COMBINED EFFECT OF FACILITY TYPES ON THE SPATIAL PATTERNS OF STREET ROBBERY: A CONJUNCTIVE ANALYSIS

by

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DEDICATION

I would like to dedicate this to my family. To my parents, as a unit, who always made sure I had all the tools, time, quiet, and support I needed to make completion of this degree possible. To my father who never doubted my ability to complete this degree and repeatedly reminded me I was capable. To my mother who gave me constant support and listened to me at length when things were hard. To my brother who always believes in me and makes me laugh when I need to laugh. To my sister who has such a free spirit and great heart that inspires me to always keep trying. To my entire family for always loving and believing in me. I love you all.

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ABSTRACT

Researchers have continuously found that certain types of facilities, such as bars, bus stops, and retail stores influence the spatial patterns of crime. The bulk of studies done in this area examine the individual effect of facilities on the spatial distributions of crime, but not the effect of multiple facilities combined. The present study analyzes the combined effect of facility types at varying distances on the spatial patterns of street robbery in Austin, Texas using a method called conjunctive analysis (also known as qualitative comparative analysis). This study found that certain combinations of facilities were associated with higher robbery counts at all considered distances. The most notable limitation is that the statistical significance of the findings has not been determined. Implications and suggestions for future research are discussed.

CHAPTER I

Introduction

In recent decades, researchers have continually explored and substantiated the notion that crime is not randomly distributed in space (Sherman, 1995; Sherman, Gartin, & Buerger, 1989; Shiode, 2011; Weisburd, Bushway, Lum, & Yang, 2004). This knowledge has been utilized by law enforcement agencies to focus their efforts on high-crime locations. Often called hot spot policing, this is a form of problem-oriented policing. Problem-oriented policing is a proactive approach to policing that consists of identifying, examining, and dealing with specific crime problems, rather than simply dealing with individual offenses as they occur (Reitzel, Piquero, & Piquero, 2010). Hot spots refer to areas of high crime concentration including addresses, street blocks, or intersections. Researchers and law enforcement alike have found that proactively policing these high-crime areas can effectively lower crime rates with minimal dispersion (Taylor, Koper, & Woods, 2011; Weisburd, Telep, Hinkle, & Eck, 2010).

Environmental criminology theories help explain why crime concentrates at certain locations through the influence of situational and other contextual variables. Two examples of variables of interest are the presence of particular types of facilities, and the distribution of land use types across the urban environment. Prior studies have shown facilities such as bars and retail land uses appear to be associated with increased levels of crime (e.g., Lockwood, 2007; Toomey et al., 2012). Although most of these studies investigate the independent effect of individual types of facilities or land use, more recently the influence of these urban features in combination with one another has been systematically explored using a methodology called conjunctive analysis (Hart & Miethe,

2014, 2015). This thesis will expand this knowledge base by considering the combination of facility types around street robbery events. More specifically, the present research replicates and extends the findings from Hart and Miethe's (2014) study, using data for the city of Austin, Texas. It is hoped the findings from this research help strengthen the existing evidence base that may then be used to inform police resource allocation strategies and city planning.

Structure of the Thesis

Chapter II reviews previous literature regarding crime concentration and the influence of facilities on the spatial distribution of crime. Routine activity theory, crime pattern theory, and behavior settings theory (discussed in Chapter II) are also discussed in relation to facilities and street robbery. Special emphasis is then made on studies that have utilized conjunctive analysis to determine which specific configurations of facilities are associated with the places where robberies occur. This includes Hart and Miethe's (2014) study of robbery in Henderson, Nevada, on which this research builds upon.

Chapter III discusses the methodology. This includes a review of the collection and cleaning procedures of all data, including the robbery data as recorded by the Austin Police Department and data pertaining to the types of facility considered. This is followed by a detailed description of conjunctive analysis methodology.

Chapter IV begins by offering a general overview of street robbery in Austin, Texas, as compared to other cities in the state and beyond, so as to place the findings in context. Descriptive summaries of the spatial and temporal patterns of the data are presented next, and this is followed by the findings of the conjunctive analyses

themselves. Throughout the chapter, the results are related to criminological theory and the findings from the two studies that have, to date, used conjunctive analysis to explore the influence of facility configurations on the spatial distribution of street robbery (i.e., Hart & Miethe, 2014, 2015).

Chapter V summarizes and further discusses the findings of the current research. The limitations of the study are considered, as well as how such limitations may have impacted the results. Based on this discussion, suggestions are made for future research. The implications of the findings for theory, policy, and practice are presented.

