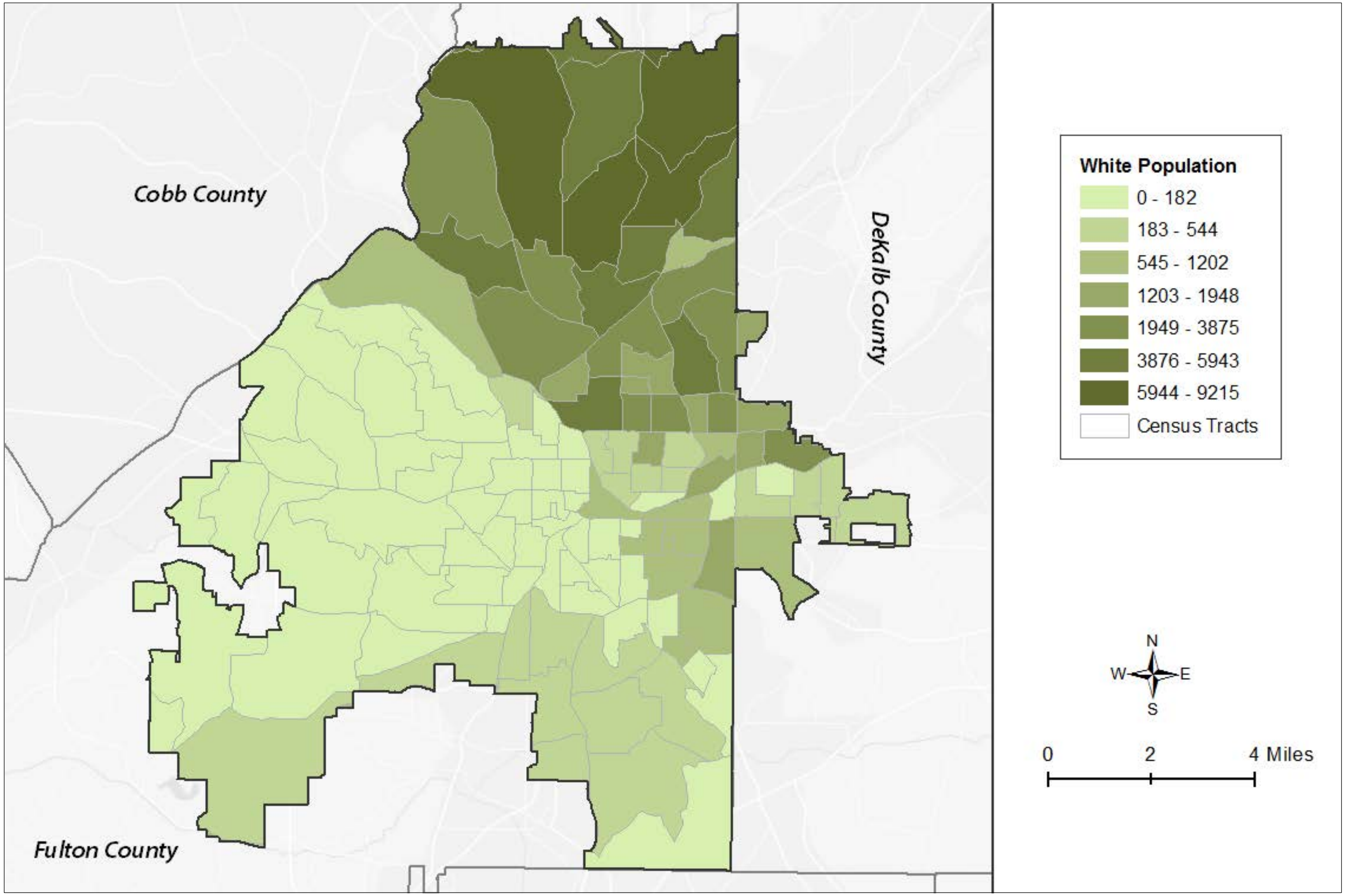


Figure 3.3. Atlanta White Population

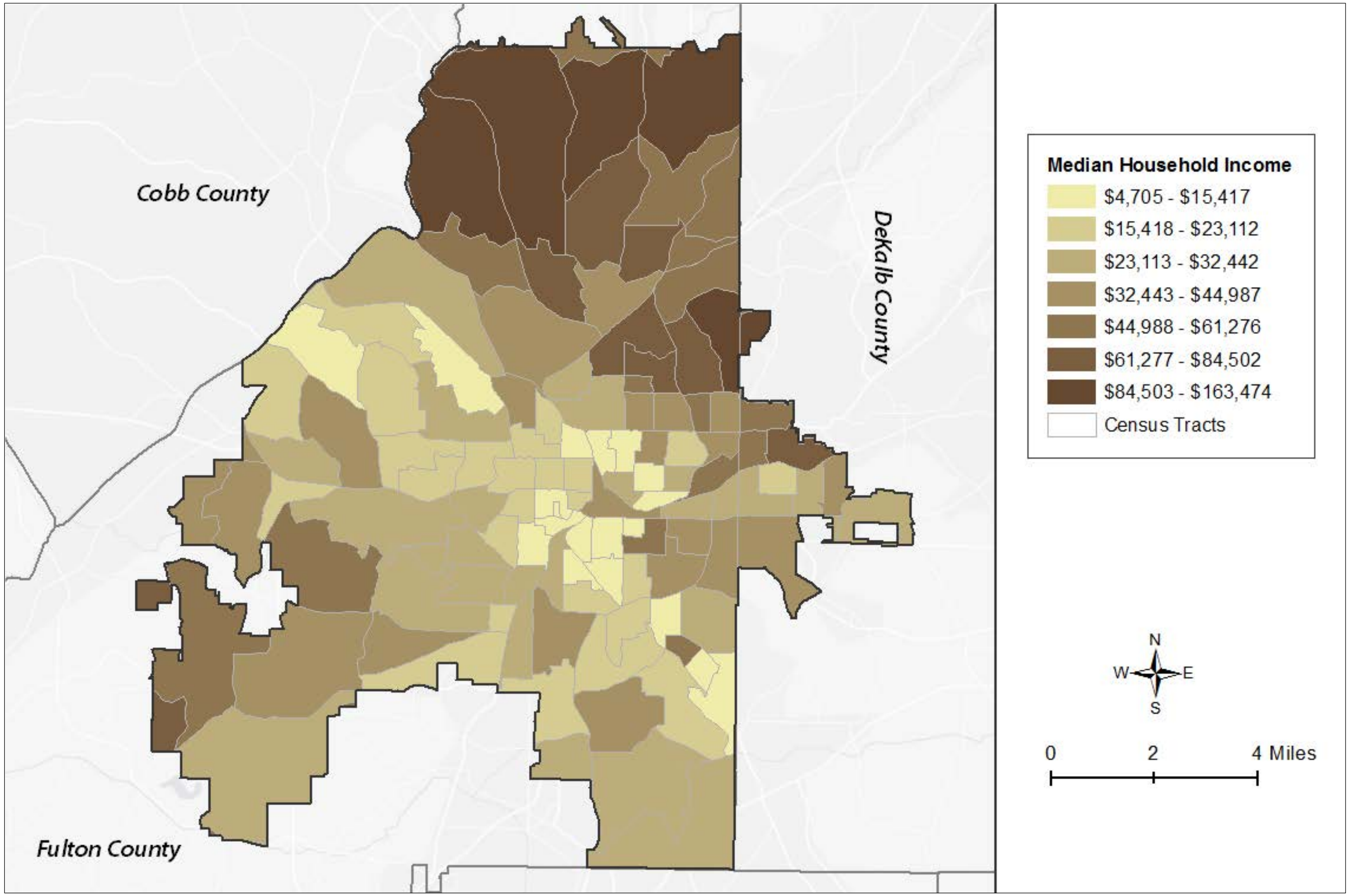


Figure 3.4. Atlanta household income

Table 3.1. Top five Tapestry Market Segments representing 116,696 households

	Market Segment	Demographic	Socioeconomic	% Households
1	*Metro Renters*	Young, educated singles, residents of Metro Renters neighborhoods are just beginning their professional careers in some of the largest US cities such as New York, Chicago, and Los Angeles. Residents will sometimes share housing with a roommate to help defray the cost of their high rent. Households are either single person or shared. The median age of 33.6 years is younger than the US median of 37 years. Approximately 30 percent are in their 20s; 14 percent are in their early 30s. This younger population is also more diverse than the US population; 11.5 percent of the residents are Asian.	The median household income is $56,311 and rising. Approximately 60 percent of employed residents work in professional and management occupations, most in the service industry sector. One of Tapestry Segmentation's most educated markets, more than one in four Metro Renters residents aged 25 years or older holds a graduate degree; one in three has earned a bachelor's degree. More than 80 percent of these residents have attended college; 17 percent are still enrolled in undergraduate or graduate school. Although their median net worth of $22,097 seems low, 78 percent of these residents are renting and don't own a home, often considered a primary household asset.	22.2%
2	*City Commons*	Single-parent families or singles who live alone comprise most of these very young households. With a median age of 24.6 years, City Commons is one of Tapestry Segmentation's youngest segments. Approximately half of the households have children; some households are multigenerational, with adults still living at home or grandparents who provide child care. The average household size of 2.8 is higher than the national average. Since 2000, population in these areas has declined at 0.4 percent per year. **These neighborhoods are not ethnically diverse; 81 percent of the population is black.**	Thirty-one percent of the residents who work are employed in service occupations (twice the national level). Nineteen percent of the households are on public assistance; 13 percent receive Supplemental Social Security income. Overall, more than 60 percent of the residents aged 25 years and older have graduated from high school. Six percent hold a bachelor's or graduate degree; 27 percent have attended college. Because they have limited employment options, more residents work part-time than full-time. Unemployment is at 30 percent, the highest rate among the Tapestry segments, and almost three times that of the national level. The median household income is $16,830, and the median net worth is $9,958.	10.9%
3	*Laptops and Lattes*	With no home ownership or child-rearing responsibilities, residents of Laptops and Lattes neighborhoods enjoy single life in the big city. Most households are singles who live alone or with a roommate. The average household size remains constant at 1.8. Although this segment is slowly increasing, it is maturing and diversifying more quickly. The median age is 38.7 years. **Although most of the population is white, Asians represent 10.4 percent of the total population.**	This segment is affluent; the median household income of $93,899 supports these residents. The median net worth is $285,718. Laptops and Lattes residents are highly educated. More than 70 percent of residents aged 25 years and older hold a bachelor's or graduate degree; approximately 90 percent have attended college. The percentage enrolled in college or graduate school is more than three times the national level. Two-thirds of the employed residents work in professional or management positions, especially in the scientific, technical, finance, insurance, educational services, health care, and information industry sectors. More than half receive investment income; 19 percent earn self-employment income.	10.7%
4	*Family Foundations*	Family is the cornerstone of life in these neighborhoods that are a mix of married couples, single parents, grandparents, and young and adult children. The average family size is 3.3. The median age is 39.4 years, slightly older than the US median; 7 in 10 are aged 45 or older. **Diversity is low; 84 percent of the population is black.**	The median household income is $46,990. Because workers are beginning to retire, the 58.1 percent labor force participation is below average. More than 20 percent of the employed residents work for the government. Approximately one-third of the households are on Social Security or public assistance. Their median net worth is $81,495. Although education attainment levels are below the US level, a slightly higher proportion of residents aged 25 or older have graduated from high school.	10.6%
5	*Metro City Edge*	Married couples, single parents, and multigenerational families are the household types found in Metro City Edge neighborhoods. Grandparents are caregivers in 4 percent of these households, twice the US rate. The median age of this segment is 29.4 years because of the children, including adult children who still live at home. The average family size of 3.5 is slightly higher than the US average. **Seventy-two percent of the residents are black; 17.3 percent are white; and 4 percent are American Indian—four times the US level.**	The median household income for this segment is $33,018; the median net worth is $14,773. Although 78 percent of households derive income from wages and salaries, 9 percent receive public assistance and 9 percent receive Supplemental Security Income. Nearly half of employed residents work in service industries. Unemployment is more than double the US level. One in ten residents aged 25 years or older have a bachelor's or graduate degree; four in ten have attended college.	7.9%

3.1.5 Micro-Level Areas for Analysis

Twelve police beat areas were analyzed for this study (Figure 3.5). Beats 111 and 101, and beats 102, 103, and 107 (located west of Downtown Atlanta) make up the relative center of the city. Beat 401, 302 and 303 are situated southwest and southeast of beats 111/101. The most western beat analyzed was 411, and the most eastern was 603. Beats 202 and 203, both located in the northern most part of the city, border the wealthy suburb of Sandy Springs. For the purposes of this study, beats 111 and 101 were combined into one location due to their areal size.

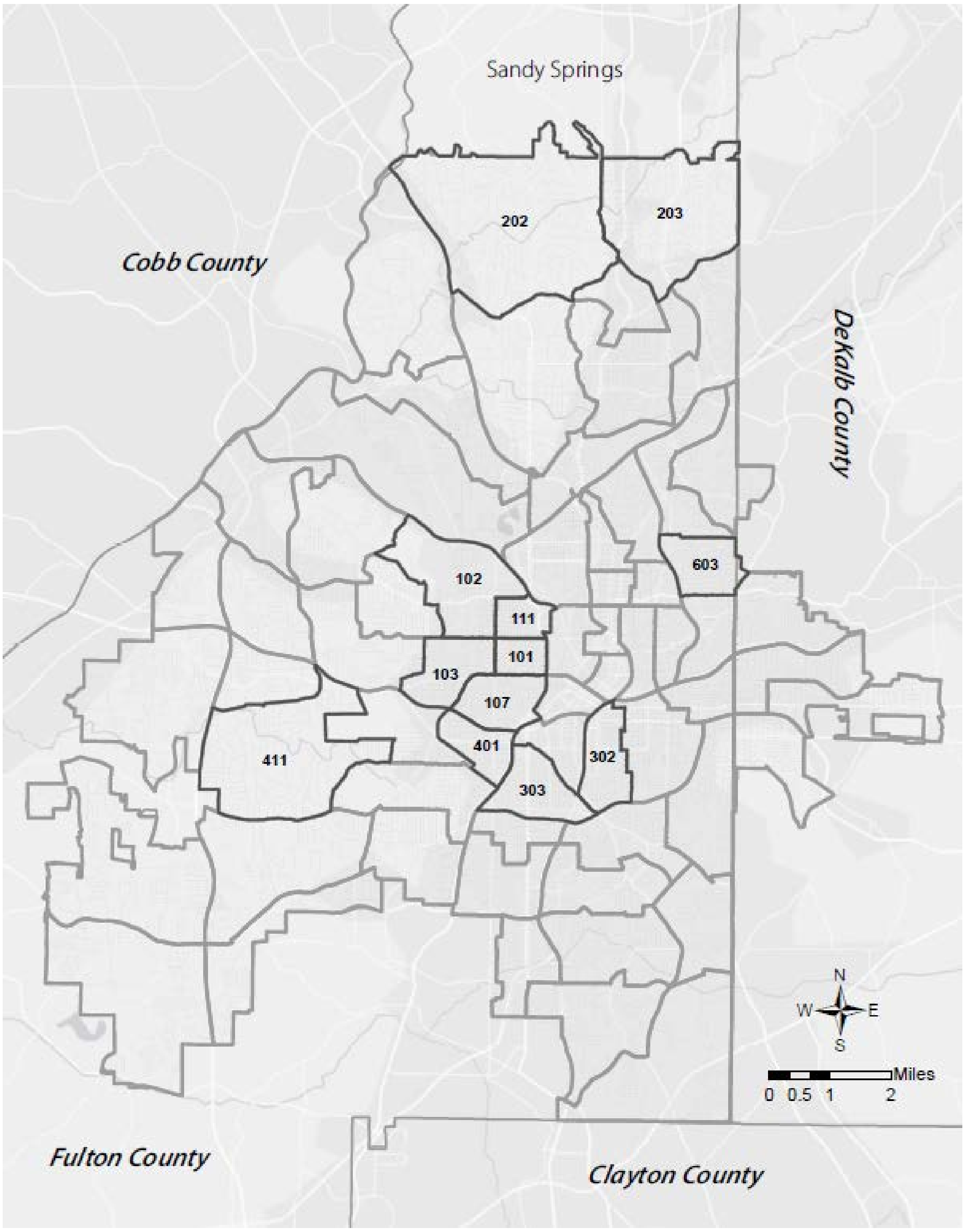


Figure 3.5. Police Beats with areas of analysis outlined

3.2 Datasets

Data were collected from several sources. Reported crime data and monthly Uniform Crime Reports were obtained from the Atlanta Police Department. Demographic, economic and housing data were acquired from the 2000 U.S. Census using American Fact Finder, iPUMS, and the U.S. Department of Labor. Supplemental demographic and socio-economic data were gathered from the 2008 Community Tapestry dataset provided by ESRI. Business location data were collected from Reference USA, and Atlanta Department of Planning and Community Development. Additional housing vacancy and foreclosure data were acquired from the U.S. Department of Housing and Urban Development (HUD), the United States Postal Service, and the Atlanta Housing Authority (AHA). LandPro Land Cover-Land Use (LCLU) digital maps, commonly referred to as “shapefiles”, for 2008 were downloaded from the Atlanta Regional Commission Information System (ARIS) GIS data portal, as were datasets containing MARTA public transportation shapefiles. City of Atlanta geographic shapefiles were obtained from the Atlanta Department of Planning and Community Development, Atlanta Police Department, the U.S. Census Bureau and ESRI (TIGER/Line).

3.2.1 Crime Data

Part I crime data for the years 2004 to 2010 were obtained from the Atlanta Police Department Crime Analysis Unit. These were raw data of reported incidents or Calls for Service (CFS), and were analyzed for errors and omissions of information across the 32 variables for each incident case number. However, since not all NPUs in the city have designated neighborhoods, some occurrences did not include that variable. For incidents with no NPU designation, the address point was matched against the NPU vector layer in ArcGIS, and then added to the table. Missing or omitted information that could not be ascertained was excluded from the table. The dataset already contained geolocations for the addresses.

Additionally, the Uniform Crime Reports (UCR) sent to and published by the Federal Bureau of Investigation (FBI) were obtained from the Crime Analysis Unit to compare the officially reported figures against the CFS counts. The comparison revealed discrepancies in the aggregate incident counts, which may have been due to several circumstances including: end-of-month report dates shifted to the following month, final reporting day of the year shifted to the next year, and/or reclassifying reported offenses based upon information provided by investigators, victims, and witnesses. The latter occurs because of reporting regulations defined by the FBI. For the purposes of this study, the CFS count was used, as it contained the discrete point data needed for analysis. However, reported figures for the monetary value of property stolen, filed with the FBI in the official monthly UCRs for Atlanta, were used to illustrate the estimated economic losses for the offense of residential burglary.

3.2.2 Limitations

Precise residential burglary times are sometimes difficult to pinpoint, as they often occur when the victim is away from home, therefore incidences are not reported until after the resident arrives home to discover the intrusion. This could be anywhere from one hour to one month or longer. In addition, many of the unknown shift times recorded occurred over a weekend or a one-week period and some crimes are not reported (Ratcliffe, 2000). Therefore, this study examines only reported residential burglaries, their location, and the estimated times of occurrence as reported to the police.

Due to the manner in which the data were entered into the police records management system (RMS), offenses for December 31 are recorded in the following year, and are not included in this study. When entering the shift time of occurrence, there was no consistency in how the shift was recorded. On several occasions, an event with a starting time of the previous evening and an ending time in the afternoon the following day was recorded as “morning”, even though the day shift seemed more intuitive. Therefore, for this study, the shifts were categorized using the time-from column as the shift indicator on an eight-hour division of the 24-hour period. What that means was that for every time-from recorded between 1:01 am and 9:00 am, a shift designation of “morning” was assigned; every time-from recorded between 9:01 am and 5:00 pm received a shift designation of “day”, and; every time-from recorded between 5:01 pm and 1:00 am received a shift designation of ”evening”. The “unknown” shift designation remained the same, for it denoted an unspecified time of event occurrence.

Moreover, there appeared to be several occurrences of duplicate entries with unique incident numbers. Without viewing the actual written reports, it was difficult to determine whether there were in fact two separate events. For the purposes of this study, the duplicates were treated as two separate events occurring at the same location. Adjustments were made for the calculations and counts; however, the inaccuracies do leave a negligible margin for error.

CHAPTER IV

METHODOLOGY

4.1 Application of Methods

The research for this study applied mixed methods of quantitative and qualitative analysis. It was important to understand quantitative measures of the factors or variables that influenced the outcome of the study; in this case, high residential burglary rates (Creswell, 2009). It was equally as important to use an exploratory approach (qualitative) to understand the spatial dispersion of the offenses and the topographic elements of the study area, which lend themselves to the discovery of quantitative variants.

4.1.1 Visualization Methods

A common problem with displaying high-volume crime on a map is the sheer number of discrete points, which tend to clutter the area making it difficult to interpret. Attempting to discover a high-density location of offenses proved to be nearly impossible, as the symbols on the map appear to be on top of each other (Ratcliffe, 2000).

To visualize the spatial distribution of reported residential burglaries, ArcGIS 10, a mapping software package from Environmental Systems Research Institute (ESRI), was used. With more than 47,000 record entries for 2008, each with 31 attributes, the comma separated text file was imported into Microsoft Access for closer examination. After identifying the relevant categories of offenses needed for the study, a subset containing only those records designated as residential burglary, including attempts, was exported to an Excel spreadsheet for further analysis.

The records were automatically geocoded in the Records Management System used by the Atlanta Police Department, thus the text file included the X and Y coordinates for each offense. Once the points were overlaid on a basemap of Atlanta as point shapefile in ArcGIS, it seemed relatively obvious where clustering was occurring; however, determining whether the clustering was random could not be so easily determined. To resolve the issue, discrete surface mapping techniques were applied, which included kernel density estimate and Hot Spot analyses.

4.2 Regression Analysis

To determine which variables were most correlated with residential burglary events, two types of linear regression analysis were used: Ordinary Least Squares (OLS) and Geographically Weighted Regression (GWR). These analyses used block group level variants, which required an aggregation of discrete residential burglary points from the block level to obtain counts for use as the dependent variable.

Regression analysis in ArcGIS was employed to better understand the underlying influences of spatial patterns by determining the correlation coefficients of explanatory variables (Scott and Pratt, 2009). In general, the modeling tools were used to examine spatial relationships.

4.2.1 IBM SPSS

Before running any regression models in ArcGIS, SPSS 19 was used to explore the data in an effort to test the effects of key explanatory variables (predictors) on the dependent variable. For this, a stepwise regression procedure was initiated. This allowed the software program to select which variants to enter into the final output.

The stepwise method added variables to the model according to their effect on the model's overall R^2 coefficient values. The model was run 11 times using different independent variable combinations to obtain the best performing model. The default significance values of .05 for entry and .10 for removal of variables from the model were not changed. With one exception, where race/ethnicity and income were introduced into the model, the resulting adjusted R^2 value was lower, creating a lower performing model. The exception pertained to the introduction of the Hispanic variable only, and excluded Black and White variables.

The final model selected with the highest adjusted R^2 value of .497, included the following exploratory variables: Bus Stops, Percent Vacant, Percent Poverty, Age 10-21, White, Renter, and Age 25 and Up with No Education (Figure 4.1(a)). In this case, using the combination of variables White and Percent Poverty improved the model. A scatter plot of the residuals revealed a strong positive relationship with the dependent variable of residential burglary (Figure 4.1(b)).