CHAPTER II

Background

Studies have consistently shown that crime is not randomly distributed in space (Sherman, 1995; Sherman, Gartin, & Buerger, 1989; Shiode, 2011; Weisburd, Bushway, Lum, & Yang, 2004). Weisburd, Bushway, Lum, and Yang (2004) found that half of all crime events over a 14-year span in Seattle, Washington, occurred on approximately five percent of street segments. Another study in Minneapolis, Minnesota, found that half of all calls for police service were dispatched to just three percent of the addresses in the city (Sherman, Gartin, & Buerger, 1989). Studying these patterns to understand the extent to which crime concentrates, as well as determining a method for identifying why it concentrates where it does, is important to police. Law enforcement agencies often have limited resources, making it necessary for them to seek out cost-effective ways to reduce crime. Research in this area can help police departments determine where to effectively allocate resources to help reduce crime.

While spatial concentration applies to crime in general, some specific crime types appear to display more concentration than others. For example, the same researchers in Minneapolis noted that "only 5% of the 115,000 street addresses and intersections in the city produced 100% of the calls for [the predatory crimes of robbery, criminal sexual conduct and auto theft]" (Sherman, 1995: 36); by comparison, calls for persons locked out of their cars, noise violations, and shoplifters displayed much lower levels of spatial concentration (Sherman, Gartin, & Buerger, 1989). The authors explained how these high concentration rates could not be solely attributed to the fact there were many more

addresses than crimes; even after accounting for this, marked concentration levels were still detected (Sherman, Gartin, & Buerger, 1989).

Within the criminology field, routine activity theory and crime pattern theory focus on how the environment provides criminal opportunities, which helps to explain why crimes, such as robbery, are not spatially random. Routine activity theory (Cohen & Felson, 1979) considers how individuals' everyday routines may bring suitable targets in contact with motivated offenders in the absence of capable guardians, thus providing opportunities for crime to occur. Crime pattern theory (Brantingham & Brantingham, 1984) builds on routine activity theory and argues that crime is likely to occur where offenders' awareness spaces —as shaped by their routine activities, and centered around their homes and other significant activity nodes— overlap the areas where crime opportunities exist.

Offender interview research generally supports these two theories. For example, robbers state they often commit robberies when they encounter "opportunities that seemed too good to pass up" (Wright & Decker, 1997: 34). These same active street robbers explained how they tended to seek out areas with many people, such as malls, as these provided multiple targets from whom to choose (Wright & Decker, 1997). Wright and Decker (1997) also reported that most of the robbers they interviewed committed their crimes within their awareness space, which tended to cover their home neighborhood and other areas they often frequented, supporting the idea that a robber's daily routine impacts the opportunity for crime. Similarly, a study by Harper, Khey, and Nolan (2012) found robbery incidents in New Orleans, Louisiana, primarily occurred in areas of high foot traffic and limited police presence, corroborating the idea that

opportunities for crime arise where targets and offenders merge while capable guardians are lacking. So it seems that both offender interview and police recorded data studies of robbery provide evidence that street robberies are highly concentrated in space, and often related to certain environmental features and facility types such as shopping malls, emphasizing the role of the physical characteristics of the environment.

The locations and facility types described by the robbers interviewed by Wright & Decker are examples of what Brantingham and Brantingham (1995) describe as crime generators and crime attractors. Crime generators are places associated with higher crime levels, due to the large number of people that congregate there (e.g., bus stops, train stations, shopping districts, etc.). On the other hand, crime attractors (e.g., drug markets) are places known to offer crime opportunities for offenders. Numerous studies support the idea of crime generators and attractors for various crime types. For instance, Bichler, Malm, and Enriquez (2010) attempted to identify crime generators and attractors relevant to juvenile delinquents by mapping their self-reported hangouts. They found large shopping complexes near movie theaters were consistently highly ranked, meaning juvenile delinquents frequented these facility types most often. Consistent with routine activity theory, delinquent juveniles were likely to commit crimes around those same facilities (Bichler et al., 2010). Another example comes from Kurland, Johnson and Tilley (2014), who examined the generating and attracting qualities of a large soccer stadium on the surrounding area and found that the facility contributed to the increased crime levels when the stadium was in use.

Individual Facility Types and Crime

Most of the extant research has evaluated the effect individual types of facilities have on the spatial distribution of crime *independent of other facilities or factors*, typically using various types of regression analysis. Studies by Franklin et al. (2010) and Toomey et al. (2012) have all reported that alcohol outlets, such as liquor stores and bars, are positively associated with the location of crimes such as street robbery, using a negative binomial regression and a Bayesian hierarchical inference approach, respectively. Groff and McCord (2012) evaluated crime around parks in Philadelphia, Pennsylvania, and reported that parks were related to higher property, disorder, and violent crime levels compared to randomly selected intersections around the city. Murray and Swatt (2010) evaluated the relationship between schools and burglary, thefts, and assaults. They determined that schools were associated with certain crime patterns. One finding was that high schools were more likely to be associated with auto thefts and aggravated assaults (Murray & Swatt, 2010).

Other studies have demonstrated a positive relationship between various transportation activity nodes and crime (Block & Davis, 1996; Kooi, 2013; Newton, Partridge, & Gill, 2014; Stucky & Smith, 2014). A study by Newton, Partridge, and Gill (2014) compared crimes committed above ground at and near rapid transit stations and found high levels of pickpocketing in the environments surrounding those stations with high counts of pickpocketing.

In a study by Kooi (2013), bus stops and crime rates were examined at the block-group level. He found that bus stop block groups predicted 1.3 times as many of the given crime incidents compared with non-bus stop block groups. In 2014, Stucky and Smith

also examined the spatial distributions of bus stops and crime. Using a grid system across Indianapolis, Indiana, they aggregated both crimes (rape, robbery, aggravated assault, burglary, and larceny) and bus stops to each cell in the grid, and determined that, as the number of bus stops in a cell increased, so did the number of crimes.

Block and Davis (1996) focused specifically on robberies and rapid transit stations. They found robberies concentrated near rapid transit stations and just off the main streets. This is likely to be due to several interconnected factors. First, a large number of potential victims are drawn to rapid transit stations, which means they act as crime generators. Second, because of this large pool of potential victims, motivated offenders are also drawn to transit stations, that may then be seen to also act as crime attractors. This convergence of potential victims and motivated offenders creates an opportunity for crime, however, the large volumes of people signifies a greater likelihood of not just potential targets and motivated offenders, but also capable guardians. For this reason, it is not unusual to find robberies do not occur in these busy spaces, but some short distance away from, where guardians are not as likely to be encountered. Angel (1968) designated these areas as “critical intensity zones.” An example scenario consists of an offender identifying a potential victim from the busy location, where a large victim pool exists, and then following the victim to an area where there is less guardianship (e.g. potential witnesses or interveners) and where the attack can be more safely carried out. For this reason, it is often the roads adjacent to or behind the main street that are often targeted by robbers (Angel, 1968).

This phenomenon was also found by Bernasco and Block (2011), who used negative binomial models with census blocks as the unit of analysis to study the spatial

distribution of robbery in Chicago. Bernasco and Block (2011) demonstrated the influence of crime generators such as bars, grocery stores, and gas stations on robbery. For instance, their study showed that for every additional liquor store in a city block, there was as much as a 67 percent increase in the predicted number of robberies (all else being equal). Each additional bar increased the number of predicted robberies by as much as 24 percent. Bars and other alcohol outlets may increase crime opportunities not just by attracting more people but by making potential targets more vulnerable, as patrons become intoxicated and less aware of their surroundings and security. Bernasco and Block (2011) also found that it was not just those blocks containing crime attractors and generators where an elevated crime risk was detected, but also adjacent blocks. While Bernasco and Block's (2011) study was informative in that it included several types of facilities, their analyses did not measure interaction effects, so no information was provided about how different facility types may interact with each other when shaping these robbery distributions.

Groff and Lockwood (2014) examined the influence of five different types of facilities on violent, property, and disorder offenses, and showed different facilities were relevant to different crime types. For example, bars and transit stations were positively related to violent crime, including robbery, while "schools were associated with disorder offenses" (Groff & Lockwood, 2014: 278). Roncek and Maier (1991) studied liquor establishments including taverns and lounges. They used multiple regression models to determine that liquor establishments were positively related to crime.

A study in Savannah, Georgia, found robberies were associated with retail land use (e.g., shopping centers, entertainment venues, restaurants) (Lockwood, 2007). This is

consistent with routine activity and crime pattern theories, as offenders are generally familiar with — and frequent and commit crimes in — their own neighborhoods, but also in areas with commercial and retail land uses because these form part of their routine activities. These would be locations known to attract large populations of people, offenders and non-offenders alike, and the multiple studies previously mentioned have shown crime attractors and generators are positively related to higher crime counts.