An additional linear regression was run with using the Enter method in the following syntax:

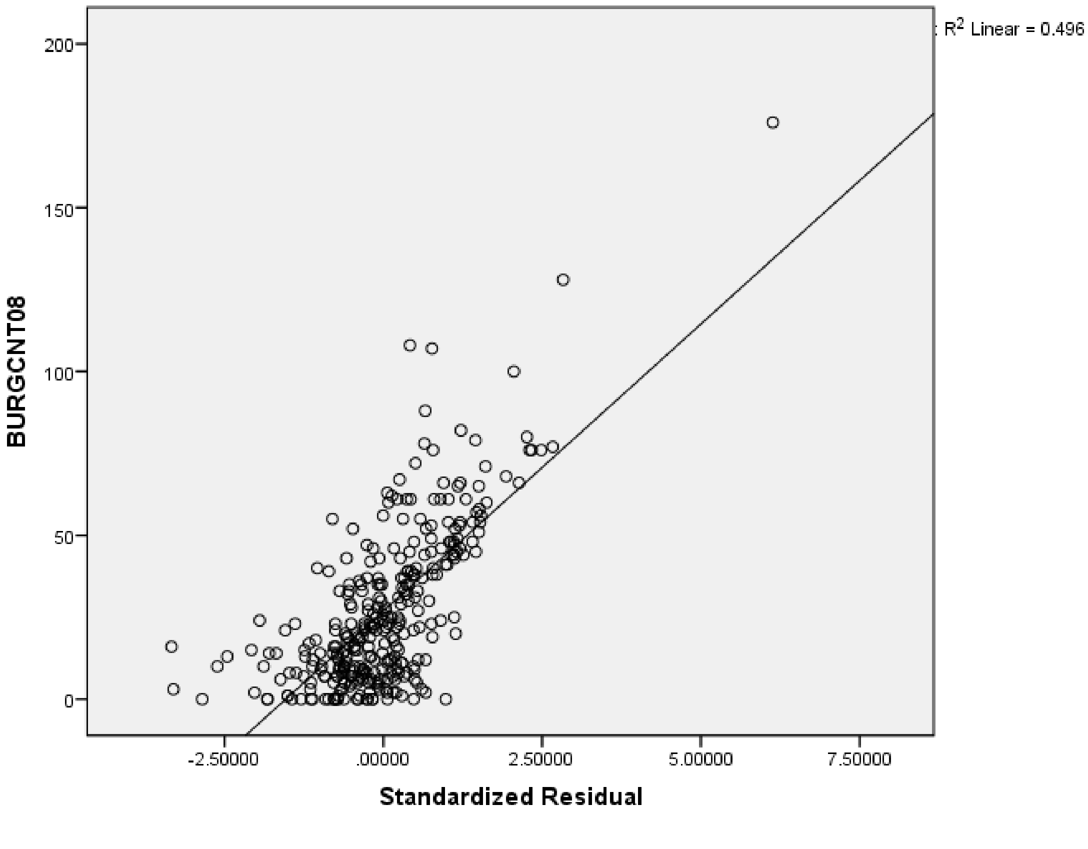
```
REGRESSION
   /DESCRIPTIVES MEAN STDEV CORR SIG N
   /MISSING LISTWISE
   /STATISTICS COEFF CI R ANOVA TOL ZPP
   /DEPENDENT BURGCNT08
   /METHOD=ENTER BusStops PercVac PercPov Age_10_21 White
                        Renter A_25Up_NoE.
```

The resulting output computed no difference from the stepwise method; therefore, the stepwise method calculations were used for comparison with ArcGIS outputs.

Descriptive Statistics

	Mean	Std. Deviation	N
BURGCNT08	26.93	24.580	317
BusStops	12.44	11.849	317
PercVac	.11318515	.124470271	317
PercPov	.95956482	.156390765	317
Age_10_21	251.90	265.016	317
White	465.47	725.518	317
A_25Up_NoE	15.13	19.883	317
Renter	302.79	280.647	317

(a)



(b)

Figure 4.1. (a) SPSS OLS model variables, (b) residuals scatter plot

4.2.2 Ordinary Least Squares in ArcGIS

Ordinary Least Squares (OLS) is the best known method to begin a spatial regression analysis (Scott and Pratt, 2009). It is the global model of the process and uses a single linear regression equation:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots \beta_n x_n + \varepsilon \quad (1)$$

where y is the value of the observed dependent variable, $x_1, x_2, \dots, x_n$ are the values of the observed independent variables, $\beta_0, \beta_1, \dots, \beta_n$ are the parameters to be estimated (the coefficients), and ε is the residual or error term assumed to be normally distributed over space and is obtained with (Fotheringham and Rogerson, 2009):

$$\beta^{'} = (\mathrm{X}^T \mathrm{X})^{-1} \mathrm{X}^T \mathrm{Y} \quad (2)$$

OLS relies upon three critical characteristics: (1) the parameters are linear, (2) the residuals are assumed to be normally distributed, and (3) the scale of the predicted scores is in the same units as the dependent variable (Cohen, 2003). A histogram of the OLS standard residuals from the SPSS output revealed an approximate normal distribution (Figure 4.2).

In checking the model for best fit in ArcGIS 10, six areas were examined: Coefficient and Koenker (BP) Statistic, Variant Inflation Factor (VIF), Akaike's Information Criterion (AICc) value, Jarque-Bera Statistic, Adjusted R-Squared value, and the p-values for spatial autocorrelation (Figure 4.3). Coefficients test for statistically significant variables at a 0.05 level. The Koenker test looks for regional variations (non-stationarity) of the spatial data relationships. The VIF value represents the acuteness of multicollinearity. If the variable's VIF value is greater than about 7.5, it means there is at least one other explanatory variant in the model that is telling the same story. The AICc is used to compare different models. The lower the AICc value, the better the model. Jarque-Bera tests for normality in the distribution. If this statistic is significant, then it means there is a key variable missing and the model is biased; therefore, the results are no longer reliable. A high Adjusted R-Squared value indicates the level of variance, or rather, how much of the model can be explained by the variation in observed dependent variable values. The higher the number, the better the model has performed.

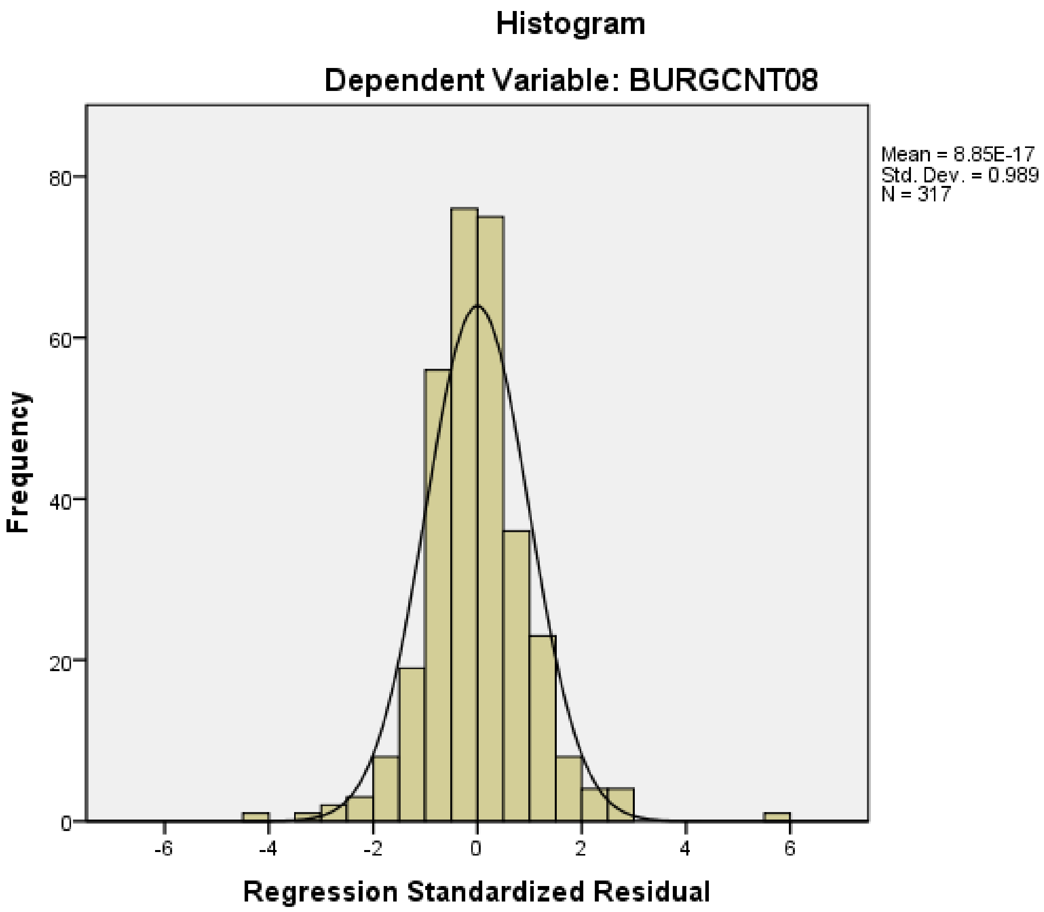


Figure 4.2. SPSS histogram showing residuals of OLS results

Summary of OLS Results

Variable	Coefficient	StdError	t-Statistic	Probability	Robust_SE	Robust_t	Robust_Pr	VIF [1]
Intercept	-37.617665	8.166970	-4.606074	0.000008*	11.392902	-3.301851	0.001086*	--------
WHITE	-0.009975	0.001461	-6.829074	0.000000*	0.001522	-6.552415	0.000000*	1.167379
RENTER	0.012909	0.004044	3.191755	0.001571*	0.004713	2.738857	0.006522*	1.339285
BUSSTOPS	0.710685	0.092759	7.661621	0.000000*	0.175198	4.056461	0.000069*	1.255742
PERCPOV	44.803417	7.648813	5.857565	0.000000*	10.769500	4.160213	0.000046*	1.487423
PERCVAC	33.566750	8.160624	4.113258	0.000056*	8.023628	4.183488	0.000042*	1.072512
A_25UP_NOE	0.134443	0.052107	2.580115	0.010331*	0.056185	2.392874	0.017301*	1.115767
AGE_10_21	0.030227	0.004602	6.568436	0.000000*	0.010025	3.015280	0.002789*	1.546098

OLS Diagnostics

Input Features:	atl_blkgrps_olsgwr	Dependent Variable:	BURGCNT08
Number of Observations:	317	Akaike's Information Criterion (AICc) [2]:	2722.380710
Multiple R-Squared [2]:	0.508013	Adjusted R-Squared [2]:	0.496868
Joint F-Statistic [3]:	45.580825	Prob(>F), (7,309) degrees of freedom:	0.000000*
Joint Wald Statistic [4]:	213.456795	Prob(>chi-squared), (7) degrees of freedom:	0.000000*
Koenker (BP) Statistic [5]:	52.419976	Prob(>chi-squared), (7) degrees of freedom:	0.000000*
Jarque-Bera Statistic [6]:	351.646692	Prob(>chi-squared), (2) degrees of freedom:	0.000000*

Notes on Interpretation

* Statistically significant at the 0.05 level.
[1] Large VIF (> 7.5, for example) indicates explanatory variable redundancy.
[2] Measure of model fit/performance.
[3] Significant p-value indicates overall model significance.
[4] Significant p-value indicates robust overall model significance.
[5] Significant p-value indicates biased standard errors; use robust estimates.
[6] Significant p-value indicates residuals deviate from a normal distribution.

Figure 4.3. Summary showing ArcGIS 10 OLS results

It was discovered that the Adjusted R-Squared value indicated a reasonably good model at .496 or 49.68%. All variables were significant, according to their p-value, and all variables met the VIF threshold of collinearity, falling between 1.07 and 1.48. The resulting histogram reflected standard residuals with a normal distribution and a mean of zero (Figure 4.4), and as such passed the Jarque-Bera test for model bias. The one test the model did not pass was for spatial autocorrelation, meaning the residuals were spatially clustered beyond what is considered statistically permissible. Furthermore, just over 50% of the variance had yet to be explained. Therefore, additional variables were sought to enhance the current model. It is possible that some of the unexplained variance resulted from an assumption that relationships in the model were constant over space (Fotheringham, 2002, p. 99). Chapter 5, section 2.3 covers further OLS analyses for each police beat and the independent variant comparisons. To improve the results of the current model, weighted regression was introduced to explore local estimation.

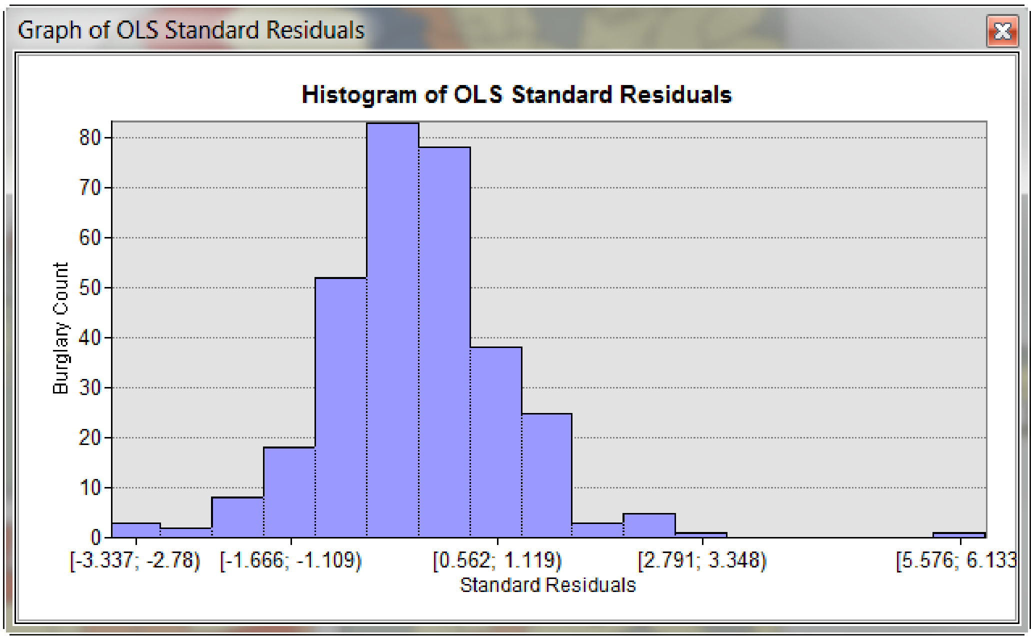


Figure 4.4. ArcGIS histogram showing residuals of OLS results

4.2.3 Spatial Autocorrelation (Moran's I)

The Global Moran's I Index measures the correlation of each neighboring feature. The tool tests for randomness in the spatial distribution of model residuals. The Moran's I statistic for spatial autocorrelation is given as:

$$I = \frac{n}{S_0} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{i,j} z_i z_j}{\sum_{i=1}^{n} z_i^2} \tag{3}$$

where z_i is equal to $x_i - \bar{x}$. The z's are then dispersed in one multivariate distribution such that the correlation between any two z's is $-\left(n-1\right)^{-1}$" (Moran, 1948(b)). The spatial weight between features i and j is represented by $w_{i,j}$, n is equal to the total number of observations, and S_0 is the aggregate of all the spatial weights (ESRI, 2011):

$$S_0 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_{i,j} \tag{4}$$

The z_I -score is calculated as:

$$z_I = \frac{I - \mathrm{E}\left[I\right]}{\sqrt{\mathrm{V}\left[I\right]}} \tag{5}$$

where E is the expected value, and V is the variance (Borwoski and Borwein, 2005) which can be found in (Moran, 1950; ESRI, 2011):

$$\mathrm{E}\left[I\right] = \frac{-1}{(n-1)} \tag{6}$$

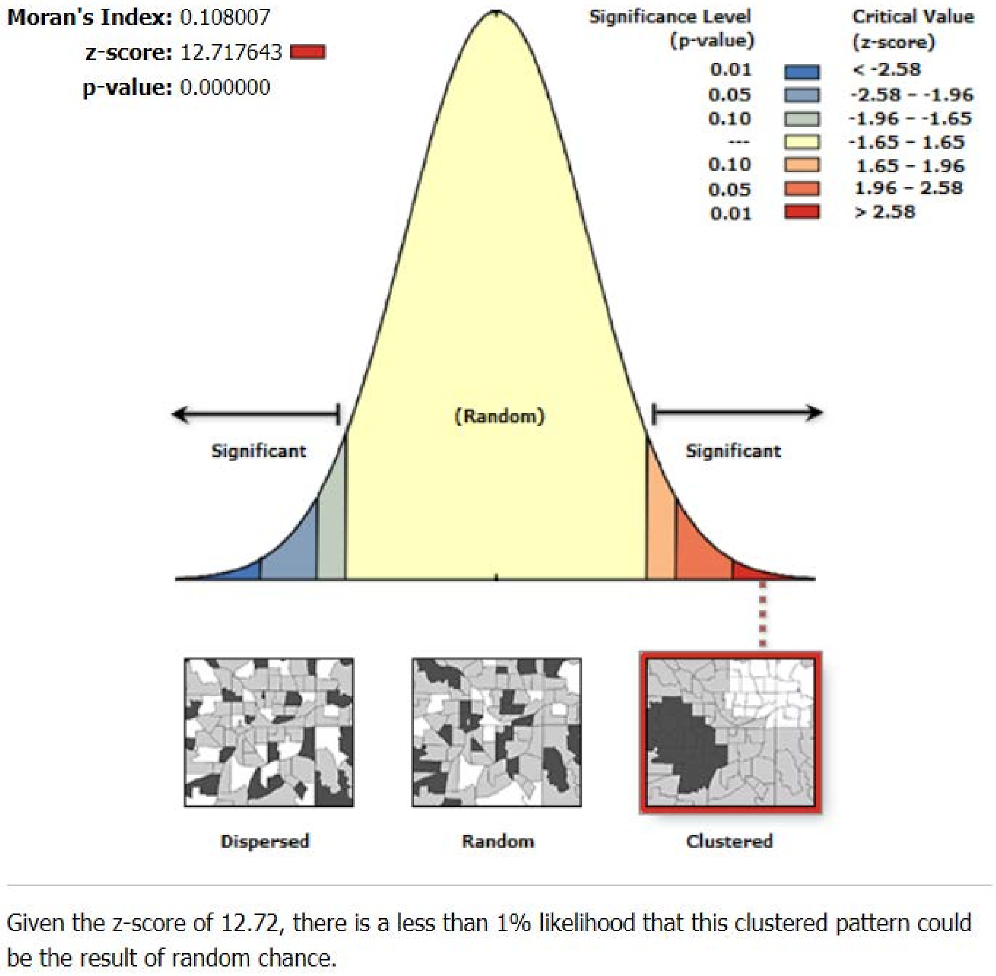
$$\mathrm{var}\left[I\right] = \mathrm{E}\left[I^{2}\right] - \mathrm{E}\left[I\right]^{2} \tag{7}$$

When the results of the calculations return a statistically significant p-value, the null hypothesis may be rejected, as a significant p-value would indicate spatial clustering of model residuals, not random patterns. P-values are statistically significant at 0.05, which indicates that the assumption of independence between observations has been violated. The areal units of measurement (census tracts, ZIP codes, etc.) are not functioning independently of each other to meet the expectation of observation independence; the neighborhoods are not distinct. Spatial autocorrelation is a common problem when using spatial data.

The computed distance was at one-half mile or 2640 feet, producing an Index score of 0.108007 (Figure 4.5(a)). Since the Index score was positive, it indicated that high values of features in the dataset tended to cluster with other high values and low values tended to cluster with other low values. Considering the z-score for the residential burglary features was 12.71, the likelihood that the clustering could have been the result of random chance was less than 1% (Figure 4.5(b)). Row standardization was deselected, as the features tested were discrete points and not polygons. Additionally, since the z-score and p-values were statistically significant for under and over predicted values in the model, a weighted regression had to be performed to obtain a more localized model.

Moran's Index:	0.108007
Expected Index:	-0.000440
Variance:	0.000073
z-score:	12.717643
p-value:	0.000000

(a)



(b)

Figure 4.5. (a) Index output, (b) Spatial autocorrelation results at one-half mile

4.2.4 Geographically Weighted Regression in ArcGIS

When Ordinary Least Squares (OLS) suffers from spatial autocorrelation in the initial determination of the explanatory variables, Geographically Weighted Regression (GWR) offers an alternative approach to traditional regression analysis by incorporating local spatial relationships. GWR is a tool that "allows the parameter estimates to vary over space" (Fotheringham, 2009). Its linear equation is:

$$y_i = \beta_{0i} + \beta_{1i}x_{1i} + \beta_{2i}x_{2i} + \ldots \beta_{ni}x_{ni} + \varepsilon_i \qquad (8)$$

where i refers to the location at which data on y and x are measured (Fotheringham, 2009). Hence, the estimated coefficients are local rather than global, as was calculated in OLS.

A GWR model uses a distance-based weight function allowing locations closest to the point of estimation to carry a greater influence on the estimate (Cahill and Mulligan, 2007). The weighted estimator is then represented by the following equation where $\mathrm{W}(i)$ is a matrix containing weights specific to location i (Fotheringham, 2009):

$$\beta^{'}(i) = (\mathrm{X}^T\mathrm{W}(i)\mathrm{X})^{-1}\mathrm{X}^T\mathrm{W}(i)\mathrm{Y} \qquad (9)$$

$$\mathrm{W}(i) = \begin{bmatrix} w_{i1} & 0 & \ldots & \ldots & 0 \\ 0 & w_{i2} & \ldots & \ldots & 0 \\ 0 & 0 & w_{i3} & \ldots & 0 \\ . & . & . & \ldots & . \\ 0 & 0 & 0 & \ldots & w_{in} \end{bmatrix} \qquad (10)$$

While there are several methods used to calculate weights, ArcGIS uses Gaussian expressions for both fixed and adaptive weighting. This study used the adaptive function as represented by:

$$w_{ij} = \left[1 - \left(d_{ij}^2 / h^2\right)\right]^2 \quad \text{if } j \text{ is one of the } N\text{th nearest neighbours of } i \qquad (11)$$

$$= 0 \quad \text{otherwise}$$

where h is the bandwidth and N is the parameter to be estimated (Fotheringham, 2009). Still the model can be largely affected by the degree of distance decay, which involves careful selection of an appropriate bandwidth. "If the bandwidth is too small, the number of data points used in estimation may become too low and result in instability in the parameter estimates" (Cahill and Mulligan, 2007). If the bandwidth is too large, spatial variance is low and the GWR model begins to resemble the OLS model. To correct for the bandwidth sensitivity, the AICc option was used:

$$\text{CV} = \sum_i \left[y_i - y \neq i^*\left(h\right)\right]^2 \qquad (12)$$

where $y \neq i^*\left(h\right)$ is the fitted value of y_i with data from point i removed from the calibration and:

$$\text{AICc} = \text{Deviance} + 2k\left[n / \left(n - k - 1\right)\right] \qquad (13)$$

where n is the number of data points and k is the number of parameters in the model (Fotheringham, 2009).

The GWR model for this study used the adaptive kernel method with a cross validation bandwidth. After running the GWR model, the AICc value was indeed lower than that of the OLS results, and the Adjusted R-Squared value was higher at 0.545 or 54.5% (Table 4.1). Although the model was improved using GWR to analyze the entire city, the coefficient results still left 46% of the explanatory variables unexplained. Exploring independent variables at the beat level was expected to yield a more robust explanation for residential burglaries in both the urban and suburban study locations.

Table 4.1. ArcGIS geographically weighted regression model results

Variable Name	Variable	Definition
Neighbors	317.00000000000	
ResidualSquares	83162.67813130000	
EffectiveNumber	14.38057247670	
Sigma	16.57737762710	
AICc	2692.06627998000	
R2	0.56442758826	
R2Adjusted	0.54516838778	
Dependent Field	0.00000000000	BURGCNT08
Explanatory Field	1.00000000000	BusStops
Explanatory Field	2.00000000000	PercVac
Explanatory Field	3.00000000000	Renter
Explanatory Field	4.00000000000	PercPov
Explanatory Field	5.00000000000	A_25Up_NoE
Explanatory Field	6.00000000000	White
Explanatory Field	7.00000000000	Age_10_21

4.3 Spatial Analysis

The primary spatial analyses were performed in ESRI ArcGIS 9.3.1 and 10 using a series of models that included Kernel Density, Getis Ord Gi* for hot spot cluster analysis, and Spatial Autocorrelation (Moran's I) to statistically determine whether the observed incidences were spatially correlated with each other. It was crucial to use a software program to visually display potential spatial patterns in the data. On occasion, OpenGeoDa, an open source spatial software package, was used for secondary test verification. Those results were given only when there was more than a negligible discrepancy.

4.3.1 Geocoding

Although the crime data files included the X and Y coordinates for the incident addresses, the addresses were processed for geocoding accuracy. An address locator was created in ArcGIS using the Streets shapefile provided by Atlanta Department of Planning. Of the 8554 incidences, 89% of the addresses achieved a match (Figure 4.5). The remaining 981 addresses were either tied (613) or unmatched (368). After examination of the unmatched addresses, the presiding issue with obtaining an accurate match was the street name. Many of the streets could not be visually located on a satellite image due to either incorrect entry or new streets not recognized in online map address files. Since various geocoding procedures exist, and the methods used by the APD records management system to geocode its CFS locations were unavailable at the time of analysis, the geolocated addresses that accompanied the incident file were used without alterations beyond what has already been stated.

4.3.2 Density Analysis

There were several different types of cluster analyses that could have been performed to achieve a spatial density outlook of the study areas, including thematic mapping, grid thematic mapping, and standard deviational spatial ellipses. A recent study conducted by the Jill Dando Institute of Crime Science found that the kernel density estimate was the most accurate for identifying hotspots of criminal activity (Chainey, Tompson and Uhlig, 2008). This study used both point density and kernel density tools to identify clusters of residential burglary.

Kernel Density in the Spatial Analyst ArcToolbox was used for preliminary cluster analyses to "calculate the density of features in a neighborhood around those features" (ESRI, 2011). For point features, it calculates the density around each output raster cell. This tool provided a smoother interpolated result over the Point Density option. The kernel function in ArcGIS 10 was based upon a probability density estimator, defined as (Silverman, 1986; Laver, 2005):

$$\hat{f}(x) = \left[\frac{1}{\left(nh^2\right)}\right]\sum_{i=1}^{n} K\left\{\frac{(x - X_i)}{h}\right\} \tag{14}$$

where K is the kernel that determines the shape of the distribution placed over each point of analysis; h is the smoothing parameter controlling the search radius; n represents the number of location points used in the analysis; and, x and X refer to the coordinate vectors of the evaluation point and all other points, respectively (Laver, 2005).