Joint Influence of Different Facility Types on Crime

Previous studies (Bernasco & Block, 2011; Groff & Lockwood, 2014; Roncek & Maier, 1991) researching the influence of facility locations on crime examine one facility type at a time, without effectively considering possible interactions between or among multiple facility types. This is of course useful information but does not allow for a full picture of the situational context of crime. It could be possible that different facility types in various combinations have an additive effect, a multiplicative effect, or no net effect on crime (because they cancel each other out). As with many behaviors there is rarely just one cause, justifying a need for a way to examine relationships more contextually.

A very small number of studies have investigated how various types of facilities considered in combination with each other influence crime through a methodology called conjunctive analysis (Hart & Miethe, 2014, 2015). One such study was carried out by Hart and Miethe (2014) in Henderson, Nevada, who found street robberies appear to be spatially clustered around certain configurations of facilities. A more detailed description of the methodology for their study is provided in the Methodology chapter, but a brief description is pertinent here so the findings can be put in context.

Conjunctive analysis is a relatively new, exploratory method of analysis that combines the qualitative approach of considering causal complexity and the quantitative approach of looking at the effect of individual variables (Miethe, Hart, & Regoeczi, 2008). Originally developed by Charles Ragin (1987) as qualitative comparative analysis, this method "does not work with samples or populations but with all relevant instances of the phenomenon of interest" (p. 15). With conjunctive analysis the relationship between each possible *combination* of facilities is evaluated instead of individual facilities, one at a time.

Succinctly, the procedure is as follows: first, the areas around each of the crime events considered are inspected and a record is made of the type of facilities that can be found in each of these areas. A frequency table is then created that describes how many of the crimes were associated with each facility configuration. For instance, a certain number of crimes may have occurred where there was a bus stop and a bar nearby but no other types of facilities. Each type of facility is noted (within the area around each crime) as either present or absent, regardless of the exact number of facilities of that type. The total number of possible configurations is a function of the number of facility types considered, and can be calculated as 2^n, where n represents the number of facility types. For example, if three types of facility are considered (e.g., bus stop, bar, and ATM), eight facility configurations are possible, as shown in Table 1. The frequencies associated with each facility configuration indicate whether certain configurations appear more "criminogenic." Configurations with high-crime counts are termed as "dominant."

Table 1. Simple illustration of facility configurations.

	Bus stop	Bar	ATM
1	yes	yes	yes
2	yes	yes	no
3	yes	no	yes
4	no	yes	yes
5	yes	no	no
6	no	yes	no
7	no	no	yes
8	no	no	no

For example, in Hart and Miethe's (2014) study, eight facility types were considered, which means there were 256 possible configurations (i.e., 2^8). Of those, only nine were found to have 10 or more crimes associated with them, and were thus classified as dominant. These nine dominant profile configurations (about 2.5 percent of all possible configurations) accounted for 52 percent of all robberies. The most dominant configuration was one lacking every type of facility, and this was followed by one where only a single bus stop was present (see Table 2). However, examples could also be found where combinations of facilities were present; for instance, the third most prevalent configuration was one where every type of facility was present; certain facilities (e.g., ATMs) only featured among the dominant profiles when in the presence of other types of facilities.

Table 2. The most criminogenic facility configurations in Hart and Miethe's (2014) study (reproduced from p. 186).

	Facilities										
Profile ID#	ATM	Bar	Bus stop	Check-cashing	Fast food	Gas station	Shopping plaza	Smoke shop	*N*	*%*	*Cum. %*
1	no	no	no	no	no	no	no	no	80	17.7	17.7
2	no	no	yes	no	no	no	no	no	49	10.8	28.5
3	yes	yes	yes	yes	yes	yes	yes	yes	18	4.0	32.5
4	yes	yes	yes	no	yes	no	yes	yes	18	4.0	36.4
5	yes	yes	yes	no	yes	yes	yes	no	18	4.0	40.4
6	yes	yes	yes	no	yes	yes	yes	yes	17	3.8	44.2
7	no	no	yes	yes	yes	yes	yes	no	12	2.6	46.8
8	yes	no	yes	no	no	no	no	no	12	2.6	49.4
9	yes	no	no	yes	yes	yes	yes	yes	12	2.6	52.1
							9 dominant situational profiles		236	52.1	
							67 other situational profiles		217	47.9	
							76 total observed situational profiles		453	100.0	

In a follow up study, Hart and Miethe (2015) expanded upon their previous findings of facility configurations around robbery by analyzing three varying distance buffers around the robbery events. As in the previous research study, the data came from Henderson, Nevada. The varying distances used were 500 feet, 1,000 feet, and 1,500 feet. Their research found that, as in their original study, the majority of robbery events tend to occur in a small number of dominant profiles. They also reported that the dominant profiles varied by buffer distance, time of day, and patrol district (see Table 3).