The kernel density tool in ArcGIS 10 uses the following biweight kernel function described by Silverman (1986):

$$K_2(x) = \begin{cases} 3\pi^{-1}(1 - x^T x)^2 & \text{if } x^T x < 1 \\ 0 & \text{otherwise} \end{cases} \quad (15)$$

where “$x^T x$ is the distance from the evaluation point to any other point in the set, divided by the smoothing factor, h. Thus, if x’x < 1, then the point in question is within the search radius (h) of the evaluation point and is used in estimating the density at the evaluation point. If x’x > 1 then the point is too far away from the evaluation point to be considered” (Laver, 2005). Once the point is included in the estimation, an inverse distance weighting function is applied, thereby creating a smoother result in the final output shape of the underlying kernel (Lavar, 2005).

While the point density result was easier to visually interpret for the annual incident analysis, a kernel density estimate was used for the monthly analyses. There were fewer points for the function to process; therefore, the results were better interpolated at two standard deviations (Figure 4.6).

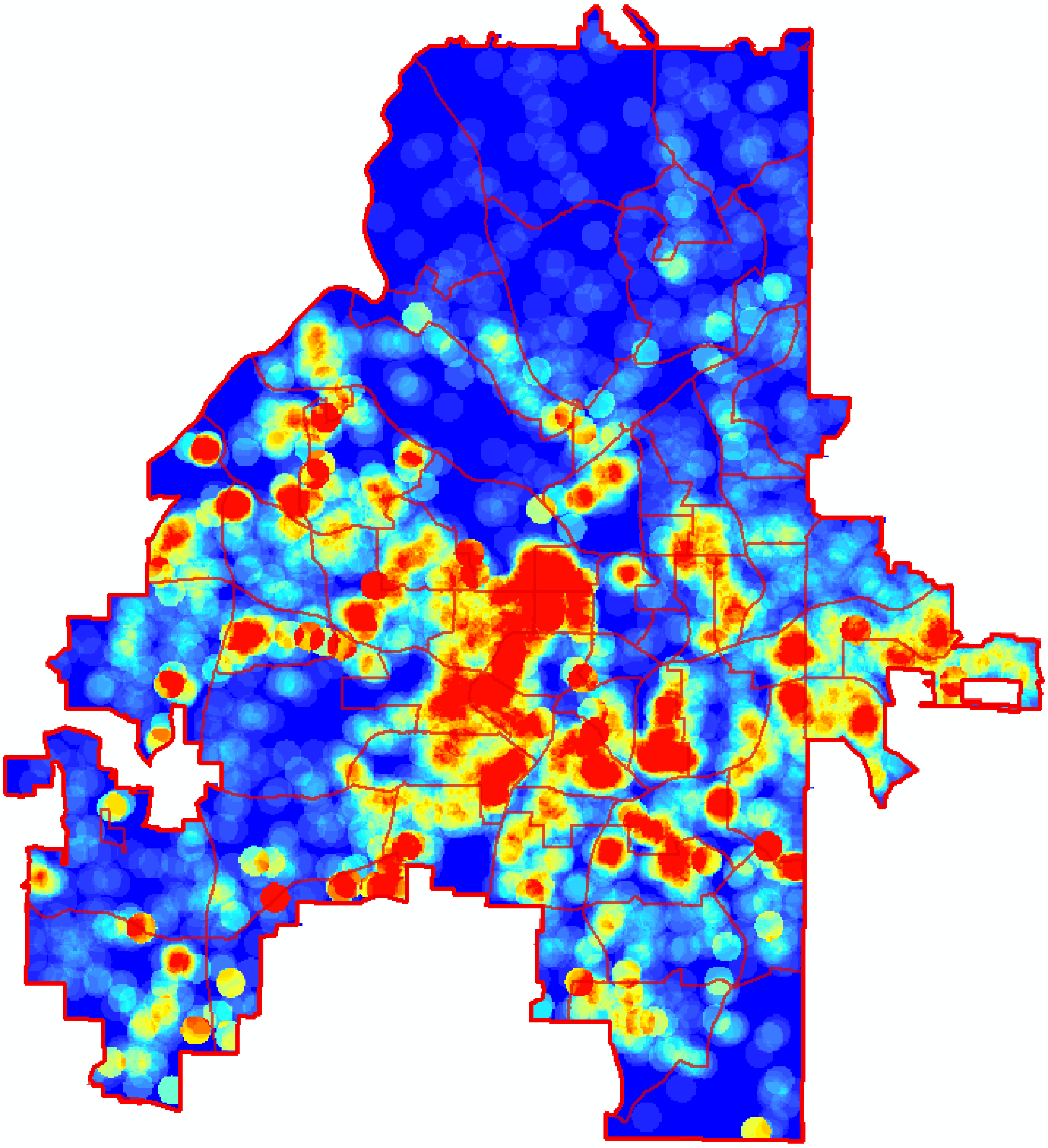


Figure 4.6. Point density analysis results for 2008 residential burglary incidents

4.3.3 Hot Spot Analysis (Getis-Ord Gi*)

Once the cluster analyses were complete, it was necessary to determine the statistical significance of the observed spatial patterns. For that process, the Hot Spot Analysis tool in ArcGIS was used. “Hot spots” are indicative of high values clustering together. “Cold spots” mean low values are clustering together. The calculation uses the Getis-Ord Gi* local statistic given as (Getis, A and Ord, J.K., 1995; ESRI, 2011):

$$G_i^* = \frac{\sum_{j=1}^{n} w_{i,j} x_j - \bar{X} \sum_{j=1}^{n} w_{i,j}}{S \sqrt{\frac{\left[n \sum_{j=1}^{n} w_{i,j}^2 - \left(\sum_{j=1}^{n} w_{i,j} \right)^2 \right]}{n-1}}} \quad (16)$$

where “ x_j is the attribute value for feature j, $w_{i,j}$ is the spatial weight between feature i and j, n is equal to the total number of features and:

$$\bar{X} = \frac{\sum_{j=1}^{n} x_j}{n} \quad (17)$$

$$S = \sqrt{\frac{\sum_{j=1}^{n} x_j^2}{n} - \left(\bar{X} \right)^2} \quad (18)$$

The G_i^* statistic is a z-score so no further calculations are required (ESRI, 2011).

“The Gi* statistic returned for each feature in the dataset is a z-score. For statistically significant positive z-scores, the larger the z-score is, the more intense the clustering of high values (hot spot). For statistically significant negative z-scores, the smaller the z-score is, the more intense the clustering of low values (cold spot)” (ESRI, 2011). The cold and hot areas were visualized using a color spectrum from blue to red, respectively (Figure 4.7).

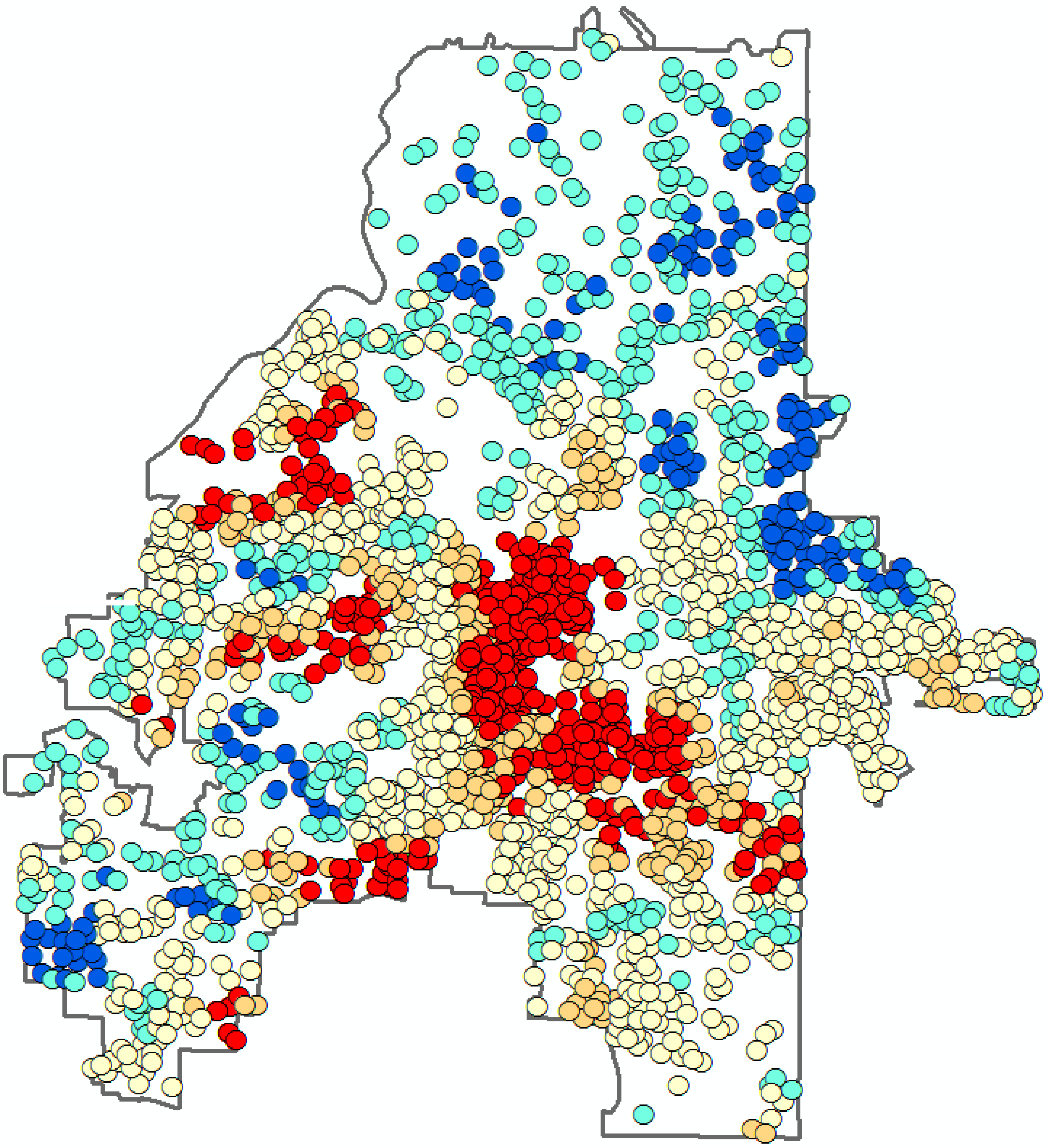


Figure 4.7. Hot spot analysis results

4.4 Imagery Analysis

The ability to view and calculate changes in land use, as well as the need to visually inspect land cover and verify land use percentages required the use of satellite imagery.

For this research, digital ortho-photographic imagery was acquired from the National Agricultural Imagery Program (NAIP) for 2009. Little processing was necessary, and the image was clipped to the city boundaries.

Additional historical imagery was acquired using Google Earth. Due to the acute resolution, this satellite imagery provided an excellent method for visually inspecting the land surfaces for changes (i.e. construction, demolition, neighborhood decay, etc.). Street-level imagery, as that obtained by Google, was not always reliable, as it was most often out of date. However, there was benefit in its use, as it provided a historical view of neighborhood upkeep.

While the use of Landsat TM imagery was explored, its overall benefit to this study was minimal at best. Therefore, the NAIP imagery and Google Earth historical imagery were the primary sources utilized.

LandPro data was used to determine land use and land cover for Atlanta. It was created by the Atlanta Regional Commission using 2008 true color imagery provided by Aerials Express, Inc. with 1.64-foot pixel resolution. The land use delineations were based on 5- and 25-acre mapping units, according to the metadata provided with the feature class shapefile.

CHAPTER V

ANALYSES

5.1 Temporal Analyses

Examining when residential burglary occurs was equally as important as studying its locations for it provided an opportunity to test popular, established theories of property crime. Moreover, the temporal aspect added a layer of analysis that could offer greater insight into other influential variants, such as employment, sporting-related events, and holidays. Furthermore, seasonal trends examined for comparison included the two previous years of 2006 and 2007 to show three-year monthly and quarterly trends.

5.1.1 Time of Day

The time of day was analyzed using Time-From column in the RMS data table (Table 5.1). It was necessary to categorize the shifts into three distinct eight-hour blocks of time, creating a Morning (1:01 a.m. to 9:00 a.m.), Day (9:01 a.m. to 5:00 p.m.), and Evening (5:01 p.m. to 1:00 a.m.) shift designation. A shift designation of Unknown meant the person reporting the crime did not know when the offense occurred.

After calculating the offenses for each shift, it was determined that for all areas except Beat 203, the Day shift was the most frequent time for burglaries (Table 5.2). For Beat 203, it was the Morning shift. The Unknown shifts were generally the second highest time. There were two occasions when it was the highest; however, because it did not carry an actual time, the figure was set aside. Split times were not calculated for Unknown shifts, as they would have added a larger margin of error for both Time of Day and Day of Week analyses.

5.1.2 Day of Week

Of the 8,540 reported incidents citywide, the most frequently reported day of occurrence by far was Friday. However, the individual patrol areas did not follow suit. The most frequently reported day of occurrence among all the smaller areas was Wednesday. In the high-clustered locations, Monday was more commonly reported; and in the low-clustered patrol beats, Wednesday was reported more often.

With a Monday reporting date, it could be inferred that people were away for the weekend and returned home to discover a break-in had occurred. Wednesday was not easily explained, as it is in the middle of the week. And with the common shift being Day, it could be inferred that the residents were at work during the time of occurrence. However, there was still the question of the particular day of the week.

Table 5.1. Residential burglary rates for hot areas.

Beat	Day	Count	Shift	Count
101 / 111	Monday	44	Day/Unk.	D: 13, U: 17
	Tuesday	39	Day	13
	Wednesday	54	Day	16
	Thursday	48	Day	17
	Friday	42	Day/Unk.	D: 10, U: 16
	Saturday	38	Evening/Unk.	E: 8, U: 19
	Sunday	26	Day/Unk.	D: 4, U: 15
103	Monday	44	Day	19
	Tuesday	32	Day	13
	Wednesday	36	Day	14
	Thursday	36	Day/Unk.	D: 10, U: 10
	Friday	23	Day	7
	Saturday	24	Unknown	8
	Sunday	22	Day/Unk.	D: 7, U: 10
107	Monday	31	Day	15
	Tuesday	26	Day	9
	Wednesday	25	Day/Unk.	D: 5, U: 12
	Thursday	24	Day	10
	Friday	33	Day	10
	Saturday	23	Unknown	11
	Sunday	16	Day	8
302	Monday	32	Morning	11
	Tuesday	39	Day	12
	Wednesday	41	Day	19
	Thursday	29	Morning	9
	Friday	35	Day	14
	Saturday	35	Evening/Unk.	E: 12, U: 12
	Sunday	19	Day	7
303	Monday	42	Day/Unk.	D: 13, U: 16
	Tuesday	25	Day	10
	Wednesday	36	Day	14
	Thursday	43	Day/Unk.	D: 13, U: 13
	Friday	47	Evening/Unk.	E: 12, U: 13
	Saturday	34	Day	12
	Sunday	21	Morning/Day	M: 6, D: 6
401	Monday	44	Day	22
	Tuesday	36	Day	13
	Wednesday	33	Day	17
	Thursday	20	Evening/Unk.	E: 6, U: 7
	Friday	24	Day	9
	Saturday	23	Day	7
	Sunday	18	Evening	9

Table 5.2. Residential burglary rates for cold areas.

Beat	Day	Count	Shift	Count
102	Monday	**21**	Day	**D: 13, U: 13**
	Tuesday	**23**	Day	**10**
	Wednesday	**13**	Day	**12**
	Thursday	**38**	Day	**13**
	Friday	**32**	Day/Unk.	**D: 10, U: 11**
	Saturday	**24**	Evening/Unk.	**E: 7, U: 9**
	Sunday	**19**	Morning/Unk.	**M: 2, U: 6**
202	Monday	**4**	Day/Unk.	**D: 1, U: 2**
	Tuesday	**5**	Evening/Unk.	**E: 1, U: 4**
	Wednesday	**4**	Day	**1**
	Thursday	**5**	Day/Evening	**D: 2, E: 2**
	Friday	**7**	Day/Unk.	**D: 2, U: 5**
	Saturday	**3**	Morning/Unk.	**M: 1, U: 2**
	Sunday	**6**	Morning/Unk.	**M: 1, U: 5**
203	Monday	**6**	Day	**3**
	Tuesday	**6**	Day	**2**
	Wednesday	**9**	Day/Unk.	**D: 1, U: 6**
	Thursday	**4**	Morning/Evening	**M: 2, U: 2**
	Friday	**6**	Morning	**4**
	Saturday	**5**	Day/Unk.	**D: 1, U: 3**
	Sunday	**5**	Day/Unk.	**D: 2, U: 2**
411	Monday	**27**	Day/Morning	**D: 8, M: 8**
	Tuesday	**22**	Day/Unk.	**D: 7, U: 8**
	Wednesday	**29**	Day	**16**
	Thursday	**23**	Day	**11**
	Friday	**28**	Day	**10**
	Saturday	**20**	Day	**8**
	Sunday	**23**	Morning/Unk.	**M: 7, U: 8**
603	Monday	**9**	Day	**6**
	Tuesday	**4**	Day/Morning	**D: 2, M: 2**
	Wednesday	**11**	Day/Evening	**D: 5, E: 5**
	Thursday	**11**	Day	**5**
	Friday	**8**	Day	**4**
	Saturday	**3**	Evening	**2**
	Sunday	**4**	Evening	**2**

For both tables, the highest and/or tied rate for the Shift is recorded.

5.1.3 Seasonal Variations

The highest monthly residential burglary rate was 1073 for December. The next two highest rates were July at 773 and August at 853. Of all the beats examined for monthly trends, beats 102, 103, and 411 were the most volatile (Figures 5.1–5.4), with regard to burglary activity. Citywide, there was a steady increase leading to the spike in December. The most frequent high month throughout the individual areas was January, which was consistent with the seasonal trends.

The quarterly average charts showed relative consistency within the high-activity areas and the low-activity areas respectively (Figures 5.5–5.8). When calculating the seasonal trends, December counts were taken from the prior year to account for the full winter quarter. Winter was season with the most frequent burglary incidents. Residential burglaries occurred more often in Q4 for the high-clustered areas, and Q3 for the low-clustered locations.

It is worth noting that the two prior years, showed similarities in the seasonal occurrences of burglaries and are visualized with the 2008 data.

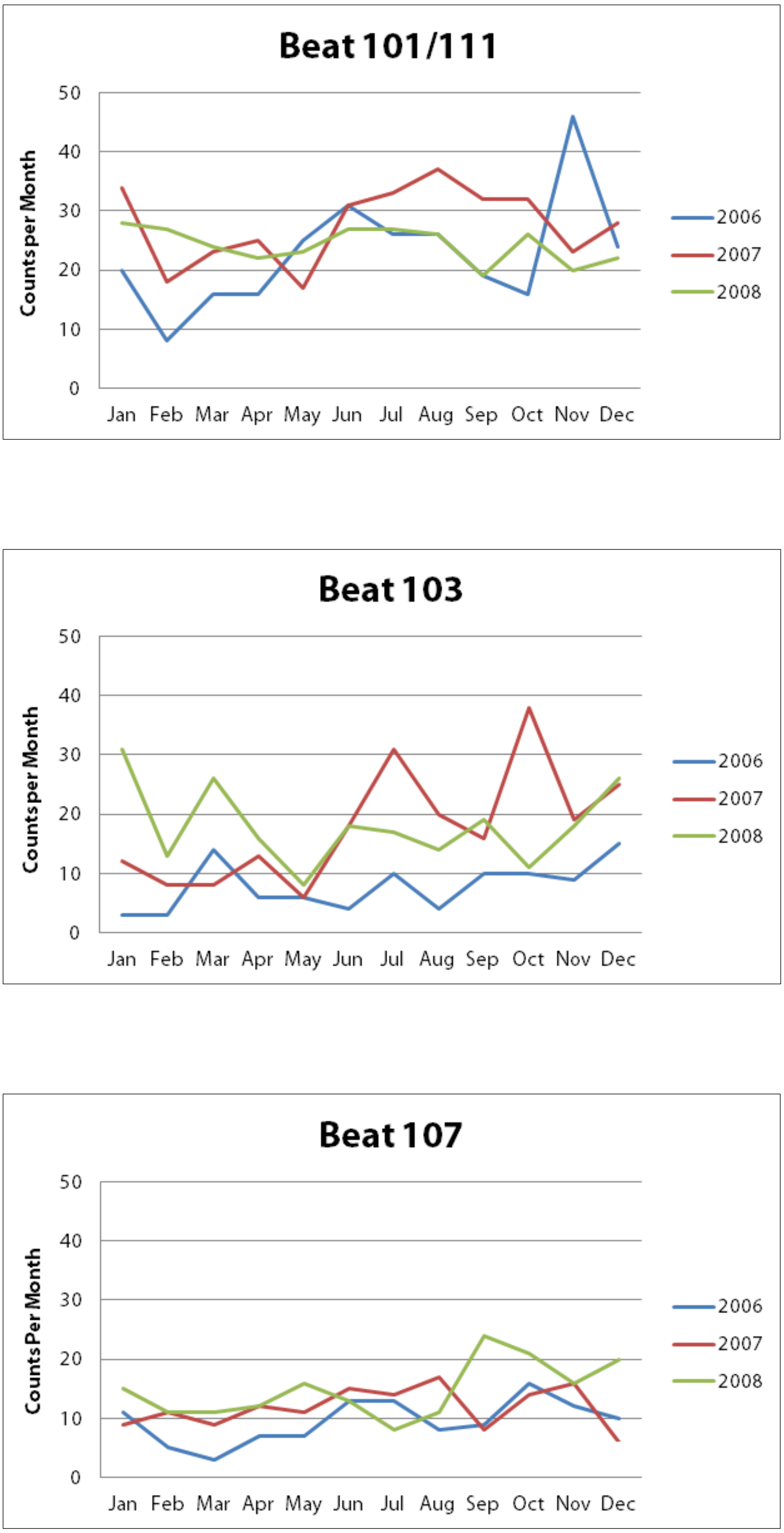


Figure 5.1. Beats 101/111, 103 and 107 monthly counts

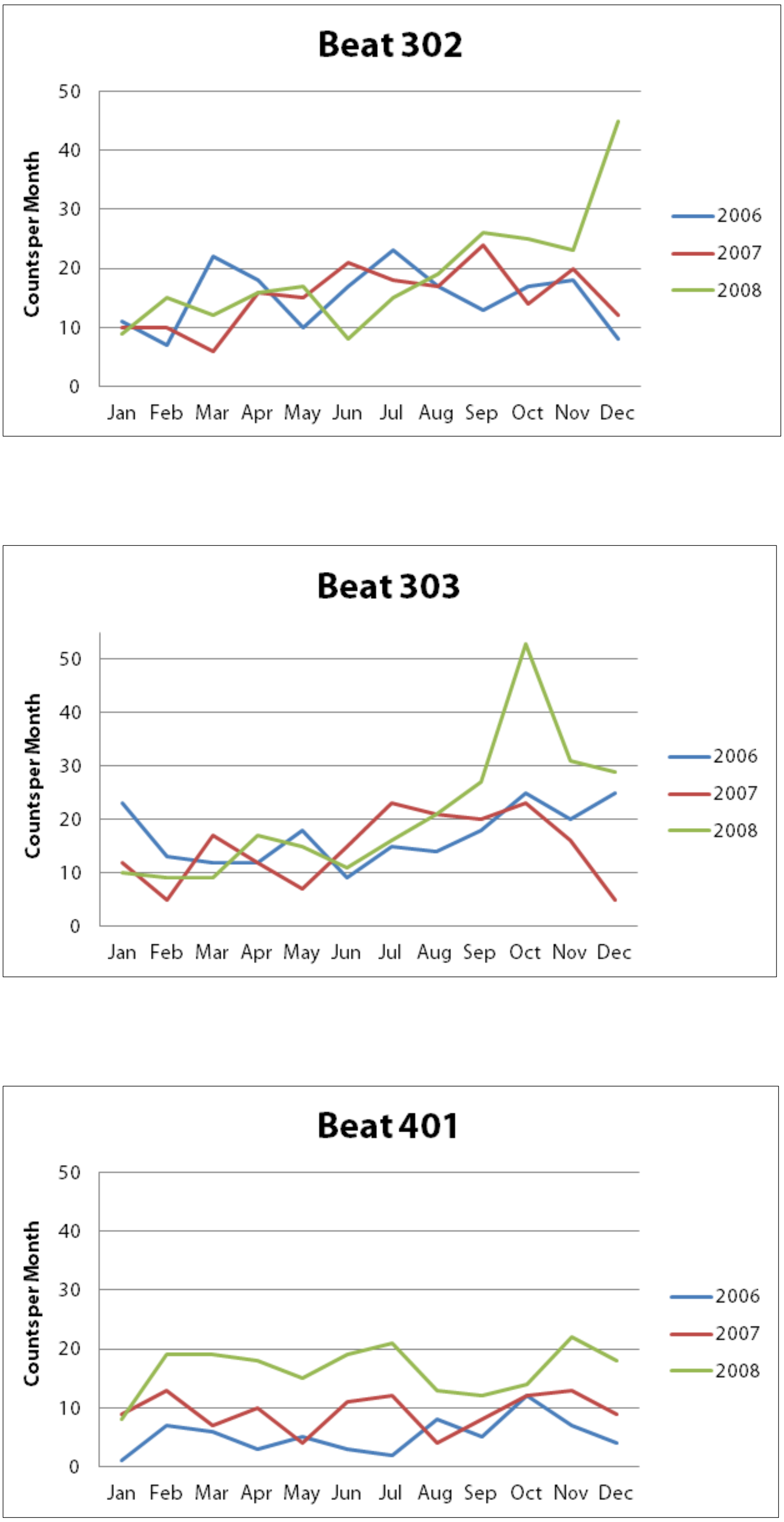


Figure 5.2. Beats 302, 303 and 401 monthly counts

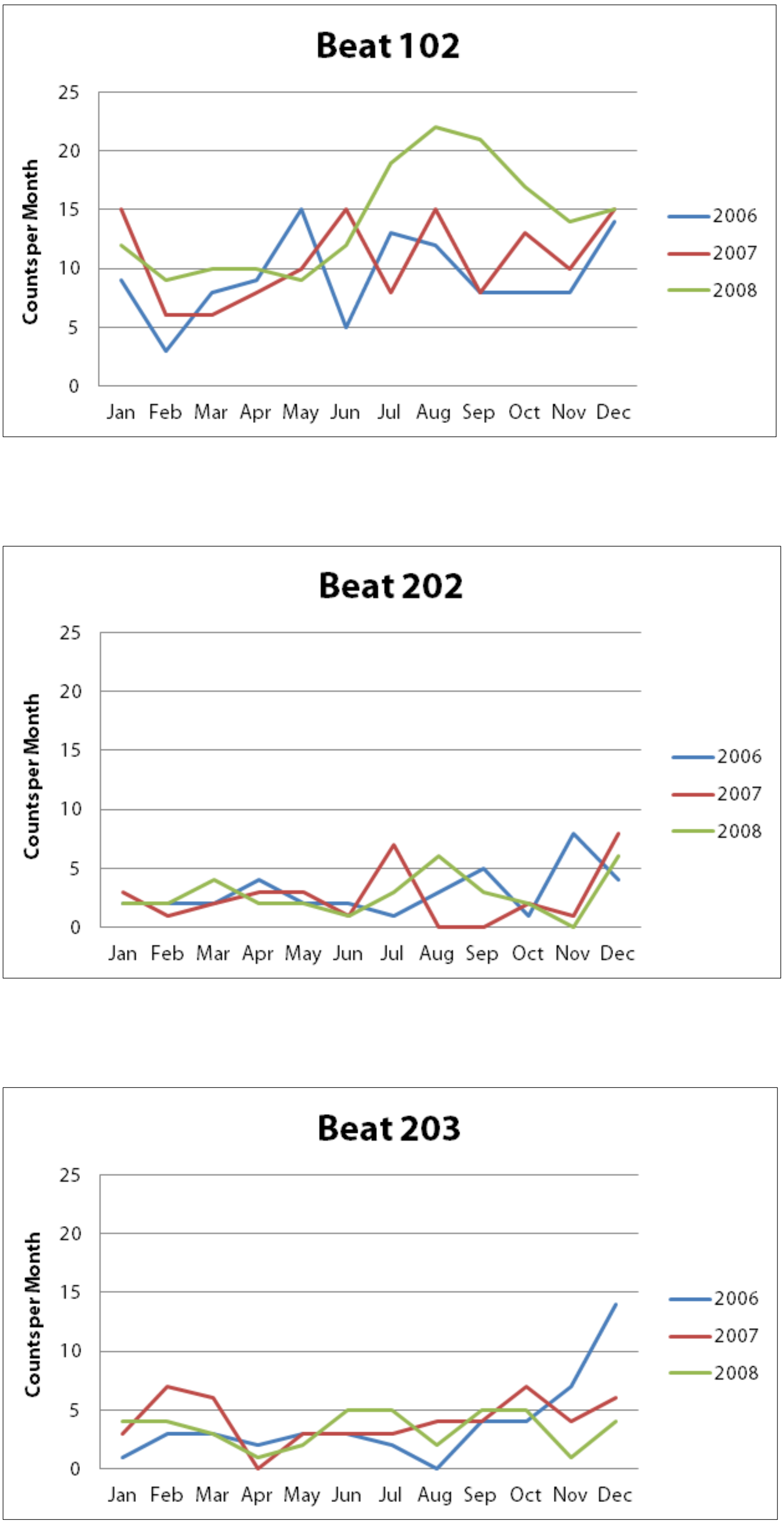
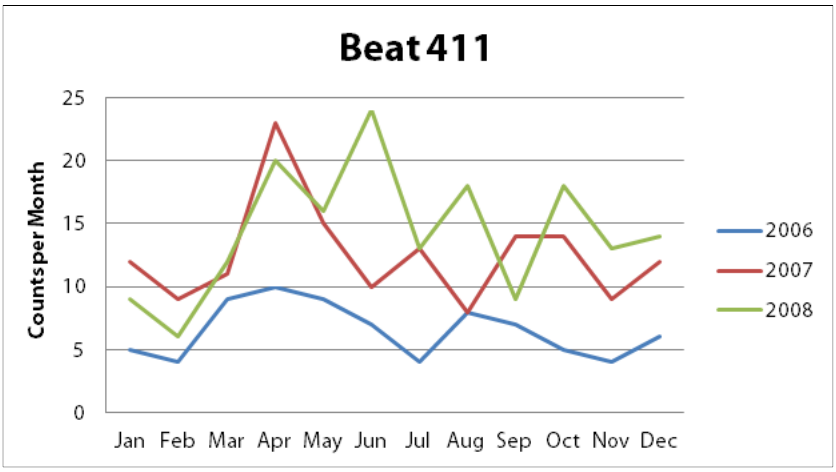
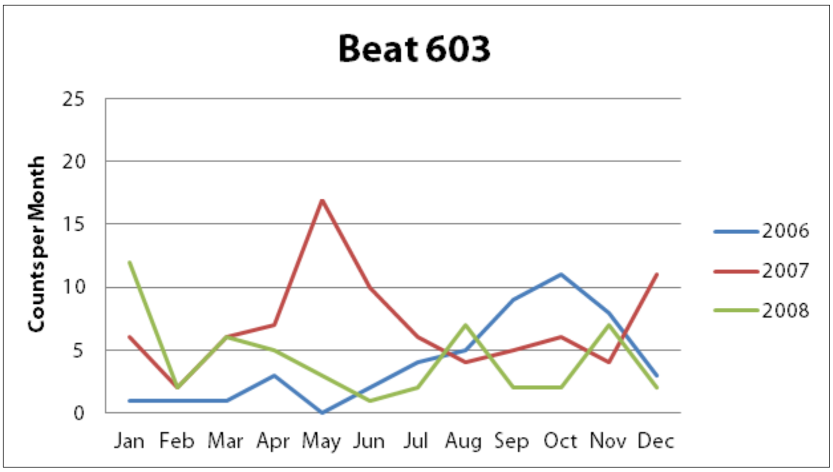


Figure 5.3. Beats 102, 202 and 203 monthly counts





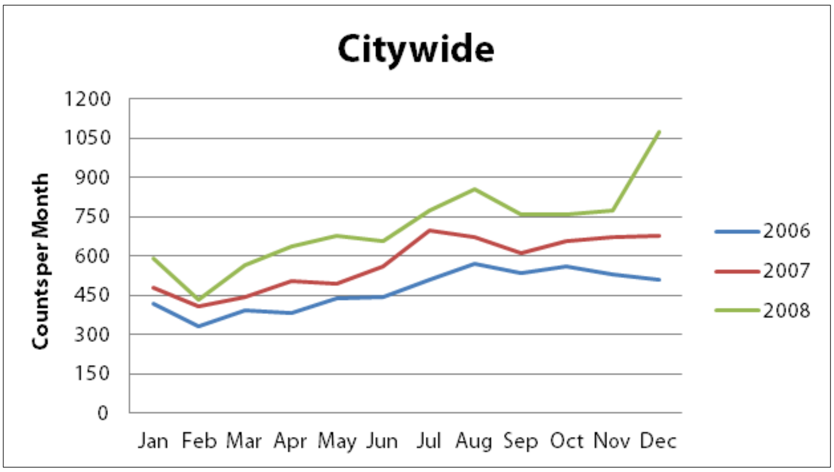


Figure 5.4. Beats 411, 603 and Citywide monthly counts

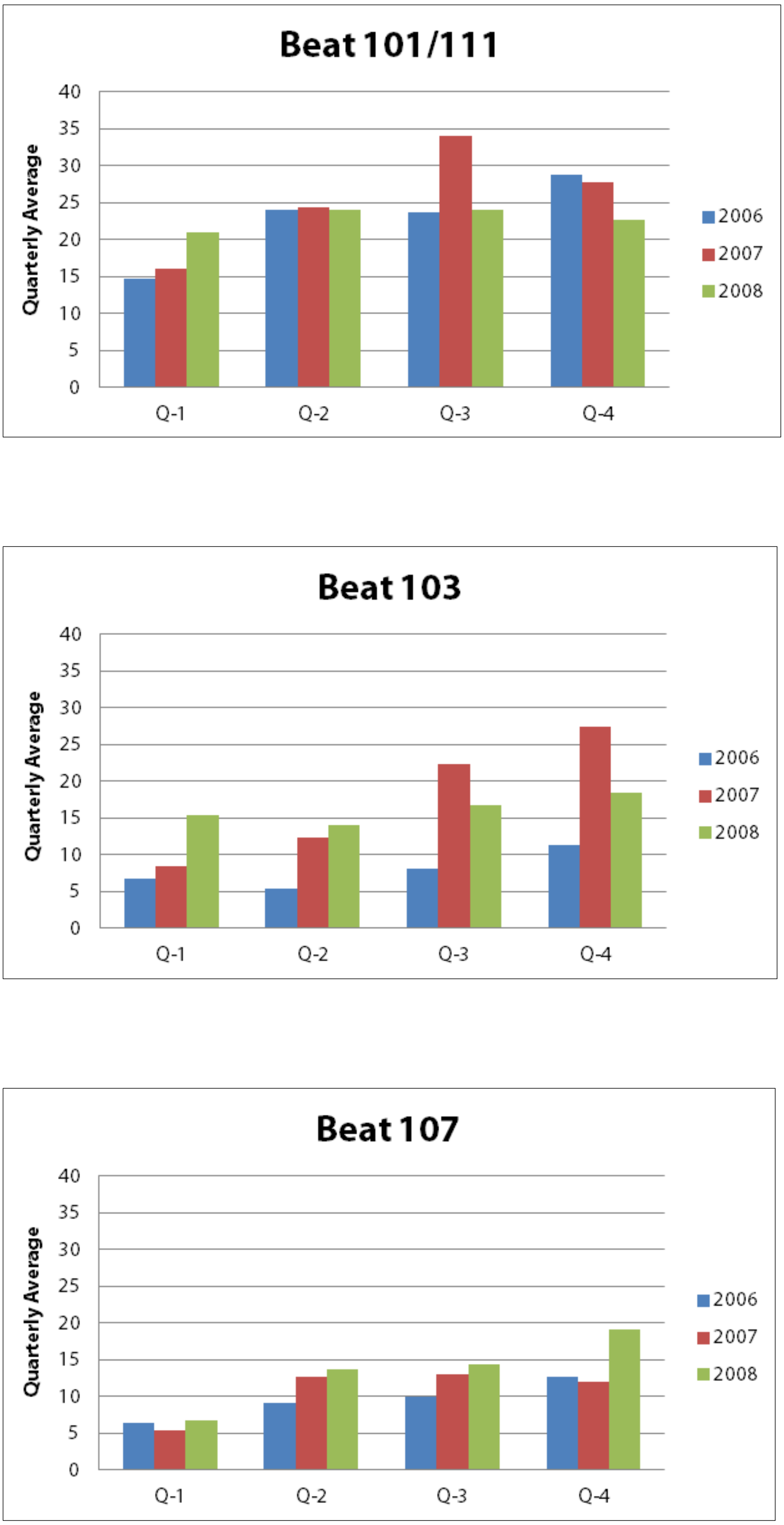
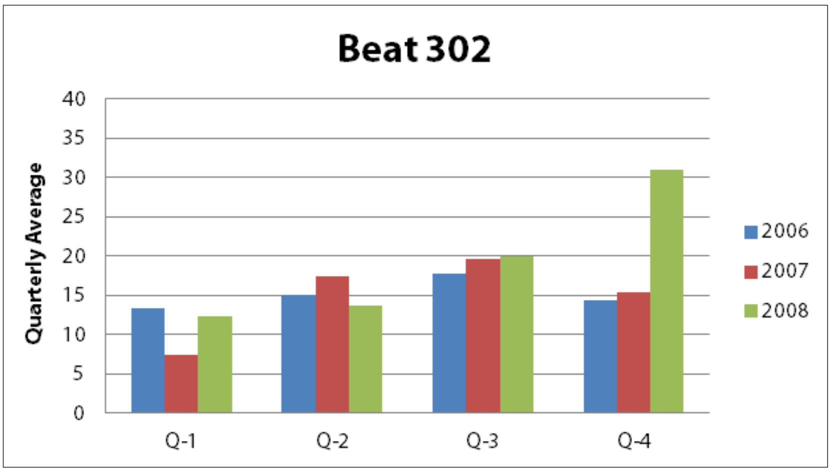
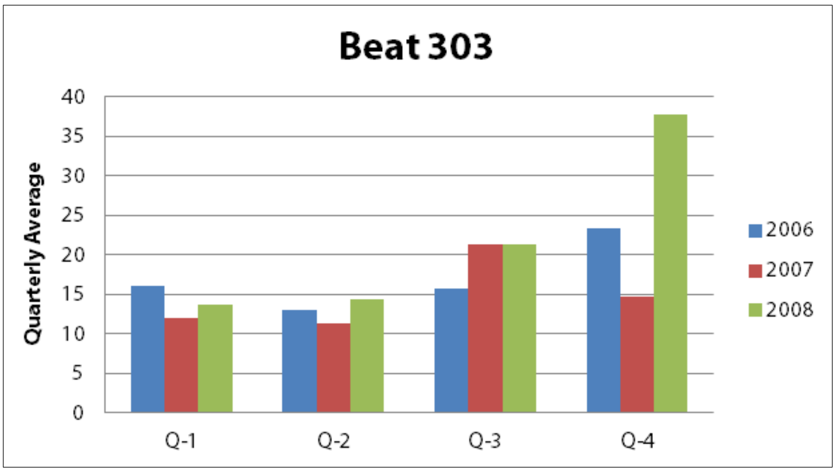


Figure 5.5. Beats 101/111, 103 and 107 quarterly averages





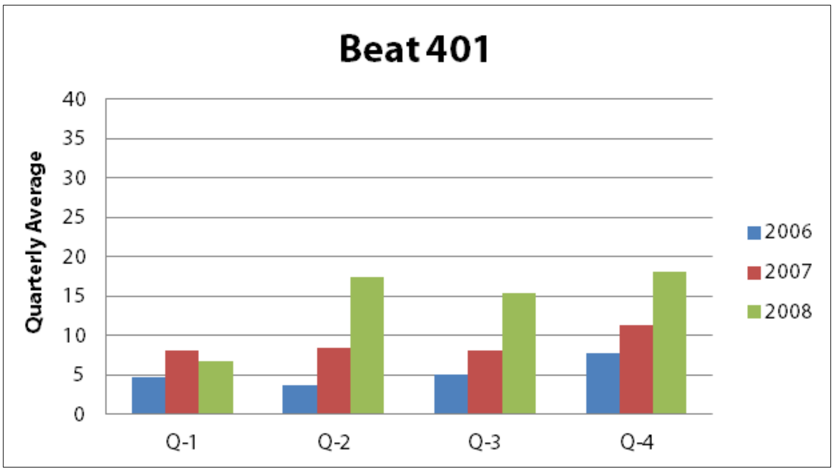
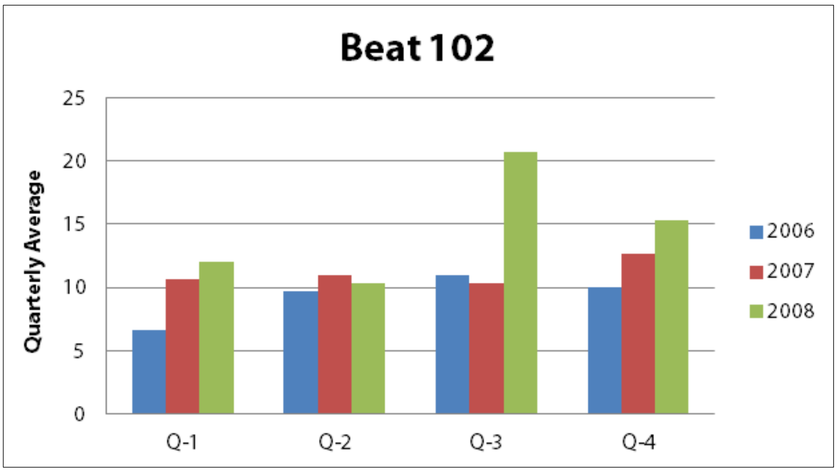
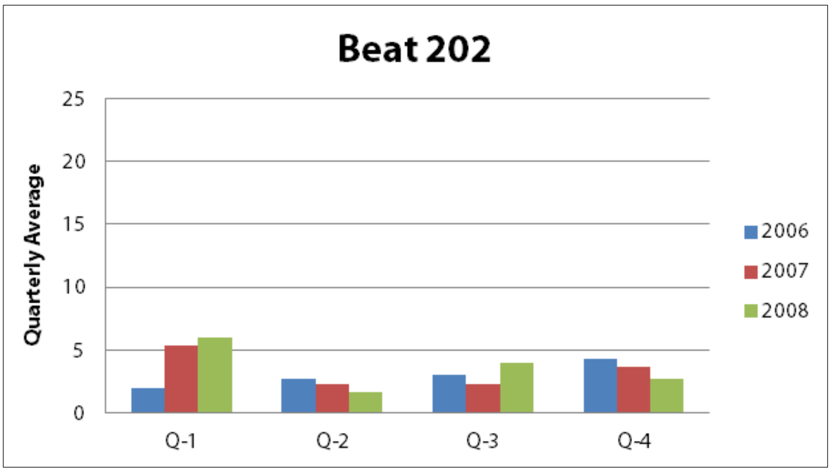


Figure 5.6. Beats 302, 303 and 401 quarterly averages





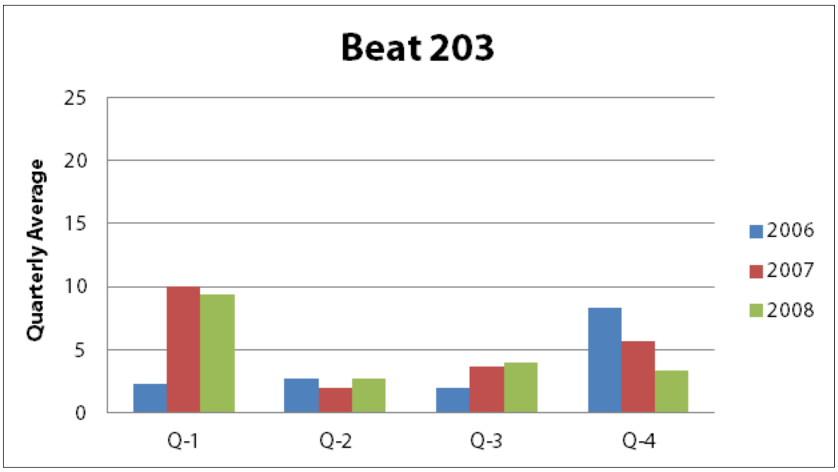
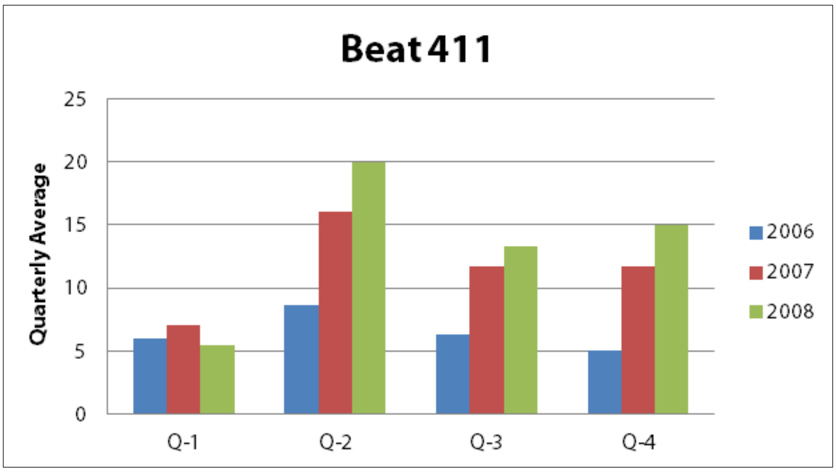
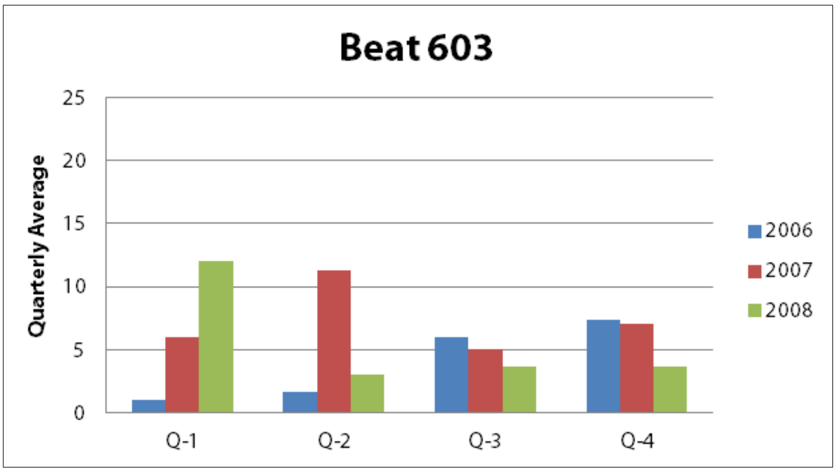


Figure 5.7. Beats 102, 202 and 203 quarterly averages





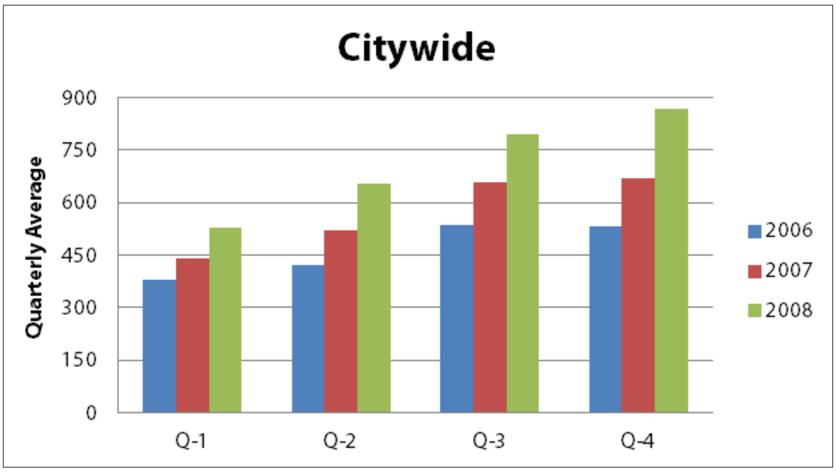


Figure 5.8. Beats 411, 603 and Citywide quarterly averages

5.1.4 Potential Issues with Time/Day Accuracy

As mentioned in Chapter 3.2.2, there were some discrepancies with the accuracy of the time/day analyses. The most troublesome issue was the reporting of the incident versus when the reporting party (RP) could determine the incident occurred. If someone was leaving for holiday and returned a week later, there was essentially no way for the RP to know when the break-in happened, unless there was an alarm or CCTV of the incident.

Again, for this study, split times were not calculated. The process involved calculating a mid-point time, which is created using an approximate start time and the ending time – the time the RP returned home. The start time is then subtracted from the ending time, then divided by two; thus splitting the time in half. The resulting time is treated as exact (Gottlieb, et.al. 1994, p. 417). While the technique works well for determining a burglary series, the resulting calculations did not work for this study, as the research was not examining series crimes.

5.2 Spatial Data Analyses

Geocoded crime data combined with the geographic spatial data provided ample opportunity to explore residential burglary incidences to determine their spatial dispersion across the individual study areas. Simply looking at the dots on maps did not explain the visualized phenomenon; therefore, additional analyses were needed to obtain a deeper understanding of what was happening within the clustered and non-clustered locations.

In that respect, topographic aspects of each burglary location within the constructs of each police beat were taken into consideration when applying spatial analysis techniques.