Table 3. The most criminogenic facility configurations in Hart and Miethe's (2015) study (reproduced from p. 16).

Facilities										Rank order of profile at distance (in feet)		
ATM	Bar	Bus stop	Check-cashing	Fast food	Gas station	Shopping plaza	Smoke shop	Land use	Day of week	500	1,000	1,500
no	no	no	no	no	no	no	no	Residential	Weekday	1	1	1
no	no	no	no	no	no	no	no	Residential	Weekend	2	2	4
no	no	yes	no	no	no	no	no	Residential	Weekday	3	3	3
no	no	no	no	no	no	no	no	Nonresidential	Weekday	4	13	25.5
no	no	yes	no	no	no	no	no	Nonresidential	Weekday	5.5	6	9.5
yes	yes	yes	no	yes	yes	yes	yes	Nonresidential	Weekday	5.5	4	30.5
yes	no	yes	no	yes	no	no	no	Nonresidential	Weekday	7	8.5	9.5
no	no	no	no	yes	no	no	no	Nonresidential	Weekday	8	-	-
yes	no	no	no	no	yes	no	no	Nonresidential	Weekday	9.5	-	-
yes	no	yes	no	no	no	no	no	Nonresidential	Weekday	9.5	13	25.5
									Total number of *observed* behavior settings:	146	128	129
									Total number of *dominant* behavior settings:	18	28	28
									Percentage of robberies accounted for by *dominant* behavior settings:	50.6	60.7	62

Conjunctive analysis melds the nomothetic with the idiographic. A nomothetic approach is a deductive approach that "seeks lawfulness by testing hypothesis" (Karson, 2007: 685). In contrast, an idiographic approach is inductive and more holistic, and seeks "lawfulness by inspecting individual cases and accounting for them" (Karson, 2007: 685). Conjunctive analysis combines the two approaches by deductively testing hypothesis of combinations that were created inductively by inspecting possible configurations around individual crime locations, and by considering the holistic context around crime events.

To consider this context, a different unit of analysis is required. Previous studies have usually used one of two kinds of units of analysis. The first units are areas delimited by already existing boundaries such as census tracts or city blocks, or by a grid that is artificially imposed over the study area; individual facilities and crimes are then aggregated to these areas before performing the analyses. The second type of unit of analysis consists of areas that are created around certain spatial objects that are treated as independent variables, such as facility types. In conjunctive analysis, this procedure is applied but the center of each unit of analysis is the crime event itself, which is treated as the *dependent* variable.

Some studies have used this technique to evaluate entire crime events (Hart & Miethe, 2008; Hart & Miethe, 2009; Hart & Miethe, 2011; Mieczkowski & Beauregard, 2010; Miethe & Drass, 1999). The term "crime event" is used to refer to discrete events that are composed of many components including "the law, the offender, the target, the site of the crime, the social situation obtaining at the site at the time of the crime, and the mechanics of the criminal act" (Meier, Kennedy, & Sacco, 2001: 278). Evaluating an

entire crime event goes beyond the characteristics of the physical environment, and also considers characteristics of the criminal act, the victim, and the offender. For example, Mieczkowski and Beauregard (2010) used victim characteristics (such as gender and relationship to offender), situational characteristics (such as drugs used by the perpetrator and/or the victim, and the timing of the offense), and *modus operandi* (M.O.) characteristics (such as use of weapon or humiliation of victim) to examine the nature of sexual assaults in Canada, and to determine whether certain types of characteristics were more closely associated with deadly outcomes. The use of a weapon (one of the crime characteristics) was found in seven of the 11 profiles that resulted in a fatal outcome. Researchers using this method of analysis have related this approach to behavior settings theory (e.g., Hart & Miethe, 2015).

In line with theories of environmental criminology, the ecological psychology theory of behavior settings describes how the environment influences the way individuals behave by promoting or inhibiting specific actions (Barker, 1968). In Barker's theory, the unit of analysis is the specific environment surrounding a particular behavior and this is referred to as the behavior setting. An example given by Barker (1968) is that of a classroom, where the desks facing the teacher encourage the students to listen; this would be an example of an element of the behavior setting of the entire classroom. Since a behavior setting is considered to be the entire encompassing environment surrounding the behavior and all the elements contained within it, this allows for a more holistic and comprehensive unit of analysis.

In most studies that use behavior settings as their theoretical framework, however, the environment is determined first, and any behaviors that occurred within such an

environment are subsequently examined within. For this study, as with the research it stems from, the behavior of robbery is determined first and then the surrounding environmental configurations examined. This is different than the more common method of defining the environment first, usually by a grid or through predefined areas such as census tracts, and seeing where crime falls within these areas. However, by making the crime events the center of the unit of analysis, a narrower focus is possible that may reveal interesting findings.

Previous applications of behavior settings theory have focused on discrete environments that are small, often within a room or a building. This study examines a larger behavior setting around robbery events, using three differing buffer sizes. In Hart and Miethe's (2014) study, only a fixed buffer of 1,000 feet was considered. The present research uses three smaller buffers after a study by Ratcliffe (2012) found the impact of facilities on crime decays significantly after 85 feet. The current study will consider three buffer sizes of 85 feet, 300 feet, and 1,000 feet. The 85-foot buffer was selected based on Ratcliffe's findings. The second buffer has a radius of 300 feet, equivalent to an average street block in the study area. Finally, a 1,000-foot buffer is employed, to allow for a comparison of the results to those of the original study.

Hart and Miethe (2015) recently published a follow up analysis in Henderson, Nevada, but considered three differing buffer sizes, of 500 feet, 1,000 feet, and 1,500 feet. This thesis complements this analysis by examining smaller buffer areas and replicating the study in a different setting based in a larger city. The US Census Bureau (2013) estimates that in 2013 the population of Henderson, Nevada, was 270,811, while Austin, Texas, had a population of 885,400. While robberies were collected over a three

year period in order to obtain a big enough sample in Henderson, Austin has enough robbery events in a single year. This increases reliability because facilities are less likely to open or close in a shorter time period.

This study seeks to answer two main questions. First, can Hart and Miethe's (2014) findings be replicated in a different setting? Second, if certain combinations of facilities are more common around street robbery events, as found in the original study, does changing the buffer distance around the robberies alter the patterns observed for the most dominant facility configurations?

CHAPTER III

Methodology

Design

This descriptive study uses secondary data to replicate and extend research conducted by Hart and Miethe (2014). In their study, the authors utilized conjunctive analysis to identify the facility configurations that were most often found around street robbery events in Henderson, Nevada. They began by considering 16 facility types that were then narrowed down to the eight most often found in the proximate environment of robberies in their study area. Following this, buffers were created around the robbery events. Within each buffer, the presence or absence of each of the eight facility types were recorded and then compiled into a conjunctive analysis matrix for analysis.

In the present study, the same process was replicated for a different city. The same 16 facility types were narrowed down to the eight types most often found in the proximate environment of robberies in Austin, Texas. These eight facility types were then compared to the eight shortlisted in the original study from Henderson.

Next, the eight facility types for Austin, Texas, were analyzed using conjunctive analysis to determine if there are configurations, within 1,000 feet, that appeared to be more commonly present around robbery events. In addition to this, conjunctive analyses were performed using these eight facility types on two additional distances, namely 85 feet and 300 feet, to determine if dominant configurations differed across the three buffer distances.

Data Sources

Two main types of secondary data were employed in this project. The first consist of street robbery data that were obtained from the Austin Police Department (APD). These data include all street robberies reported to APD during 2013, and contains the date, time, and exact location of each offense in the form of geographical coordinates. The definition of robbery for this study comes from the FBI's Uniform Crime Reports (UCR) and refers to "the taking or attempting to take anything of value from the care, custody, or control of a person or persons by force or threat of force or violence and/or by putting the victim in fear" (U.S. Department of Justice, 2013, para. 5). Data for robbery against individuals recorded during 2013 from the APD consisted of 625 robbery events.

The second type of secondary data relate to the facilities. These were the same 16 facility types considered in Hart and Miethe's (2014) original study: adult stores or entertainment sites; ATMs; bars; bus stops; check-cashing centers; restaurants; gas stations; liquor stores; (public) parking lots; pawn shops; recreation centers or parks; (public and private) schools; shopping malls; shopping plazas; smoke shops; and public storage facilities. These 16 facility types were chosen by Hart and Miethe (2014) based on previous research of facilities known to be related to crime.