5.2.1 Analysis Scale

The majority of the finer analyses at the police beat level used census blocks for demographic data. This was done because the administrative boundaries of the policing beats were more closely aligned with the census blocks than the census block groups. Income-related analyses were performed using the aggregate data at the block group level, as that data was not available at the smaller unit. Additionally, USPS vacancy and foreclosure data were only available at the census tract level. Therefore, inferences had to be made regarding the smaller units using the larger aggregated calculations. Such analyses using different scales have been attributed to ecological fallacy, which occurs when inferential results based on aggregate data are applied to the individuals or specific sites within the [area] itself (Dark and Bram, 2007).

Furthermore, using different scales for analysis may have contributed to an issue referred to as the modifiable areal unit problem, and awareness of the topic has been discussed in the geography discipline (Openshaw and Taylor 1979; Dark and Bram 2007; Wong 2009).

5.2.2 Modifiable Areal Unit Problem (MAUP)

The Modifiable Areal Unit Problem or *MAUP* is an issue with scale and aggregation when performing quantitative studies in spatial-related geography. "The term *MAUP* was coined by Openshaw and Taylor [in 1979] when they experimented with how correlation coefficient values changed when smaller areal units were aggregated to form larger areal units wither hierarchically or non-hierarchically" (Wong 2009, p. 105).

There are two types of *MAUP*. The zoning problem deals with inconsistencies in data based upon varying zoning systems; and the scale problem, which is associated with inconsistencies in geographic scale or spatial resolutions (Wong 2009, p. 108). Because this research used statistical data at varying levels of scale, it was not immune to potential errors when aggregating up to a larger unit of measure or attempting to disaggregate to a smaller unit of measure. For example, as the administrative boundaries of the city of Atlanta were located in two separate counties, it was necessary to combine both Fulton and DeKalb geographies, to include their census data. However, once the city boundary was clipped from the resulting merge of the two counties, there was most assuredly error in accounting for population for each police beat. At times, both the police administrative boundaries and the city boundaries subdivided census tracts and block groups, which meant median values were averaged. Moreover, when relating vacancy and income data to the smaller units, ranges had to be used to cover the span of data.

The above technique did not necessarily remedy the *MAUP* issue, however, it is hoped that it minimized the amount of error (or fallacy) often associated with the inconsistent scales.

5.2.3 Areas of Clustered Occurrences

There were 1145 reported residential burglaries in the urban beats, whereas the suburban beats had less than half that number at 467. The high-clustered or hot spots for this study, accounted for 13.41% of burglaries citywide. Among the study areas considered in this analysis, the high-clustered locations represented about 71% of burglary occurrences.

Beats 101/111, 103, 107, 302, 303, and 401 had higher levels of clustering, and represented urban-type areas. These locations had consistently higher population densities, more renters and bus stops, and a Black population of more than 87%, with Beat 103 as high as 97.97%. On average, there were more public housing facilities in these hot spots – 14 in total.

5.2.4 Spatial Relationship to Gathering Centers

Whether burglaries are "unplanned and speculative in nature" (Grabosky 1995, p 3) or carried out by rational agents who case a residence prior to committing the burglary (Nee and Meenaghan, 2006), the proximity of burglary clusters to large gathering centers cannot be overlooked. Of the areas with densely clustered burglaries, Beat 101/111 is west of the downtown area, which includes notable gathering places such as the Georgia Dome, Philips Arena and the World Congress Center.

In Beat 303, the Norfolk-Southern Railway Station, which services freight shipments, is the apparent attractor for clustering. The freight yard has structures for maintenance, metal works, and some empty or seemingly abandoned buildings that could potentially serve as shelter for some homeless. However, in the absence of official data on where the homeless seek informal shelter, such as under bridges and overpasses, the railway as a haven for shelter is mere speculation. Additionally, there have been few empirical studies to show that the homeless population commits residential burglaries as a practice. One study did explore the connection between railroad yards, the homeless, and property crimes (Harring, 1977); however, the period covered by the research was from 1892 to 1894. Additionally, the campaign by the police to rid Buffalo, New York of vagrants (known as tramps at that time) was strategic and fueled by social elite fears of safety while traveling (Harring 1977).

Turner Field, where the Atlanta Braves Major League Baseball team plays their home games, is located in Beat 302. Two of the outer parking lots for the stadium are utilized off-season. It is also common to park in the neighboring communities and walk to the stadium for games. The increased foot and vehicle traffic puts additional strain on the residential communities, for both day and night games. While such disruption may occur, a recent study found that “little to no evidence [supports] that sporting events are correlated with…property crime…” (Baumann, et.al. 2012).

Clark Atlanta and Atlanta Universities are located in Beat 107, along with Morehouse and Spellman Colleges. Studies have shown university housing and surrounding residential areas to be prone to thefts and burglaries, especially if the residential unit is located on the first or second floor of the structure or entryways are obstructed by foliage (Brantingham and Brantingham 1981; Letkemann 1973; Robinson 1997).

While Beat 401 was south and Beat 103 was west of Beat 107, it would appear that based upon the locations of the hot spots, it could be inferred that housing surrounding the university properties was targeted, though it could not be easily ascertained whether the residences located within the beat boundaries were designated student housing.

Among the areas with less densely clustered burglaries, Beat 603 neighbors a shopping mall. Although this was not much of an issue with regard to residential burglaries, it was a major influence for higher thefts from motor vehicles (English, 2011). This area also contained a large park to the north, which was not much of a factor for burglaries.

Beats 202 and 203 both contain shopping malls and golf courses, neither of which had much of an effect on residential burglary rates in the two areas. Beat 411 is misshapen by a cemetery, which encompasses an adjacent patrol area.

Beat 102 was an anomaly in that although it had hot spot activity mostly in the southern portion of the patrol area where residences are concentrated, it contains a quarry and the Fulton County Jail. The proximity to the jail in no way indicates there is a correlation between the facility's location and the location of the clustering. Only the southern-most portion of the area was active, suggesting that its proximity to Beats 101/111 was influential. This type of phenomenon has been referred to as “spillover”, where “arbitrary boundaries are likely to divide places that have similar characteristics and are functionally connected” (Matthews, et.al. 2010). This would include areas that may be geographically divided but are socially connected. For example, a home on one side of the street may be in one patrol jurisdiction, while the house directly across the street may be in another. Such types of administrative boundaries would not necessarily deter an offender from burglarizing either home (Morenoff, et.al. 2001).

5.3 Topographic and Environmental Analyses

The research for this study applied mixed methods of quantitative and qualitative analysis. It was important to understand quantitative measures of the factors or variables that influenced the outcome of the study; in this case, high residential burglary rates (Creswell, 2009). It was equally as important to use an exploratory approach (qualitative) to understand the spatial dispersion of the offenses and the topographic elements of the study area, which lend themselves to the discovery of quantitative variants.

All of the areas with dense burglary activity were well under 1.5 square miles. Conversely, the locations with low clustering covered more than two square miles, except for Beat 603, which was 1.07 square miles. Additionally, the high-clustered areas were classified as urban, according to LandPro land use/land cover data. The low-clustered areas were mostly classified as suburban. The one exception was Beat 102. Because of its grid-patterned plan, it was considered an urban location for this study. However, the uniqueness of that patrol beat’s topography facilitated its shift to a suburban-industrial location, as it was divided by both a large quarry and a county jail.

5.3.1 Land Use

According to 2008 land use data (Figure 5.9), the low-clustered beats had much higher percentages of land used for residential purposes (Table 5.3–5.4). However, there appeared to be an inconsistency between LandPro data and the city’s planning and zoning data (Figures 5.10–5.16). For example, Beat 101 was under development and carried the zoning code of SPI-11 (Appendix A). This was not shown in the LandPro data due to its regional analysis coverage. Therefore, while the land use data from LandPro was used as the primary collection source, the city planning and zoning data was used for the closer beat-level analysis.

Lot size was influential in distinguishing between urban and suburban areas. The larger the lot size, the more suburban the location. Any location designated as Special Public Interest (SPI) was under redevelopment, which meant there was some type of construction or roadwork occurring in the area. Much of the SPI areas were located in Beat 101. There was an SPI area in the north part of Beat 302, which was where the new mixed-income housing was under development. Beats 107 and 401 were also affected by SPI zoning.

The only R-5 zoning was located in Beat 107, which could be contributed in large part to the housing proximity to the colleges and university. Beat 107 also had the largest portion of Office-Industrial (O-I) zoning, again due to the colleges and university in the area.

The largest lot sizes zoned for residential (R-1 and R-2) were located in Beat 202. It was also the most affluent of all the patrol beats.

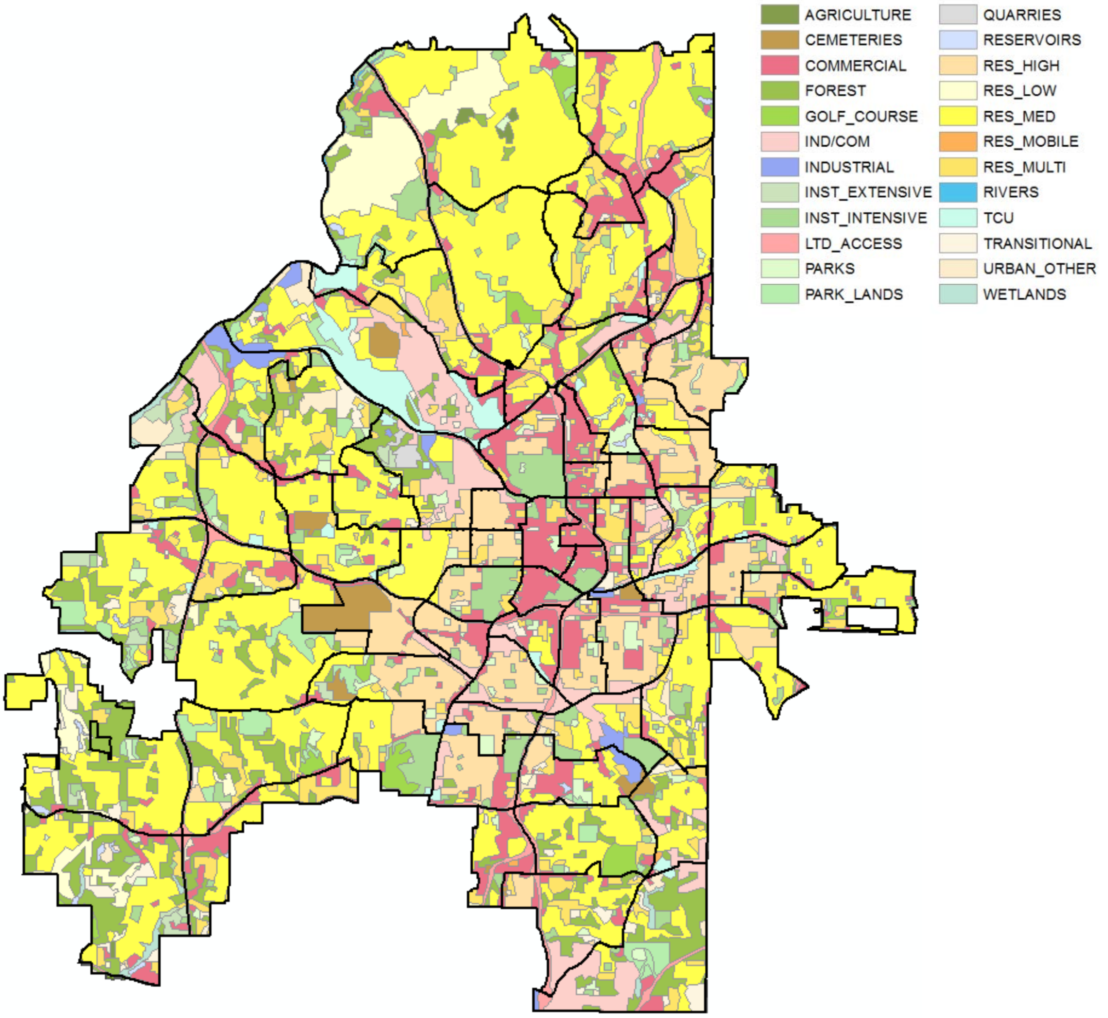


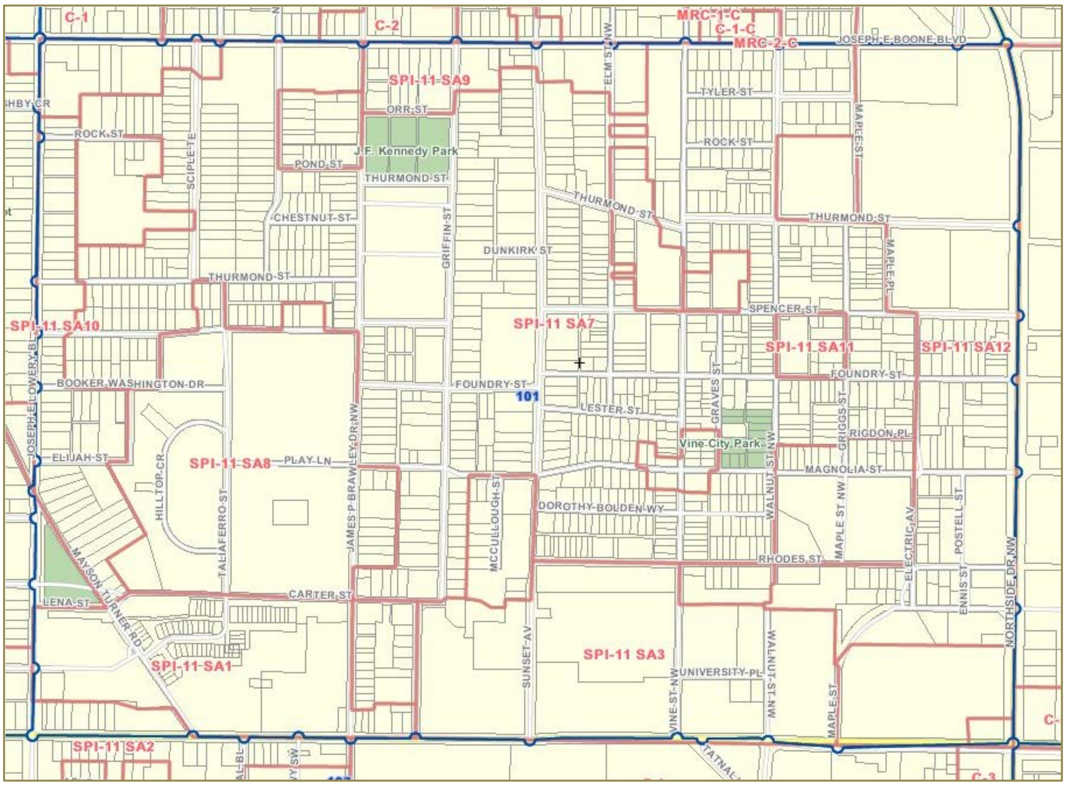
Figure 5.9. LandPro 2008 land use data with patrol beats outlined

Table 5.3. Land use in low-clustered patrol beats

Variable	Beat 102	Beat 202	Beat 203	Beat 411	Beat 603
Square Miles	2.41	7.08	4.22	4.43	1.07
Population	7851	7179	9639	8024	8196
Commercial	10.79%	2.90%	2.88%	0.88%	29.73%
Industrial	8.78%	—	—	—	—
Residential - High	8.97%	—	—	6.64%	49.06%
Residential - Medium	47.16%	30.69%	46.80%	17.92%	9.00%
Residential - Low	—	4.18%	—	0.13%	—
Residential - Mobile	—	—	—	—	—
Residential - Mixed Use	1.82%	0.45%	1.30%	1.32%	3.61%

Table 5.4. Land use in high-clustered patrol beats

Variable	Beat 111, 101	Beat 103	Beat 107	Beat 302	Beat 303	Beat 401
Square Miles	1.08	1.2	1.3	1.14	1.28	0.84
Population	7278	5661	11404	6809	5542	3824
Commercial	41.32%	0.01%	5.12%	1.63%	1.39%	1.19%
Industrial	18.50%	0.11%	—	2.73%	5.19%	0.75%
Residential - High	30.61%	4.46%	4.18%	4.48%	6.65%	9.51%
Residential - Medium	—	16.44%	15.39%	—	—	—
Residential - Low	—	—	—	—	—	—
Residential - Mobile	—	—	—	—	—	—
Residential - Mixed Use	1.75%	0.50%	0.43%	0.27%	0.12%	—



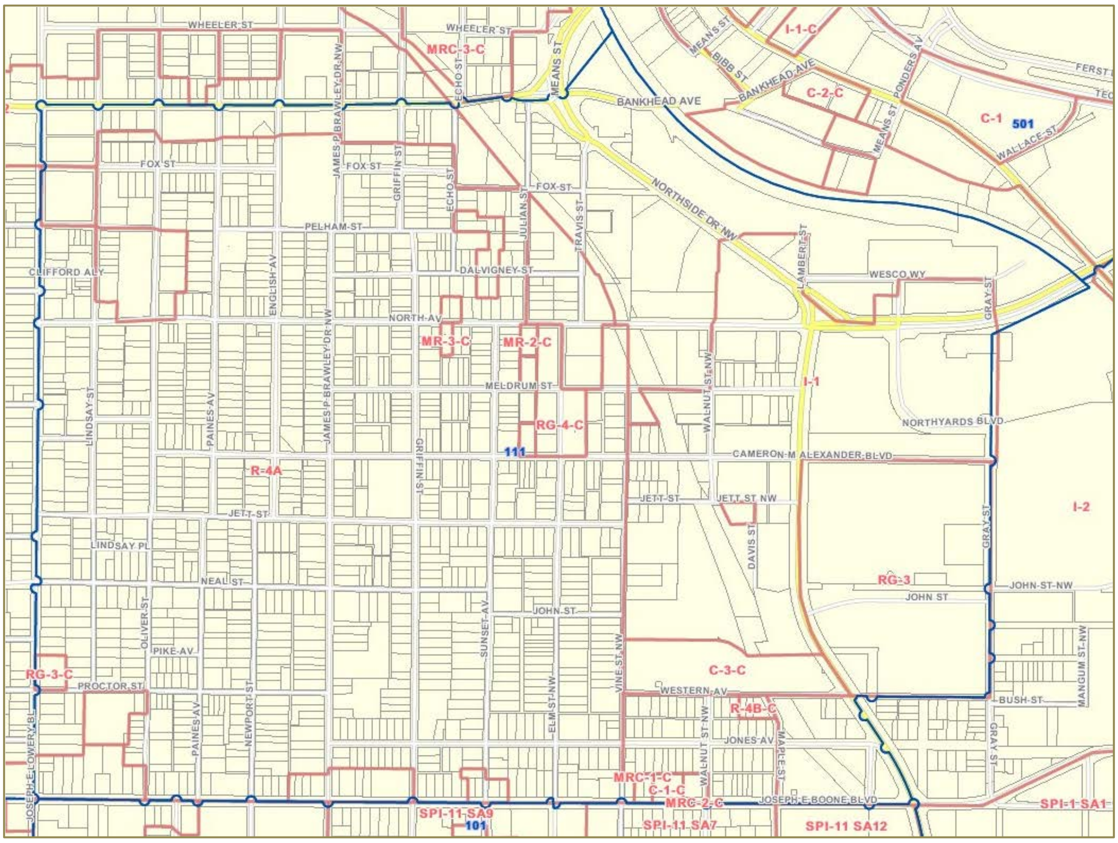
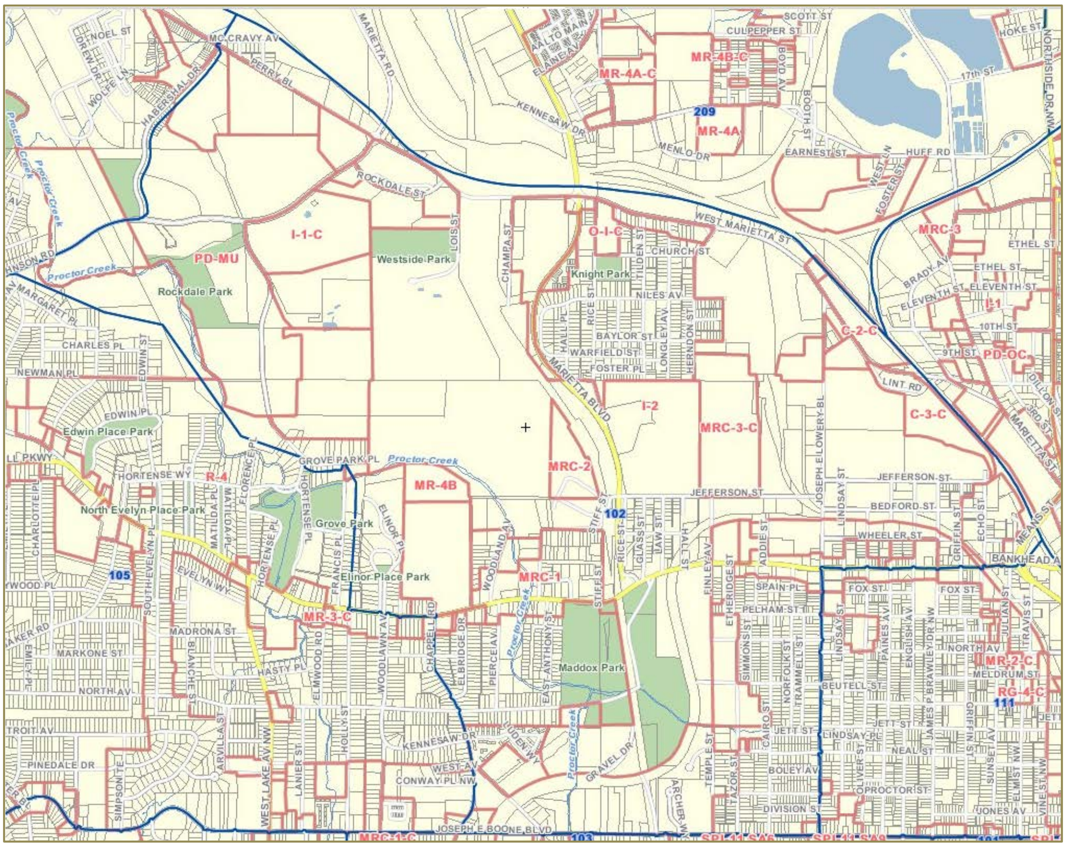


Figure 5.10. Beat 101/111 land use zoning.



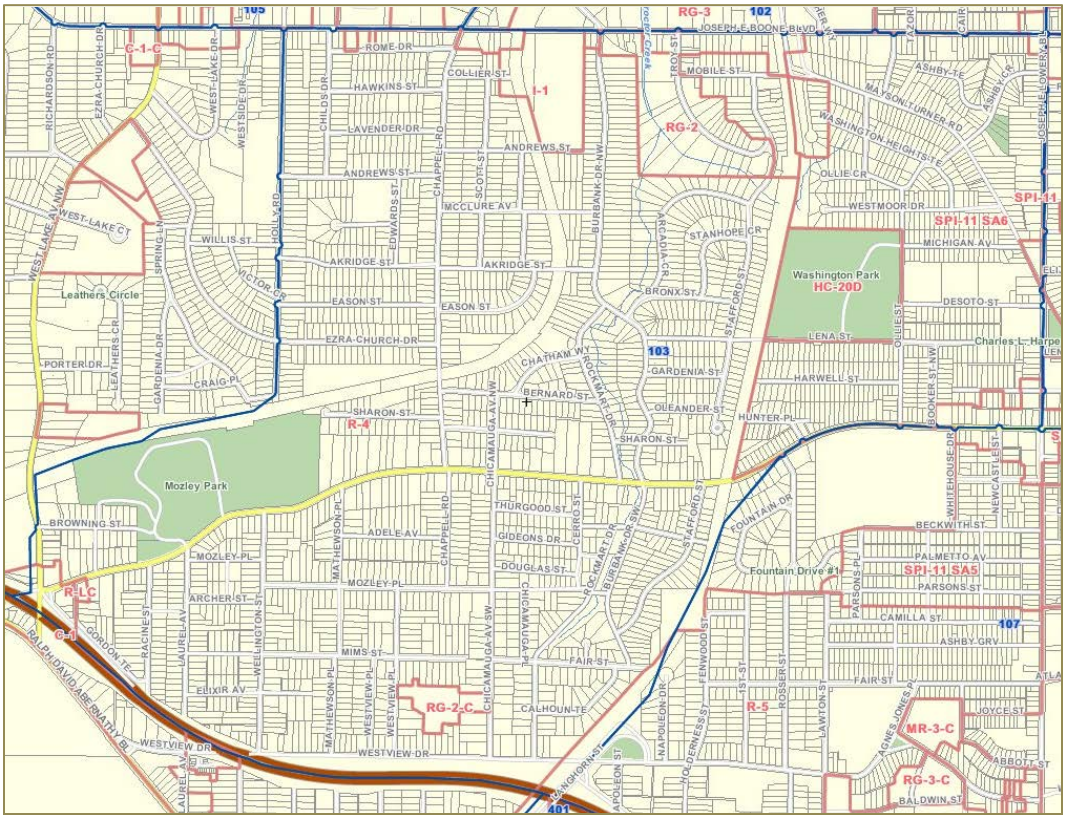
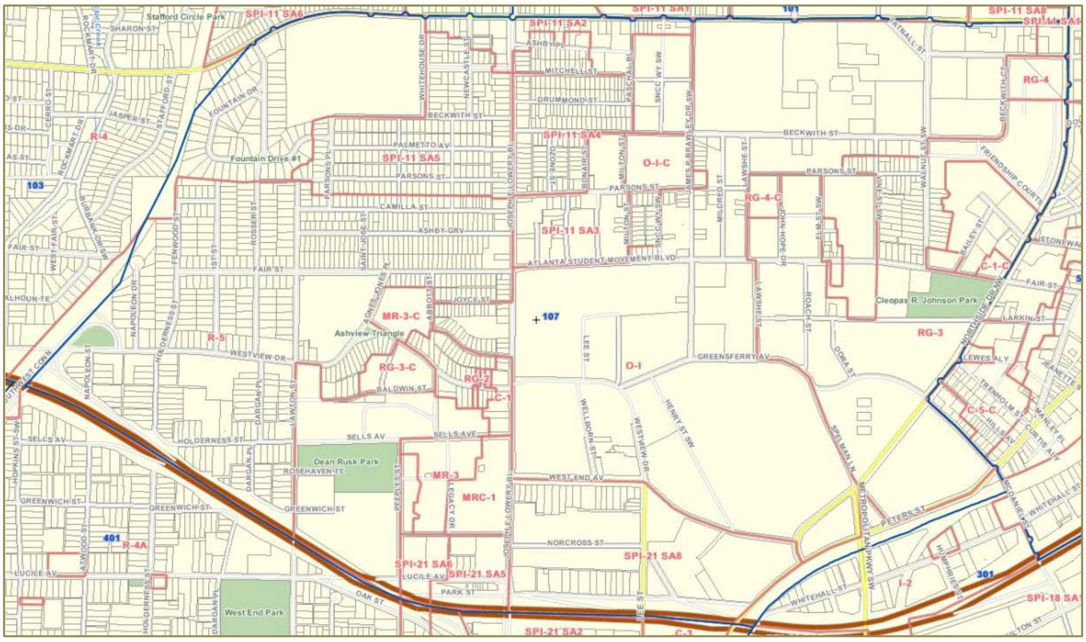


Figure 5.11. Beats 102 and 103 land use zoning.