All facility types were identified using the operationalization procedures of the original study, with one exception. Due to time constraints and challenges in obtaining the data, the present research considered all public parking lots, which include, but are not limited to, public parking garages (public parking garages were the only parking facilities considered by Hart and Miethe). This may lead to an over-representation of this

facility type in the configurations identified, and this is taken into account when discussing the findings.

Information relating to these facilities and their location are publicly available. Most of the data were accessed through either the public websites of the licensing agencies or through an open public information request. Since ATMs are not registered or available in any common or shared database, addresses had to be individually identified from numerous websites, many of which were websites of banks and credit unions. To identify these websites, internet searches were performed using the search terms “ATM,” “bank,” or “credit union,” and “Austin, TX.” Individual addresses were then entered into a newly created database.

The addresses of adult stores and adult entertainment venues, shopping plazas, and shopping malls were gathered from the Yelp and Yellow Pages websites (Yelp.com and yellowpages.com, respectively), using the search terms “adult,” “adult entertainment,” or “adult store,” and “Austin, TX,” and “shopping center,” “shopping mall,” or “shopping plaza,” and “Austin, TX,” respectively. Table 4 lists all 16 facility types with a description of the facility and details about the data sources.

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Table 4. Facility type descriptions and data sources.

Facility type		Description	Source
1	Bus stops	Bus stops as determined by Capitol Metro Services	CapMetro
2	Parks	Parks as determined by the City of Austin	City of Austin
	Recreation centers	Recreation centers as determined by the City of Austin	City of Austin
3	Adult stores / entertainment	Stores designated as "adult" and "adult entertainment" in Austin, TX by Yelp.com	Yelp
4	ATMs	Manually compiled from banks and credit union websites	National bank and credit union websites
5	Bars	BE (retail dealer's on-premise license), BG (wine and beer retailer's permit), BL (retail dealer's on-premise late hours license), FB (food and beverage certificate), LB (mixed beverage late hours permit), MB (mixed beverage permit), RM (mixed beverage restaurant permit with FB), BP (Brewpub License)	Texas Alcoholic Beverage Commission
6	Liquor stores	P (package store permit), Q (package store permit-wine only), BF (retail dealer's off-premise license), BQ (wine and beer retailer's off-premise permit)	Texas Alcoholic Beverage Commission
7	Check-cashing centers	Credit access business license holders	Office of Consumer Credit Commissioner
8	Fast food	Limited service restaurants (NAICS code 722513) without an alcohol license	ReferenceUSA and Texas Alcohol Beverage Commission

Table 4. (Continued) Facility type descriptions and data sources.

Facility type		Description	Source
9	Gas stations	Public information request of all gas stations in City of Austin	Texas Department of Agriculture
10	Parking lots	Surface parking for a variety of establishments/parcels, including actual parking garage facilities or pay for parking lots. Parcels on separate lots that serve only one establishment are coded with the use of that establishment (Land use code 850)	City of Austin
11	Pawn shops	Pawn shop license holders	Office of Consumer Credit Commissioner
12	Public schools	Texas regular, charter, and alternative schools	Texas Education Agency
	Private schools	Accredited elementary and secondary non-public schools in Texas	Texas Private School Accreditation Commission
13	Shopping malls	Clusters of 25 or more stores with at least two anchor (e.g., Macy's JCPenney) stores; area in between stores is usually covered	Yelp and Yellow pages
14	Shopping plazas	Cluster of six or more stores connected to each other; area in between stores is usually open-air	Yelp and Yellow pages
15	Smoke shops	Tobacco stores (NAICS code 453991)	ReferenceUSA
16	Public storage facilities	Lessors of mini-warehouses and self-storage (NAICS code 531130)	ReferenceUSA

NAICS = North American Industry Classification System.

For some of the facility types, it was possible to request or narrow down only locations that were "active" in the physical environment during 2013. These facility types included bars, liquor stores, check-cashing centers, gas stations, and pawn shops. A small percentage of these facilities (16 percent) began or ceased operating during 2013 (see Table 5 for list of these facilities). A decision was made to keep them in the study after sensitivity analyses showed observed patterns remain unchanged after they were removed. Results of the sensitivity test can be found in Appendix A.