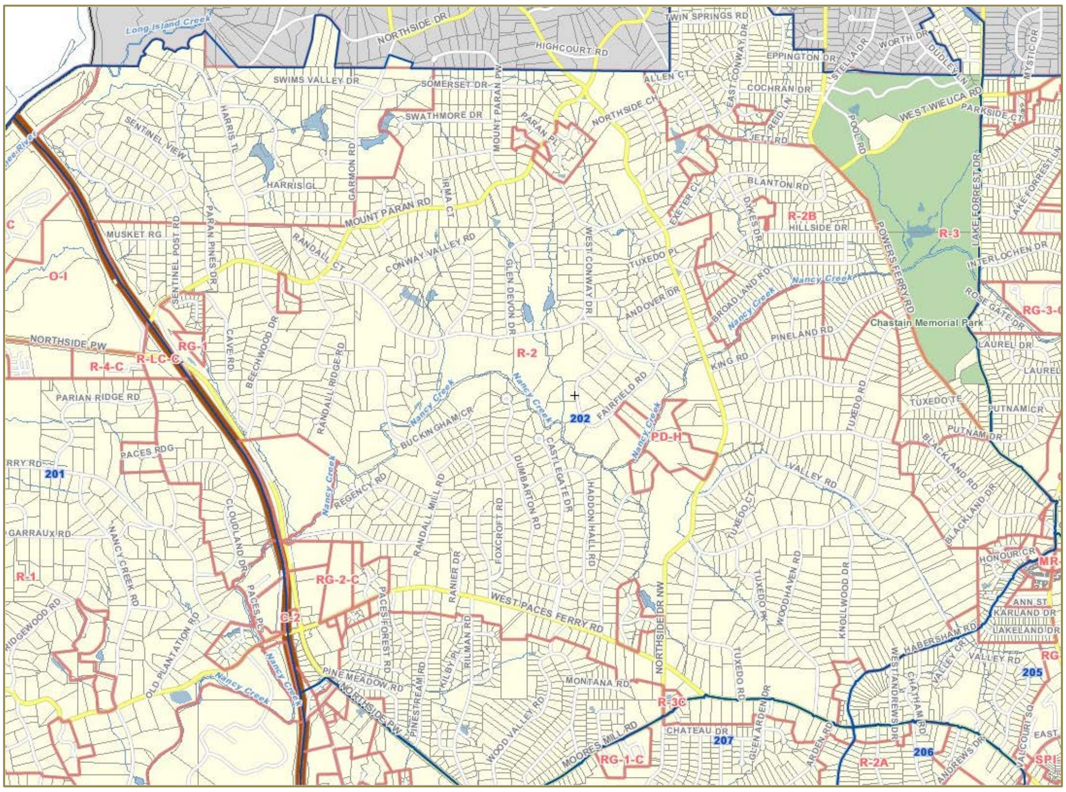


Figure 5.12. Beats 107 and 202 land use zoning.

Figure 5.13. Beat 203 land use zoning.

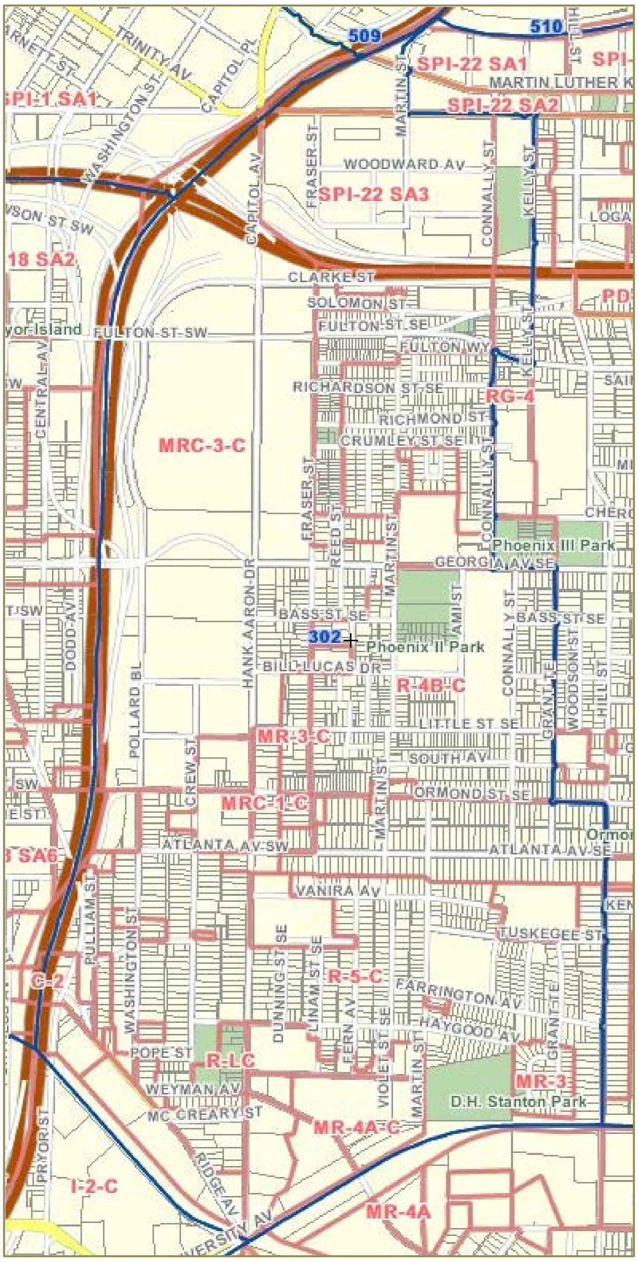
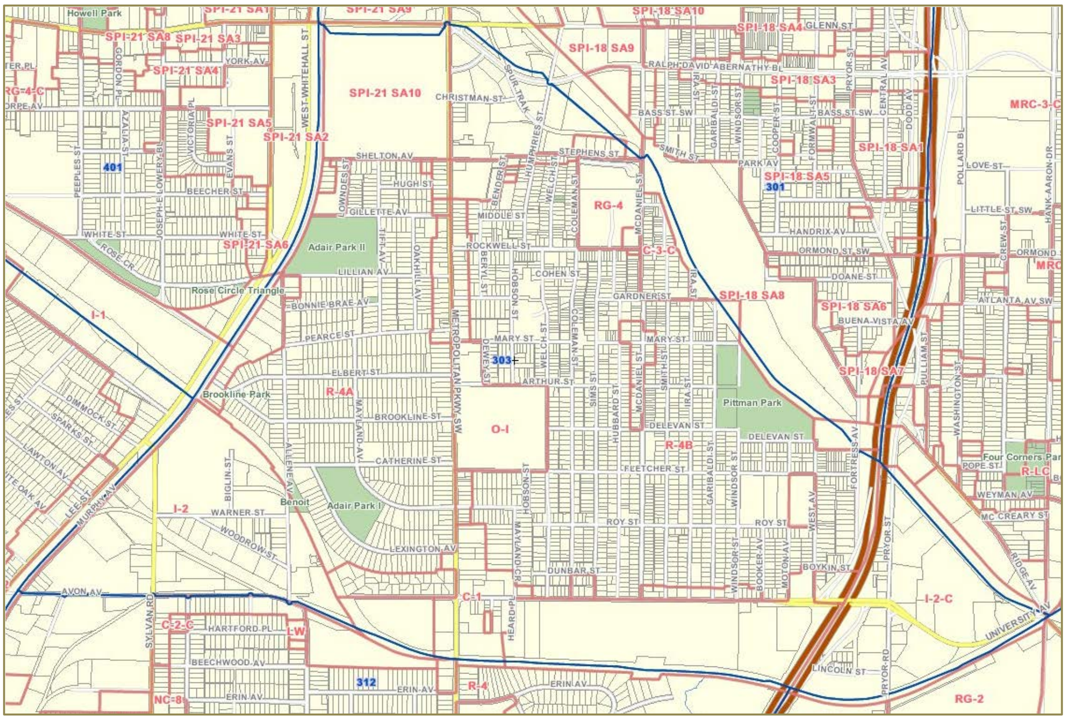


Figure 5.14. Beat 302 land use zoning.



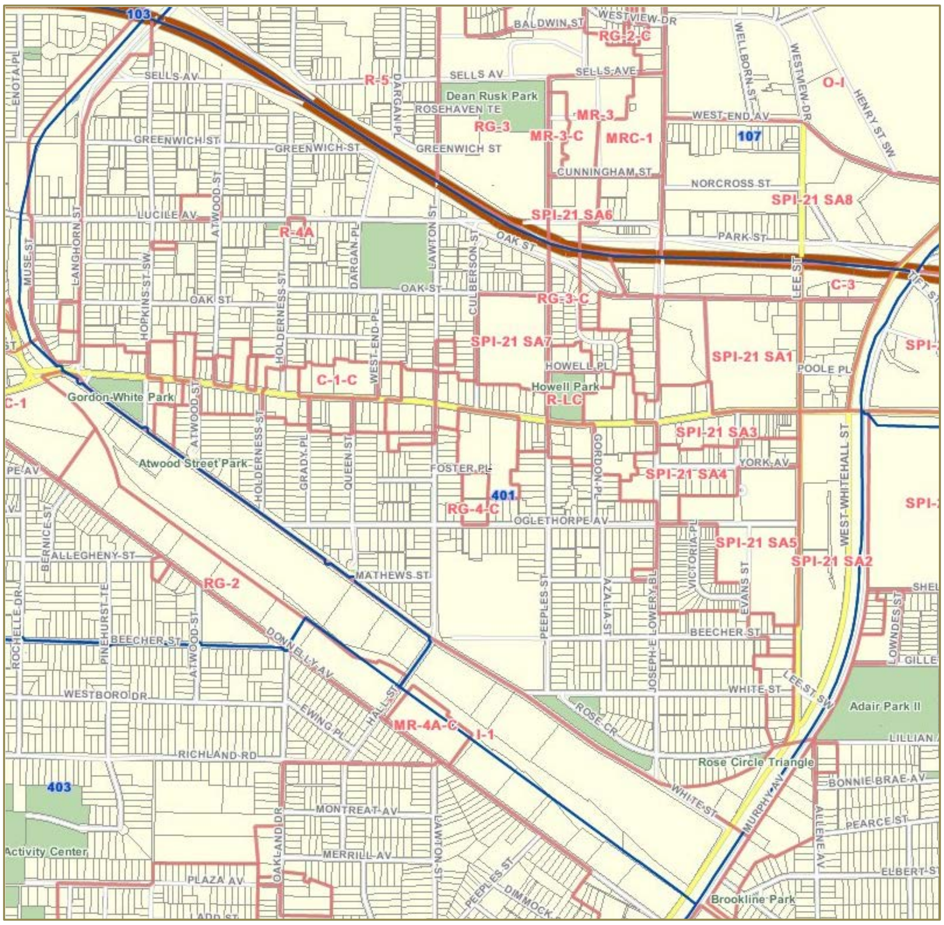
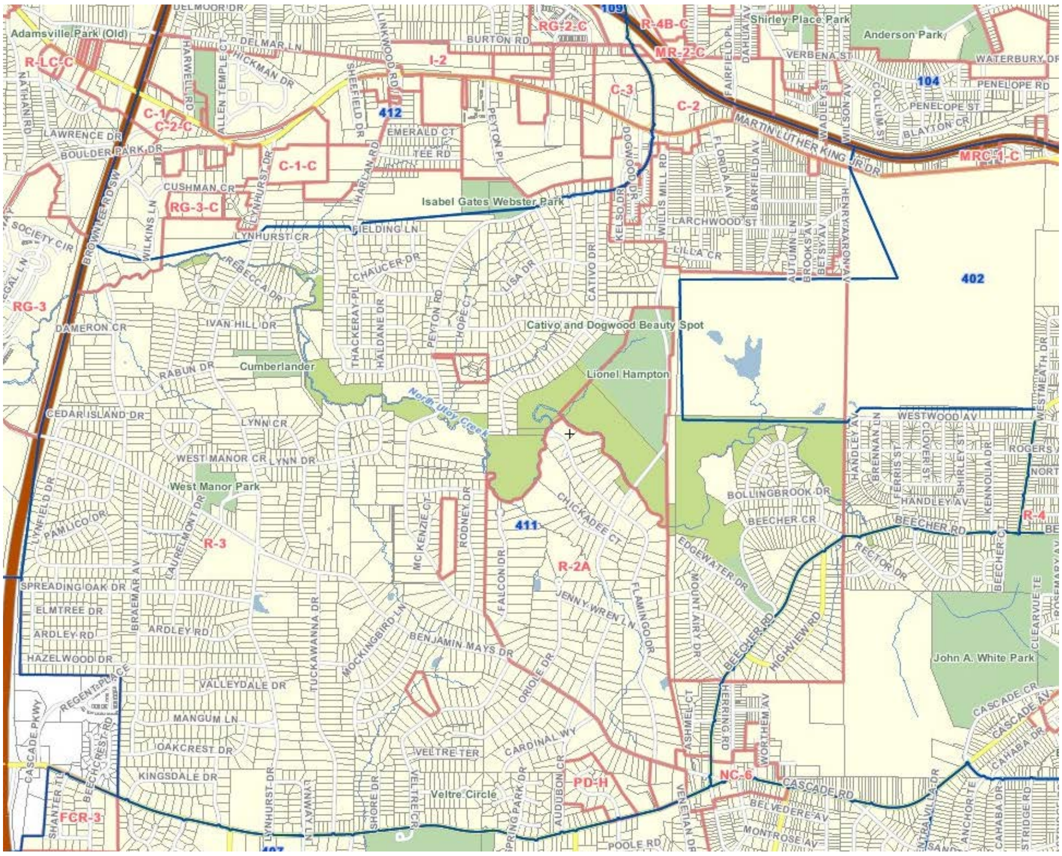


Figure 5.15. Beats 303 and 401 land use zoning.



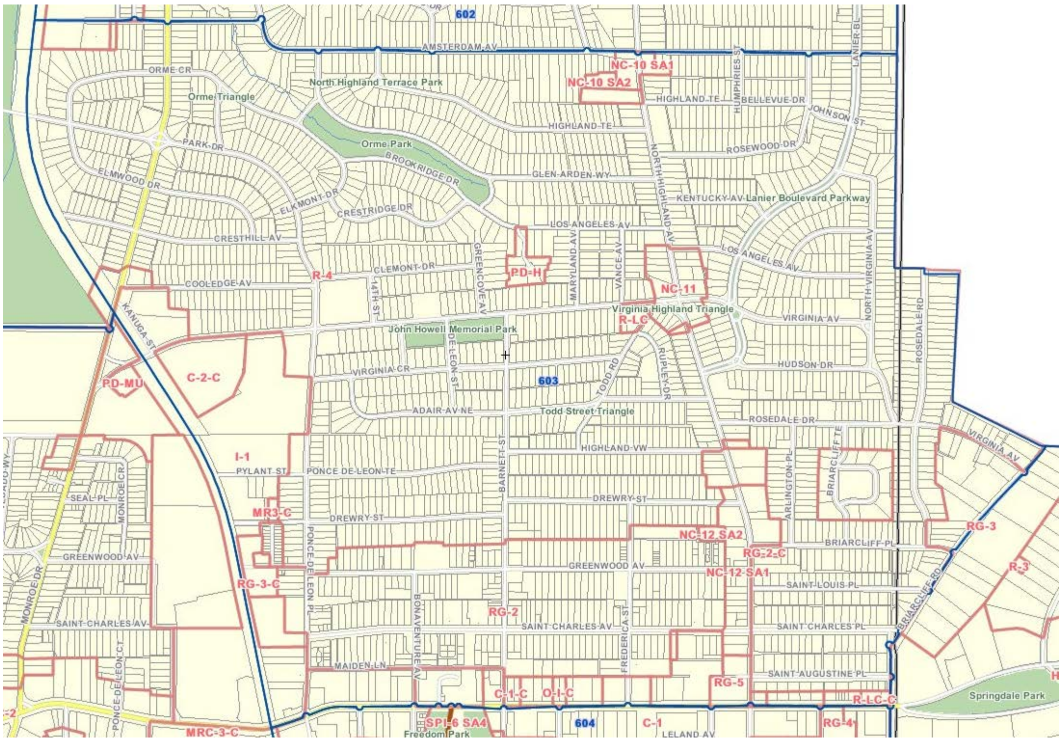


Figure 5.16. Beats 411 and 603 land use zoning.

5.3.2 Micro-Level Socio-Economics

Block-level income information was not publically available from the U.S. Census Bureau. However, it was available at the block-group level. Therefore, to examine the socio-economics of each individual patrol beat, it was necessary to use a high-low range to determine the differences in economic statuses of the clustered versus the non-clustered areas.

None of the patrol beats were heterogeneous. Citywide, Blacks made up about 61% of the population, whereas the percentage of Whites was at 33% (U.S. Census, 2000). Only three study areas had a population of over 85% White. Those were Beats 202, 203, and 603 (Table 5.5). Additionally, those three beats also represented the most affluent locations with income earnings as high as $117.9 thousand. Moreover, while Beats 102 and 411 were categorized as low-clustered or cold areas, they both had lower income ranges, and Beat 102 was within the poverty threshold with an average income of $24.8 thousand.

Furthermore, Beat 102 recorded a marked difference in the ratio of males (64.22%) to females (35.78%). The high percentage of males was likely due to the jail located within the boundaries of the patrol area, which would have been included in the decennial census enumeration.

In the high-clustered areas, the average median age was under 30 years, except for Beat 103 with a median age of 40 (Table 5.6). The income range of Beat 103 was $4.7 thousand less than Beat 303 and $25.6 thousand less that of Beat 302, yet it had the highest number of owner occupied homes, more than twice that of Beat 303 at 648. There were far more single female heads of households than in the low-clustered areas; and, there were many more bus stops than in the low-clustered areas, barring Beat 411, which had 85. Comparatively, the number of renters in the high-clustered areas was greater than in the low-clustered locations. The exception was Beat 603, which was just shy of 3000 renters.

Table 5.5. Low-density location variables

Variable	Beat 102	Beat 202	Beat 203	Beat 411	Beat 603
Square Miles	2.41	7.08	4.22	4.43	1.07
Population*	7848	8186	10711	8342	8487
Population Density	3256.43	1156.21	2538.15	1883.07	7931.78
Hegemony	90.87% Black	95.89% White	93.31% White	97.25% Black	88.48% White
Gender	M: 64.22%, F: 35.78%	M: 49.50%, F: 50.50%	M: 47.89%, F: 52.11%	M: 45.30%, F: 54.70%	M: 52.10%, F:47.90%
Single Female HH	281	330	1229	499	1363
Female HH w/Child	337	58	98	272	68
Age 5-17	1097	1651	1375	1240	540
Average Median Age	23	36	34	44	34
Median Income Range	$14.1K - $35.5K	$56.3K - $117.9K	$61.3K - $104.5K	$30.4K - $58.4K	$39.8K - $97.7K
Housing Units	2384	3199	5863	3372	5333
Housing Density	989.21	451.84	1389.34	761.17	4984.11
Average Household Size	1.45	2.21	2	2.47	1.8
Vacant Housing Units	463	139	737	119	344
Owner Occupied	415	2935	3601	2711	2038
Renter Occupied	1506	125	1525	542	2951
Bus Stops	44	7	43	85	44
Public Housing Units	2	0	1	0	0

Table 5.6. High-density location variables

Variable	Beat 111, 101	Beat 103	Beat 107	Beat 302	Beat 303	Beat 401
Square Miles	1.08	1.2	1.13	1.14	1.28	0.84
Population*	7278	5661	11404	6809	5542	3824
Population Density	6738.89	4717.50	10092.04	5972.81	4329.69	4552.38
Hegemony	97.55% Black	97.97% Black	97.25% Black	94.15% Black	87.13% Black	94.43% Black
Gender	M: 52.29%, F: 50.49%	M: 46.21%, F: 53.79%	M: 43.73%, F: 56.27%	M: 44.16%, F: 55.84%	M: 50.46%, F: 49.54%	M: 48.64%, F: 51.36%
Single Female HH	500	444	776	482	222	300
Female HH w/Child	561	266	690	751	347	217
Age 5-17	1341	945	1524	1785	1261	713
Average Median Age	28.5	40	25	26	27	26
Median Income Range	$9.5K - $21.5K	$17.8K - $28.6K	$4.7K - $21.7K	$8.5K - $54.2K	$12.4K - $33.3K	$13.9K - $24.5K
Housing Units	3679	2651	3615	2858	2234	1784
Housing Density	3406.48	2209.17	3199.12	2507.02	1745.31	2123.81
Average Household Size	1.86	2.48	1.84	2.12	2	2.11
Vacant Housing Units	774	394	425	320	390	227
Owner Occupied	529	1344	424	558	648	490
Renter Occupied	2376	913	2766	1980	1196	1067
Bus Stops	61	76	80	71	64	78
Public Housing Units	3	0	6	4	0	1

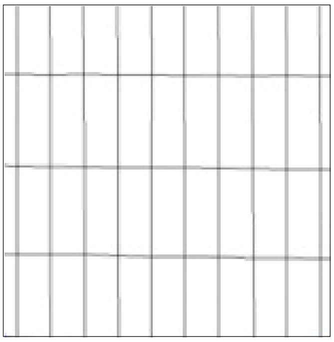
5.3.3 <u>Geographic Neighborhood Design</u>

The urban police beats are shaped by the street network. Streets were designed with a grid-style pattern, allowing for ease of access and egress to the rear of homes and apartments (Figure 5.17(a)). An exception was the gated community in Beat 101. Although the apartment complex projected an appearance of security, 28 burglaries were reported during the study period. Perhaps not coincidentally, the gated community was also the site of a newer mixed-income housing complex. Major shopping malls, grocery stores, restaurants, coffee shops and nightclubs were relatively close by. Most major roads had sidewalks.

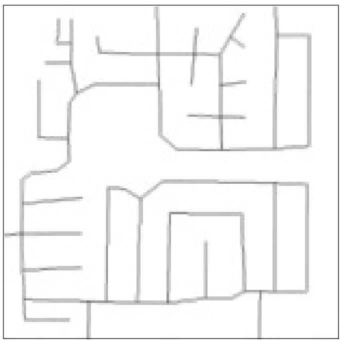
The suburban beats were shaped by areas with a post-WWII street plan incorporating numerous curvilinear streets, prominent drives and garages. (Figure 5.17(b)(c)) In those locations, most major roads had sidewalks, but the rest of the areas did not contain comfortable places to walk alongside the road, therefore a vehicle would have been needed to efficiently move around the neighborhood.

According to Higley (1995, p. 121), two main categories of suburban housing existed: traditional or formal suburbs, which generally had curbs, sidewalks, and street lighting and large-lot suburban areas, which were much further away from the city center. The large-lot areas and had a more “rural feel” with no sidewalks, minimal public lighting, and greater property acreage (Higley 1995, p. 121).

The roads and streets in Beats 202 and 203 did not have sidewalks. Many of these homes had long driveways that evoked exclusivity, though there appeared to be no fabricated barriers such as gates or high walls to prevent someone from walking on to the property. However, if an offender chose a residence in these two areas, the offender may look out of place and a vehicle would be needed to transport any property taken which would not fit easily into a pocket (Rengert and Wasilchick, 1985).



(a)



(b) (c)

Figure 5.17. (a) Traditional grid-style pattern, (b) and (c) Post-WWII curvilinear-style patterns (Illustrations: Jin and White, 2012)

5.3.4 Major Events

Separate of proximity factors, major events like blackouts, extreme weather and sporting events have also been a factor in the increase of property crime. Although Varano, et.al. (2010) found “only modest effects on crime [rates]” in the host cities in the wake of mass population relocations following Hurricane Katrina, a study conducted by Decker, et.al. (2007) found that calls for service increased for minor crime in Salt Lake City during the 2002 Winter Olympic Games.

The year 2008 saw a number of major events in Atlanta and across the nation. There was a historic and contentious presidential election in November, and following a severe economic downturn, unemployment rates in Atlanta were higher than the national average (US DoL, 2008).

Atlanta was host to a few major sporting events, including the National Hockey League All-Star Game in January, and the National Basketball Association play-off games in March. These events brought a much larger transient population into the city, and unlike the Decker, et.al. study (2007), no direction connection between the events and residential burglaries could be found.

On the evening of March 14, an E2 tornado ripped through the commercial center area of the city (Figure 5.18). Damages were estimated to be north of $200 million. There was extensive damage to housing complexes and single-family units surrounding the 6-mile path cut by the tornado (NY Times, 2008). Whether the event was correlated with the nearly 100-incident jump in reported burglaries the following month remains uncertain.

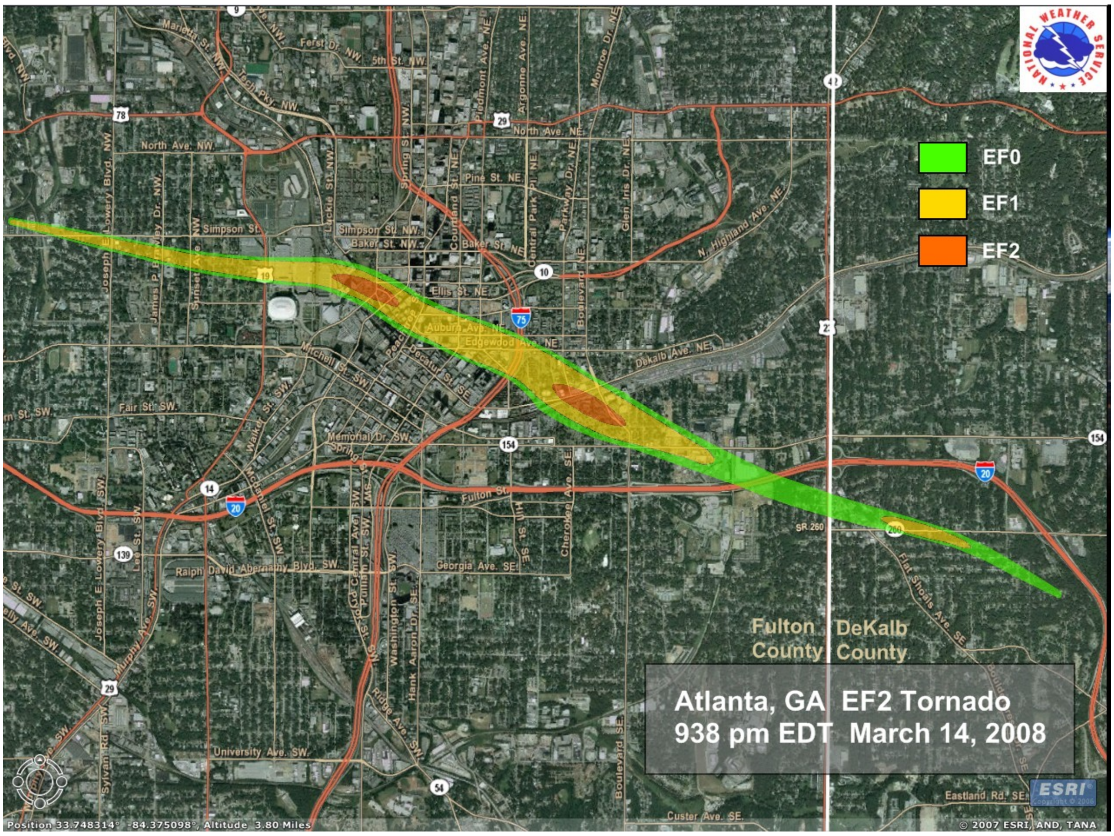


Figure 5.18. Atlanta tornado rating on March 18, 2008. Image by the National Weather Service Office, Atlanta Georgia

CHAPTER VI

DISCUSSION

6.1 Findings

The results of the analyses indicated that property offenses were not equally distributed across the selected urban and suburban policing areas. Urban areas with a traditional neighborhood grid-style pattern and higher population density had greater burglary rates. The grid pattern allowed for ease of accessibility and escape via the rear of homes and apartments, sometimes guarded only by a chain-linked fence.

The suburban areas, where burglary rates were lower, were designed with a post-WWII plan displaying mostly curvilinear streets, prominent drives and garages. That meant cul-de-sacs and T-section streets created much greater difficulty for a stranger to enter a neighborhood and easily escape. Unless the offender cased the neighborhood or worked in the community, getting in and out quickly may have been difficult.

Statistically, the Wednesday Day shift (9:01 a.m. to 5:00 p.m.) was the most common time of occurrence, and overall, December had the highest count of reported residential burglaries, with July and August on record as the two next highest months.

Economically, unemployment in Atlanta was higher than the state and national averages in 2008. (Table 6.1) With a number of Fortune 500 corporations headquartered in Atlanta, like Coca Cola, Fed Ex, Georgia Pacific, CNN, and Sun Trust Bank, it was not difficult to make the connection between the higher rates of unemployment and corporate distress at the pinnacle of the recession brought on by the failing housing market (English, 2011).

The unemployment rate for the Atlanta was higher at 7.1% in 2008, than that of both the Metropolitan Statistical Area (MSA) and the State of Georgia (US Department of Labor, 2008). In the previous year, the unemployment rate for Atlanta was 5.5% and in 2009, the rate rose to 10.3%. During the same time, residential burglary rates fell by nearly 14%. A bad economy, housing market, and bank failures contributed to job loss; however, no significant direct link could be determined between unemployment rates and residential burglary.

What could not be properly ascertained was the reason for the large population increases from 2007 to 2009. Additionally, the enumeration of the 2010 US Census recorded a loss of city population of more than 100,000 persons, which further complicated any possible discovery of explanations for the rise in estimated counts the previous years.

The elevated population in 2006 could be attributed to Hurricane Katrina, which made landfall the previous summer along the Gulf Coast, devastating the region and sending hundreds of thousands of people to neighboring states and across the country for refuge. As the economic health of the country began to decline late 2007, the population of Atlanta increased along with property crime rates. It was only in 2009 that all crimes declined to include violent offenses.

Table 6.1. Unemployment rates for Atlanta compared to the MSA and the Nation

Year	Atlanta	Metro. Atl.*	Georgia	National
2004	7.4%	4.7%	4.7%	5.5%
2005	6.6%	5.3%	5.2%	5.1%
2006	5.7%	4.6%	4.7%	4.6%
2007	5.5%	4.5%	4.6%	4.6%
2008	7.1%	6.2%	6.2%	5.8%
2009	10.3%	9.6%	9.6%	9.3%
2010	10.3%	9.6%	9.6%	9.3%

**Metropolitan Atlanta includes Atlanta and Sandy Springs-Marietta. Rates are percentage of labor force. Data refer to place of residence.*

6.1.1 <u>High Activity Areas</u>

Beats 101/111 contained 61 bus stops. Renters accounted for 64.58% of housing units and 21.04% units were vacant. Youth, defined here as Ages 5-17 represented 18.43% of the population. The areas with seemingly no activity represent construction and/or industrial sites. If thefts occurred at those locations, they would have been entered as commercial burglaries not residential. Middle and primary schools where no burglary activity occurred would have also been entered into a different category. Moreover, if the schools were policed by a separate jurisdiction, like the school police or the sheriff's department, those rates may not have been recorded with Atlanta Police Department, but with the agency responsible for patrolling the institution. The high-density of population and the general lack of visible care of the patrol area suggest the community may believe they are powerless to make positive change in their neighborhoods, which could lead to an increase in incidences of property crime (Figures 6.1–6.3).

It must be noted that the two public housing projects with the cluster of burglaries between them was technically a single property. The property was designated as part of the Atlanta Housing Authority renewal effort that razed older and troublesome public housing complexes. For this particular location, mixed-income housing units were constructed and the area was converted to a gated community.

Due to its proximity to Beats 101/111 to the northeast and 107 to the southeast, the burglary clustering followed the grid pattern in Beat 103 and could be contributed to spillover near the administrative borders. What had also occurred, which is similar to Beat 303, was the prominent clustering near the railroad lines by Washington Park. Other similarities to Beat 303 were the lack of public housing and slightly higher household income levels. A high school was located just two blocks south of the park. Although the school was part of Beat 107, it could be inferred that the proximity to the cluster was not coincidental, considering the burglary clusters along the paths leading away from the high school.

The youth population for the patrol beat was 16.69%. Moreover, while the other areas of high burglary density had an average median age between 25 and 28.5, Beat 103's average median age was 40, making it the oldest population of the group. There were 76 bus stops and renters accounted for 34.44% of the housing units, the lowest percentage of all the high-density areas. Like Beat 101/111, more burglaries occurred between the hours of 9:01 a.m. and 5:00 p.m.

Beat 107 showed clustering in the western portion of the area. Upon closer inspection, it was discovered that the entire east half of the patrol beat was comprised of the university properties of Clark Atlanta University, Spelman College and Morehouse Colleges. That may have affected the outcome of the spatial analysis because the universities maintain their own crime data, regulated by Jeanne Clery Act (1991) reporting. For 2008, Clark Atlanta University reported 44 burglaries, Spelman College (an historically black college for women) reported 20 burglaries, and Morehouse (an historically black college for men) reported 13 burglaries in the residential facilities. The Morehouse report was the only one to separate residential and campus burglary incidents.

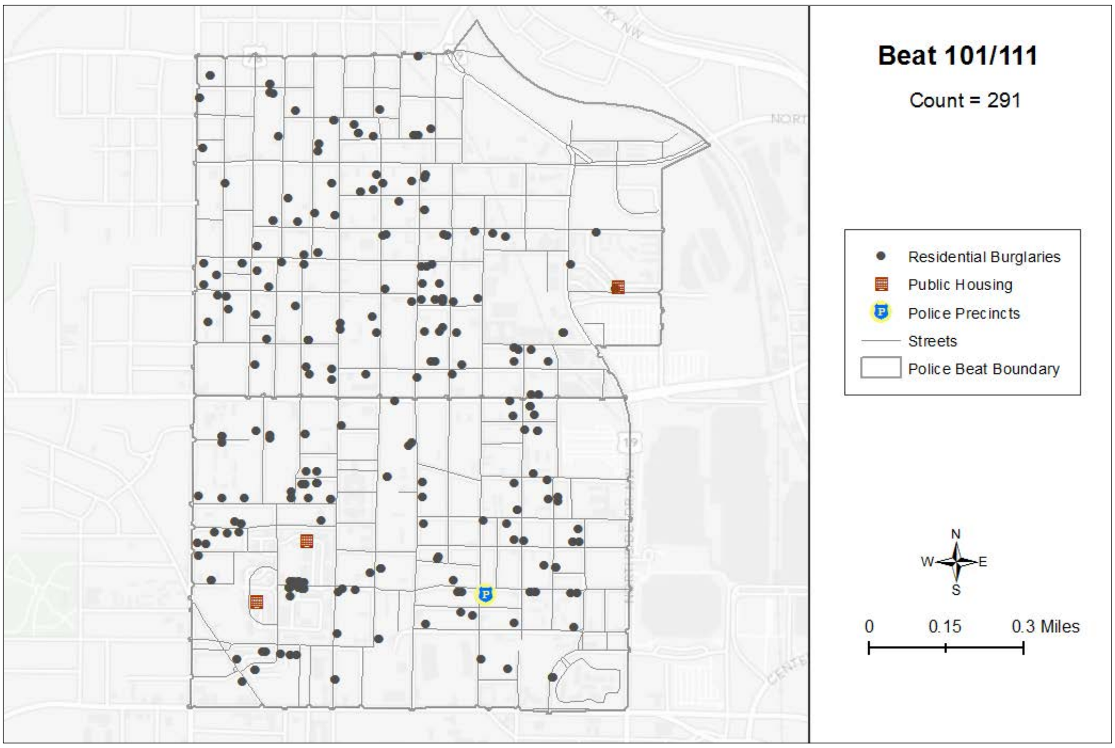
Renters made up 76.51% of the housing units. This was the highest rate for all study areas, yet this beat had the lowest rate of reported burglaries at 178. Adding the reported Clery Act figures from the universities would raise the area burglary count by 69.80%. Furthermore, the higher rate of renters in the area was likely due to the presence of the universities, which would also explain part of the 56.69% difference in population over the 7,278 in Beat 101/111. What could also have contributed to the greater population were the six public housing projects. Since the Census Bureau conducts group quarters enumeration, university, military and prison populations would be counted along with individuals (Williams, et.al. 2010).

The most prominently mapped density was near the high school. These areas were most likely along routes frequently travelled by students to and from school. Moreover, when factoring in the most reported times of burglaries, which was the Day shift (9:01 a.m. to 5:00 p.m.), it would be feasible to infer that the high school location had greatly influenced the rate of incidences for this area (Town and O'Toole, 2005). Where the incidents appear to stop at the end of Westview Drive SW sits a large church property. There were 80 bus stops in this area, most likely to service the student population.

The Turner Field property covers much of the west portion of Beat 302. The majority of burglary clustering, though, occurred in the southern portion of the patrol area around the elementary school and along the footpaths that would be travelled to and from the location. Again, given that 34% of the burglary incidents occurred during the Day shift, it is plausible to infer the primary school influenced the rate. In a 1990s ethnographic analysis of burglary the researchers found a strong correlation between burglarized residences and their distances from a school (Cromwell et.al. 1991). A 2007 study produced similar results, finding supporting empirical evidence that the proximity to schools was highly influential on neighboring residential burglary rates (Kautt and Roncek). The youth accounted for 26.22% of the population, and 69.28% of the housing units were renter occupied. There were 71 bus stops and four public housing projects. Another highly dense burglary area was sandwiched between a middle school and the Turner Field parking lot.

Beat 303 had a strange and unique situation in that the largest portion of burglary clustering was east of the Salvation Army Evangeline College and west of the Norfolk Southern Railroad Station. This rail station served as the hub for the movement of goods through the southern states. It also neighbored residential housing with little more than a rusty chain-linked fence between the residents and the cargo cars sitting on the rails. There is one primary school with burglary clustering nearby. Fifty-three and a half percent of housing units were rented, and 22.75% of the population was between ages 5 and 17. Additionally, there were 17 churches across this location, including the Salvation Army, which deserves mention because several burglary clusters occurred around church properties. Further study is required to determine if this represented another topographic variable. The seemingly empty areas were industrial or derelict freight storage facilities. As with other construction or industrial properties, burglaries would have been reported as commercial thefts.

The space surrounding the police precinct showing no activity in Beat 401 was a shopping mall property, and south of the mall is a medical center. To the west was a transit center. The youth population in this area was 18.65%, and the percentage of rented housing units was 59.81. This patrol area had the lowest total population and the least amount of housing units at 1784. The burglary incidents appeared to follow a set pattern along the grid, but not the bus routes. To the southwest of the beat along White Street, there was a place devoid of burglaries. This was the single middle school in the area, which had more burglary activity surround it than the public housing project.



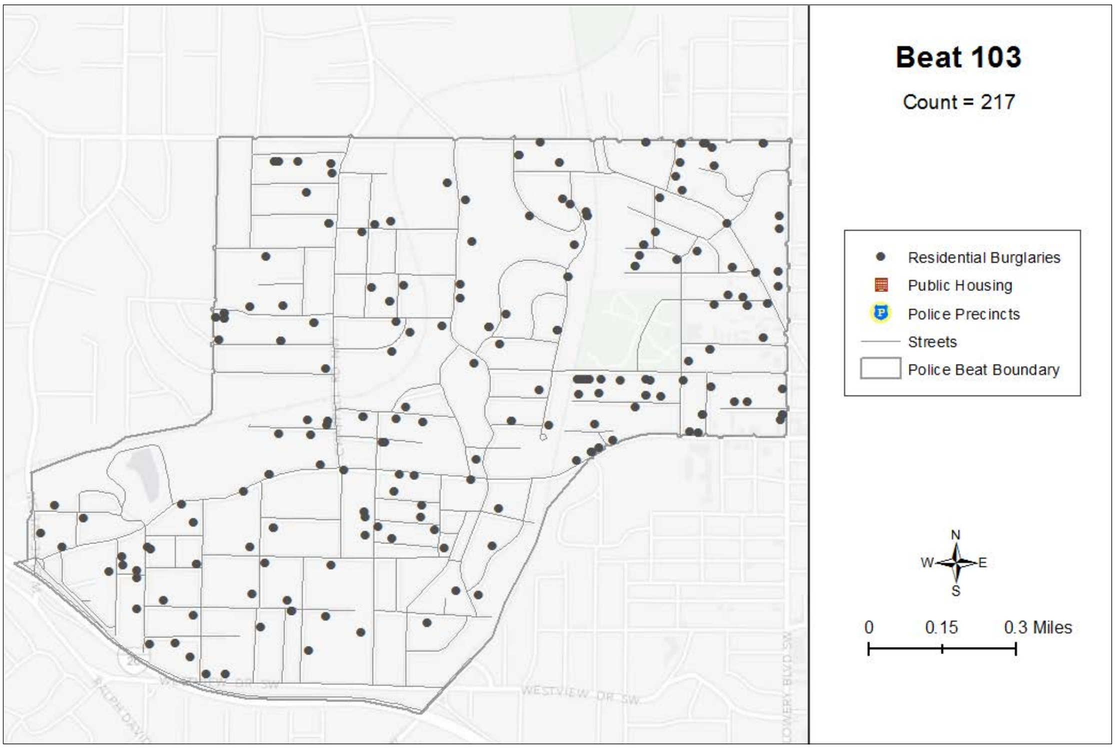
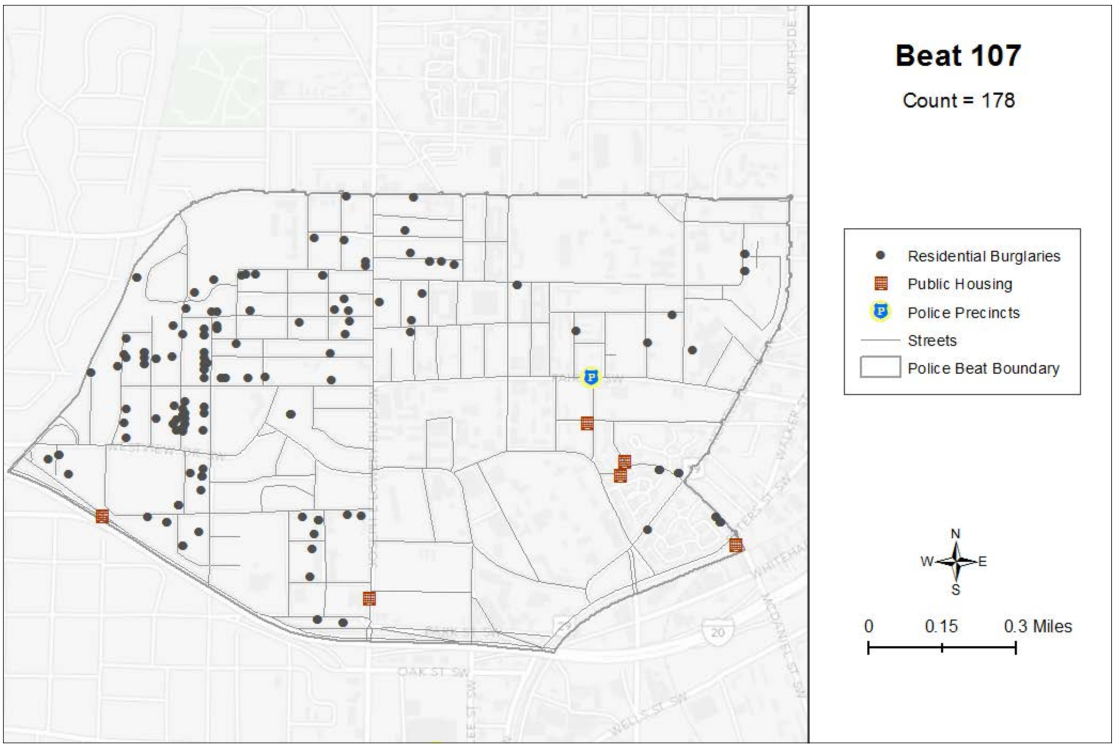


Figure 6.1. Patrol beats 101/111 and 103with burglary counts



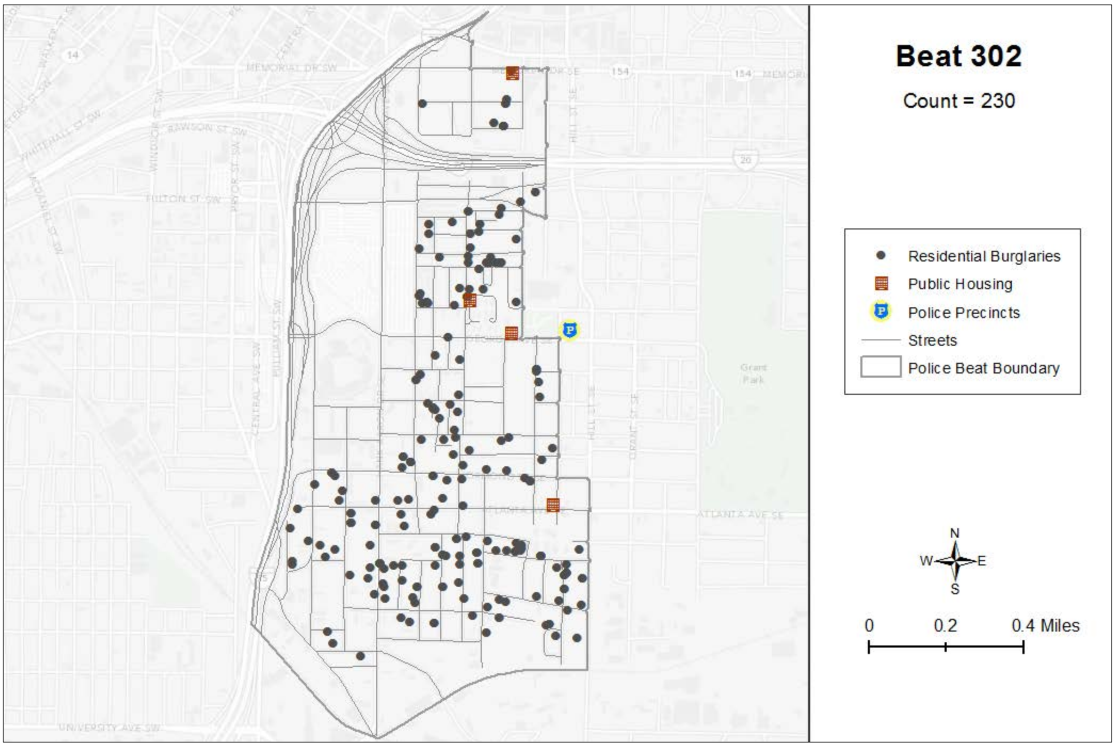
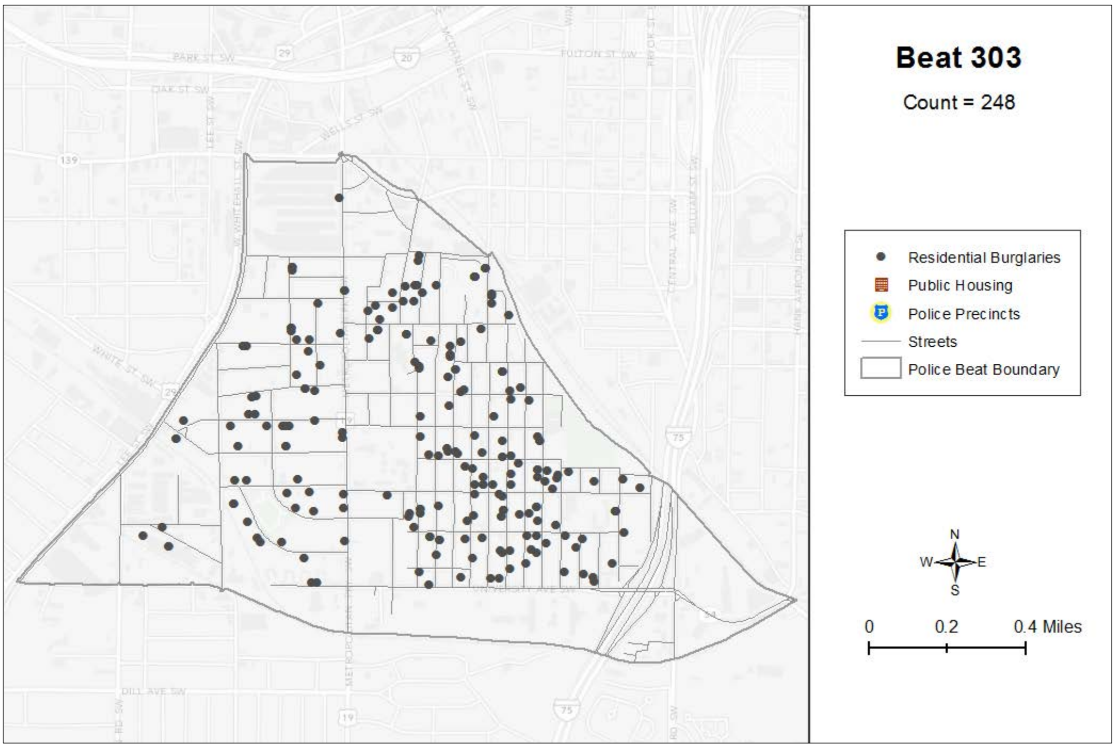


Figure 6.2. Patrol beats 107 and 302 with burglary counts



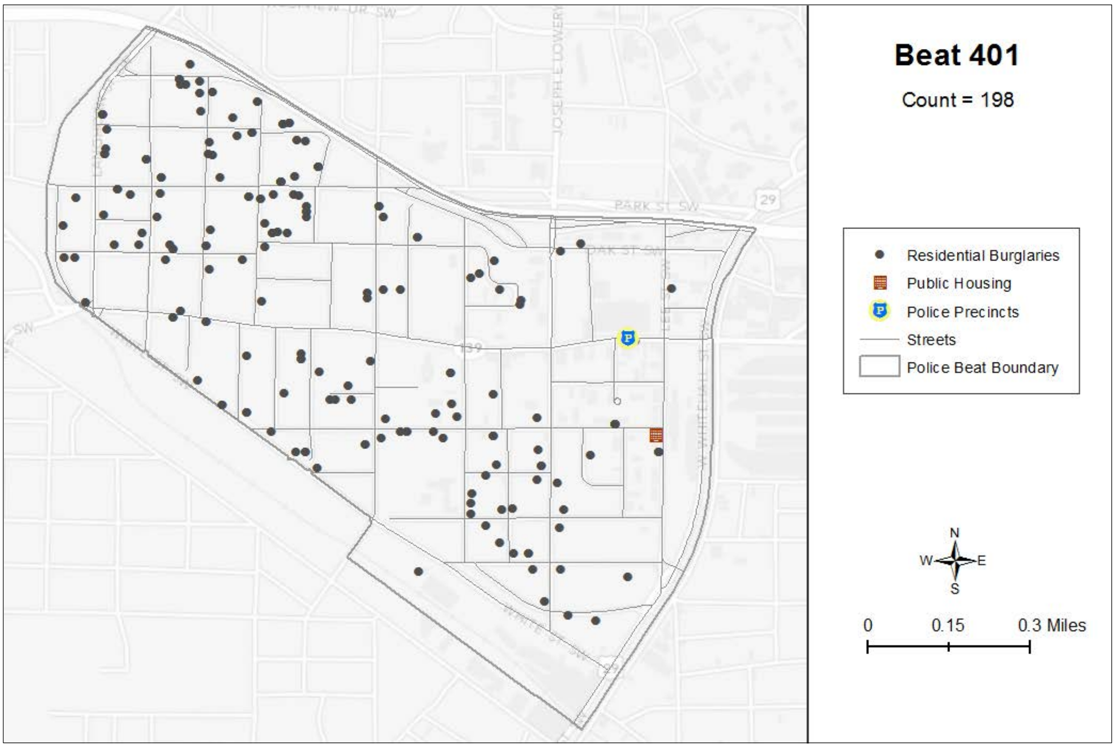


Figure 6.3. Patrol beats 303 and 401 with burglary counts

6.1.2 Low Activity Areas

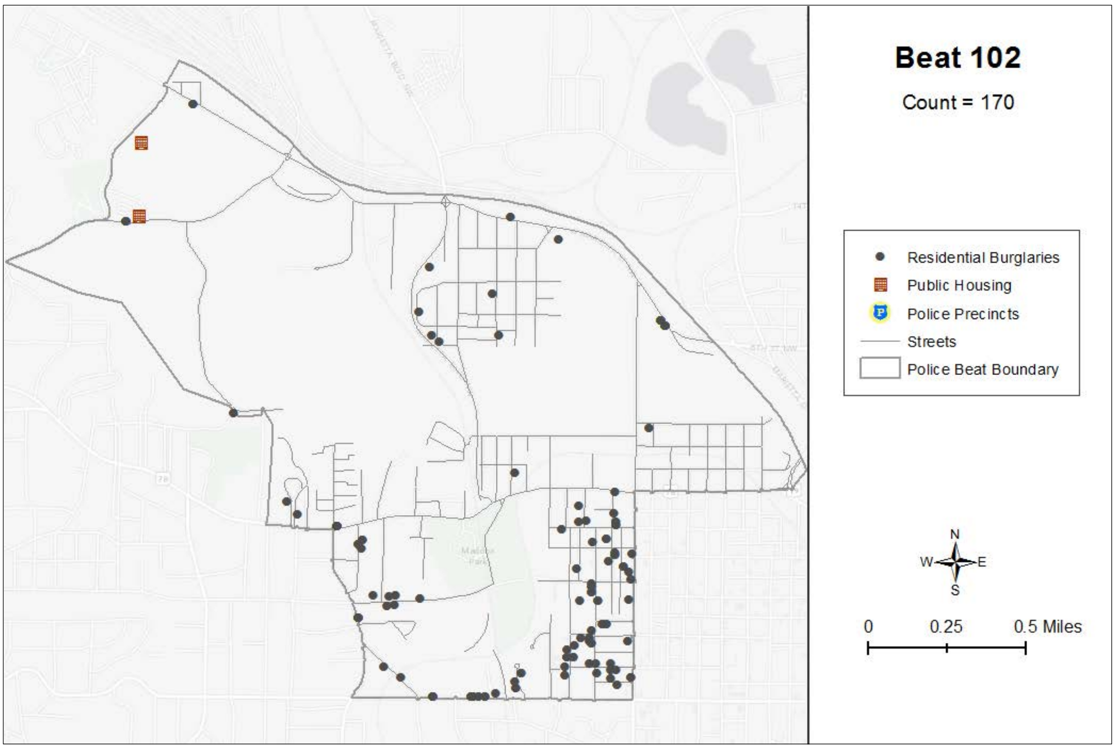
There was a general consistency with the low frequency, suburban areas. Cul-de-sacs and a lack of easy access to homes was a similar characteristic in all of the low-density study areas (Figures 6.4–6.6). The overwhelming majority of burglaries that occurred were close to main thoroughfares, places that were easy to find a way out than those further into the development or at the end of a complicated maze of non-connecting side streets. Three of the five areas each had an average of 43 bus stops. Beat 202 contained only seven. Two distinct areas strayed from the general list of similarities and thus warranted further discussion.

Beat 102, located north of Beat 101/111, contained a jail to the east, a quarry in the northwest and a large park in the south. The jail would no recorded burglaries, and any burglaries from the quarry would be categorized as commercial rather than residential. The majority of residential properties are located in the southern portion of the patrol area. Given the number of incidences near the administrative boundary of Beat 111, it could reasonably be inferred that burglaries spilled over from the neighboring grid. Beyond that point, there was not much activity in the location.

Just over 63% of residents were renters, and youths accounted for 13.98% of the population. It was unclear if the youth population included anyone enumerated in the jail, considering the facility housed adult males. That was reflected in the male to female ratio (Table 5.5), with males at 64.22% – well above the percentages for the other areas.

The other anomaly was within Beat 411. Aside from it containing nearly twice the number of bus stops as the other areas (barring Beat 202) this patrol area, when looking at the incident count alone, would seem to rival the higher clustered areas. However, the incidents were spatially dispersed in such a way as to create a situation where the standard deviations of the kernel density would result in a low-frequency rate. The area had higher activity near the two ends of the fork in the patrol beat. A cemetery split the north and south forks. Burglary activity located in the southeastern part of the beat was also adjacent to a cemetery. Other than the ease of egress, there did not seem to be any other overt explanation for the clustering to have occurred in those locations. Aside from that, the streets with cul-de-sacs remained relatively burglary-free.

Renters made up 16.07% of the housing units and household income for this area was slightly less than the three more affluent patrol beats (Table 5.5). While the youth population was 14.86%, absent from this were clusters around schools. As with all of the patrol beats, each area had at least one public or private school. Although a few locations had some activity along a travelling corridor, it was not to the degree as was indicated in the high impact study areas.



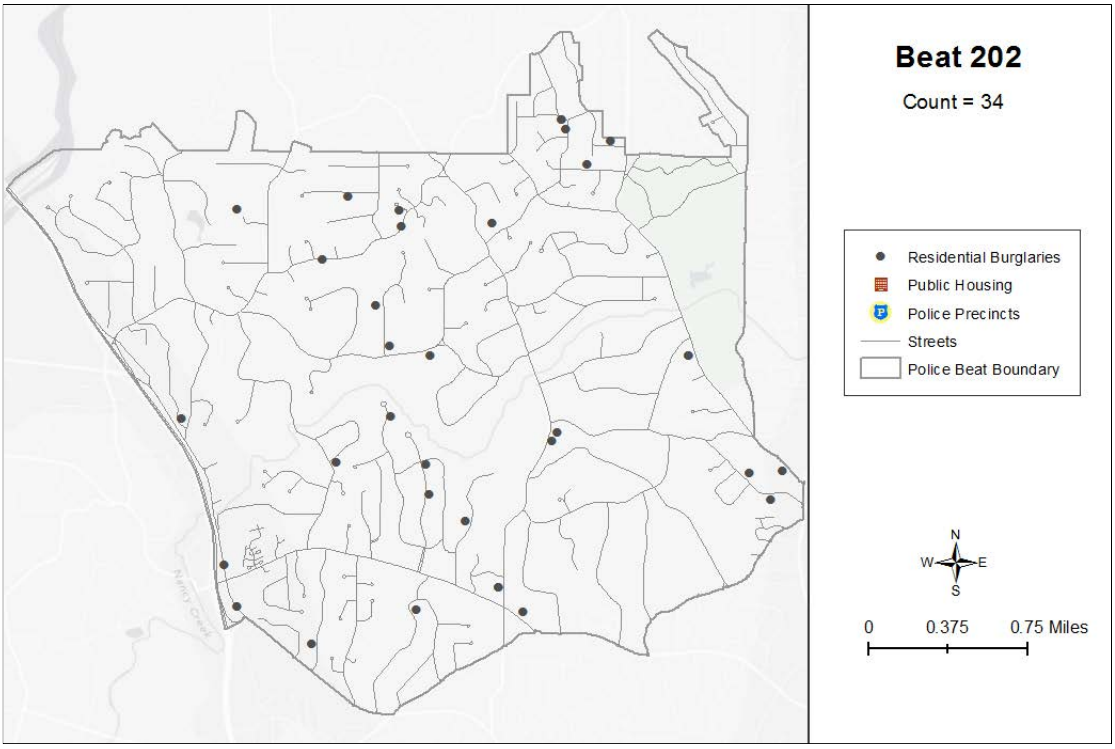
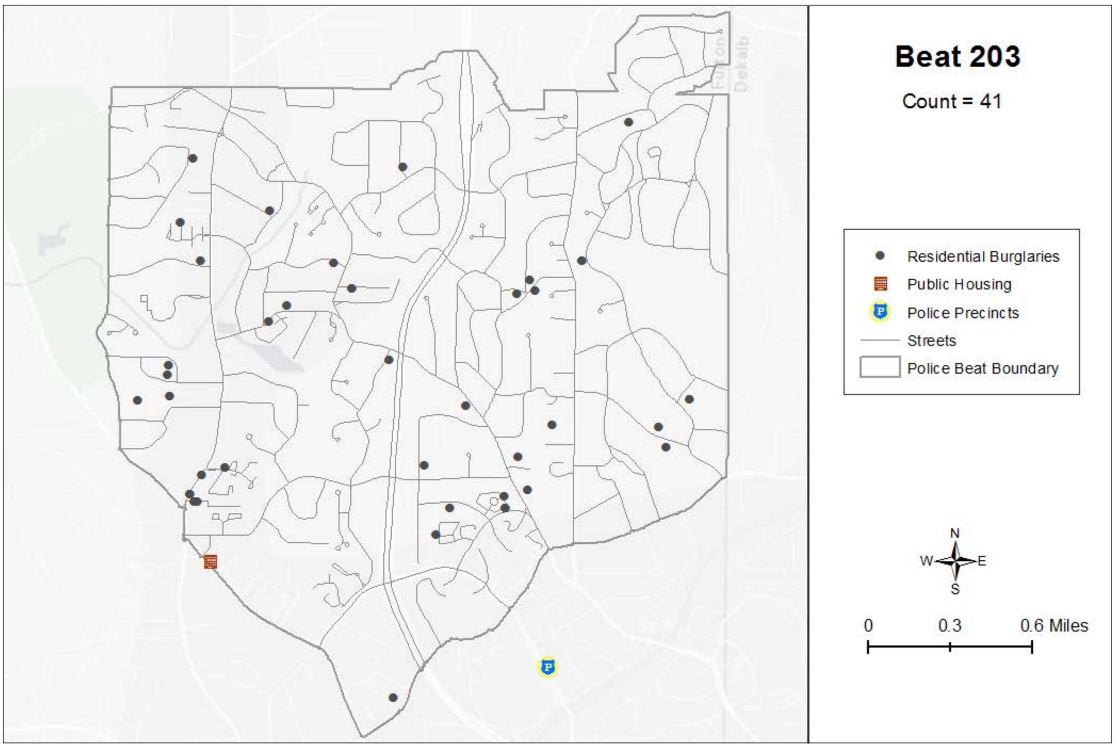


Figure 6.4. Patrol beats 102 and 202 with burglary counts



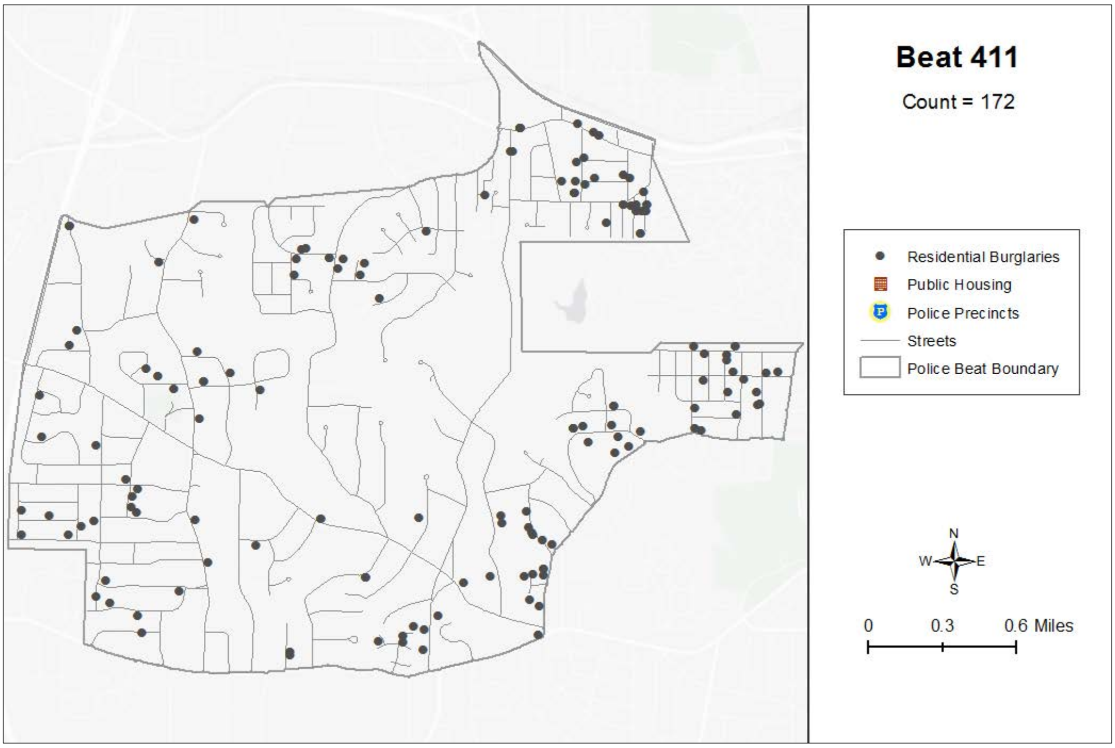


Figure 6.5. Patrol beats 203 and 411 with burglary counts

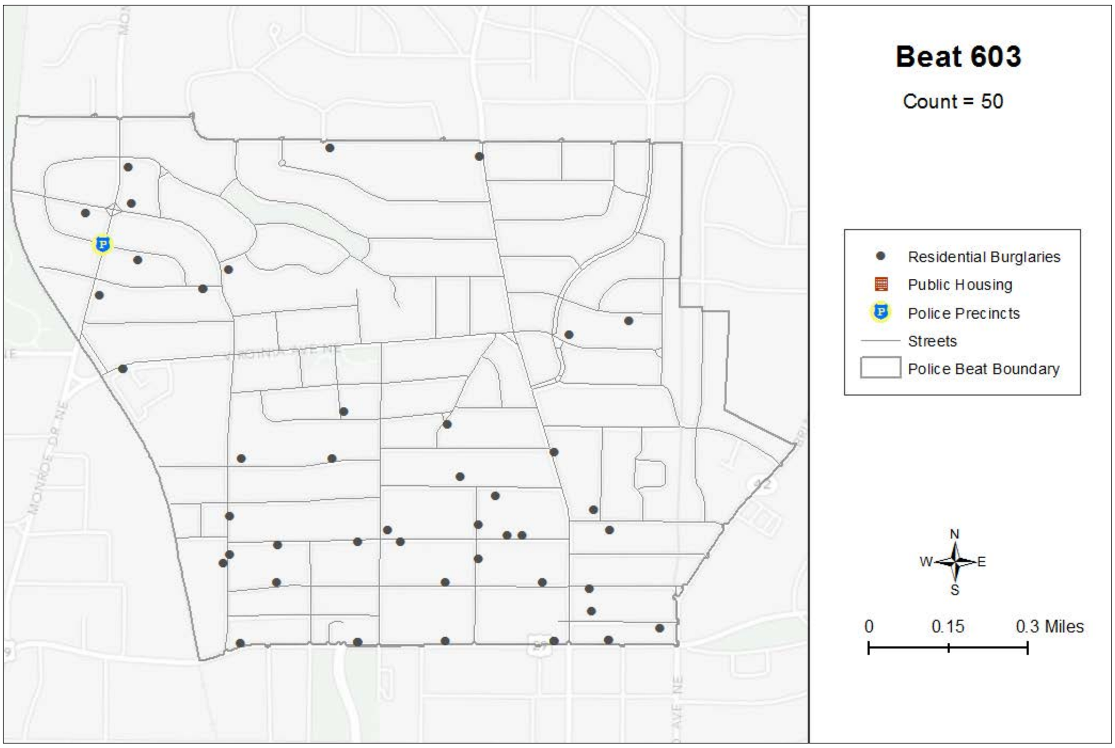


Figure 6.6. Patrol beat 603 with burglary counts

CHAPTER VII

CONCLUSION

7.1 Summary of Study

Urban areas experienced different burglary rates than suburban areas. While trees and shrubs were present in both urban and suburban areas, the foliage in the urban setting appeared to be detrimental, acting as concealment for an offender. Empty lots, abandoned housing with piles of garbage and incomplete construction may have provided increased opportunity for residential burglaries in the urban locations, as those aspects created an appearance of neglect and disinvestment in the neighborhood (Skogan, 1986).

In the suburban housing developments, offenses were generally less frequent, which meant the design of the neighborhoods and multiple cul-du-sacs may be influential in preventing ease of access and egress for offenders. Unfamiliarity with the area and the need for transportation would have made those areas undesirable for offenders, from other neighborhoods who do not own transportation of their own, especially in the more affluent Beats 202 and 203 located in the north of the city.

Acknowledging that socio-economic factors were markedly different between the two neighborhood types, it was determined that environmental and topographic elements had a greater impact on criminal events. Those elements included street patterns, proximity to gathering places and schools, the number of bus stops and the percent of renters, as well as the time of day and day of week burglaries occurred. Analyzing those elements, and others, using statistical and theoretical geographic principles made it possible to gain some understanding of what influenced higher rates of burglary in 2008.

Because of the high Black population in both the urban and suburban study areas, barring the three affluent locations, race was ruled out as a contributory factor to the high rate of residential burglaries. Moreover, it could not be concluded that unemployment was a motivating factor for the commission of the offenses. However, the number of renters versus owners appeared to correlate with the observed crime patterns. The high-density locations consistently contained higher rates of renters for housing units. This was also the case with the low-density areas, though to a lesser degree than those patrol beats with greater clustering.

7.1.1 Use of Topographic Principles in Crime Analysis

Topography has not been traditionally used in the sense that it has been for this study. However, the use of topography for the study of crime has advanced the field both within and outside of the geography domain. Research from the Brantinghams (1975, 1981a, 2008), Herbert and Hyde (1985) and Bottoms and Wiles (2001) may not have directly used the term "topography", but they have been informed by its principles of studying everything on the landscape so as to determine influential variables of a particular crime category.

This study has examined the specifics of residential burglary and what indicators on the landscape were the most influential in both high and low rates of offenses. Without the use of topography, the findings would have most likely been different, as variables like land use, proximity to public transportation and street design would not have been included as important factors to consider in the analyses.

It is truly in the details where real analysis begins, because they provide the qualitative and quantitative data necessary to understand the underlying complexities that lead to the prevalence of crime in a community.

7.2 Further Research

It has yet to be determined what the true impact of unemployment and housing foreclosure had on residential burglary and crime as a whole as a result of the economic downturn. Was there a correlation between those variables and the decrease in crime – particularly for this city? And what role did pawn shops play in the increase or decrease of burglaries? What informal markets were used to fence goods stolen, if any?

In that respect, further research is needed. It should include the strategic and tactical policing philosophies of the Atlanta Police Department. It also needs to be determined if the cause for the increase in property offenses during 2008 was due to a lag in the data, which would indicate some support of previous research on the positive relationship between unemployment and crime. Additionally, the study should examine the existence and effectiveness of city, police and community partnerships. It may be that those relationships had the greatest impact on the reduction of property crime in the beat areas for 2009 and 2010.

What also needs to be examined is the effect of the public housing closures and where the residents migrated following the demolition of those housing units. Did such closures displace enough of the lower-income population to other areas of the city, which in turn increased criminal activity? It is doubtful that criminal behaviors changed because of being without a home or having to move somewhere else in a short amount of time. Moreover, as closures of public housing projects was a national trend, future research in this area could have much wider implications with regard to housing policy, economic political decisions and publicized municipal policing successes.

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APPENDIX A

Atlanta Land Development Zoning Codes

R-1	Single-Family Residential: Not less than 2 acres
R-2	Single-Family Residential: Not less than 1 acre
R-2A	Single-Family Residential: Not less than 30,000 square feet
R-2B	Single-Family Residential: Not less than 28,000 square feet
R-3	Single-Family Residential: Not less than 18,000 square feet
R-3A	Single-Family Residential: Not less than 13,500 square feet
R-4	Single-Family Residential: Not less than 9,000 square feet
R-4A	Single-Family Residential: Not less than 7,500 square feet
R-4B	Single-Family Residential: Not less than 2,800 square feet
R-5	Two-Family Residential: Not less than 7,500 square feet
R-G	Residential General
R-LC	Residential-Limited Commercial
O-I	Office-Institutional
C-1	Community Business
C-2	Commercial Service
C-3	Commercial Residential
I-1	Light Industrial
I-2	Heavy Industrial
SPI-11	Vine City & Ashby Station Special Public Interest
SPI-21	Historic Wes End/Adair Park Special Public Interest
SPI-22	Memorial Drive/Oakland Cemetery Special Public Interest
PD-H	Planned Development – Housing
PD-MU	Planned Development – Mixed Use

PD-OC	Planned Development – Office-Commercial
NC-6	Cascade Heights Neighborhood Commercial
NC-10	Amsterdam Neighborhood Commercial
NC-11	Virginia-Highland Neighborhood Commercial
NC-12	Atkins Park Neighborhood Commercial
MRC	Mixed Residential Commercial
MR	Multi-Family Residential