Table 5. Percentages of each facility type with start/end date during 2013 and status other than "active."

Facility type	Percentage started or ended during 2013	Percentage status other than "active"
Bars	23.5	15.7
Liquor stores	11.3	11.9
Check-cashing	6.6	20.4
Gas stations	18.3	-
Pawn shops	32.7	13.7

Bars, liquor stores, check-cashing centers, and pawn shops were found to have 14.8 percent of locations with a status other than "active" or "current." Statuses other than active or current included "voluntarily cancelled" or "voluntarily suspended". These were included when they had expiration dates of 2014 and later, since it is not possible to determine when those statuses became effective. For example, if a liquor store has an

issue date in 2010, an expiration date of 2016, and a status of voluntarily suspended, there is no way of knowing if the voluntarily suspended status occurred before, during, or after 2013. A decision was made to keep these facilities in the analysis after a sensitivity test showed the patterns remained unchanged after they were removed.

Narrowing down the businesses to only those active during 2013 was not possible for other facility types. Public and private school years last from the fall of one year to the spring of the subsequent year. Due to this, the school year of 2012-2013 was selected. Additionally, facility locations for adult establishments, ATMs, fast food restaurants, shopping malls, shopping plazas, smoke shops, and public storage facilities could only be gathered for what was present at the time of collection (December 2014 to January 2015). Also, bus stops, parks and recreation centers, and public parking lots were obtained and for these the "date of last update" varied. For example, parks data were last updated July 2, 2013, while parking lot data were last updated June 5, 2014.

All facility data were manually checked for quality and, when required, cleaned before the analyses were conducted. Several facility types were gathered with coordinates included or were gathered as prepared map layers for immediate use in the mapping software. Prepared map layers included bus stops as well as parks and recreation centers. Robbery events included coordinates as well as fast food restaurants, smoke shops, and public storage facilities. Manuel cleaning included the removal of any addresses that were listed as PO boxes for which a physical address could not be identified, any duplicate addresses, and any addresses that were known to not have been established in 2013.

As most of the sources did not provide geographic coordinates, it was necessary to geocode physical addresses. Geocoding is a process that matches a given address to an address in a database with matching geographic coordinates. Geocoded facility types included adult stores/entertainment, ATMs, bars, liquor stores, check-cashing centers, gas stations, pawn shops, private schools, shopping malls, and shopping plazas. A total of 3,516 addresses were geocoded and, of those, 212 addresses had to be manually matched due to spelling errors or varying ways of identifying certain streets. For example, Ben White Boulevard is also titled State Highway 71 in Austin, Texas. Only five addresses could not be geocoded or manually verified; after the manual matching, the overall geocoding success rate was 99.8 percent.

Ethical Issues

The risks associated with this research were very low, as it utilized two types of secondary data that did not identify individuals. The exact locations of street robbery incidents were obtained, but those did not identify either offender or victim (unlike, for example, a residential burglary might). Since the location is not a direct identifier, confidentiality is not at stake. The second type of data utilized involves public facilities. Data were obtained through either public websites of the businesses or licensing agencies, open public information requests, or generic internet searches. The study was, however, reviewed by the Texas State University IRB and found to be exempt under Category 4 (i.e., Existing Data: Records Review, Pathological Specimens) due to the lack of identifiers of offender or victim and the public nature of all obtained facility data. The exemption was granted by the Institutional Review Board (IRB) on November 21, 2014.

Procedure

To begin with, all robberies were imported into a geographic information system (GIS; the specific software package used was ArcMap 10.2.2). Next, buffers were created around each robbery incident, using three different radii. As an extension to Hart and Miethe's (2014) study, three different buffers were considered. A buffer size of 1,000 feet was employed as part of the replication, and was determined to be a compromise between previous studies suggesting one to two blocks is the spatial extent of the environment on crime (Caplan, 2011; Groff, 2011) and urban planning research that suggests an individual will be unwilling to travel over one-quarter mile to utilize public transportation (Calthorpe, 1993; Duany & Plater-Zyberk, 1993).

Additionally, a buffer size of 300 feet was considered because previous literature suggests that it is the approximate average length of a city block that is critical (Groff, 2011; Hart & Miethe, 2014). Finally, a buffer size of 85 feet was examined, following Ratcliffe's (2012) reported research findings that the effect of a facility on the spatial distribution of crime appears to significantly decay after this distance. Groff (2011) compared various measures of distance and concluded road distances (i.e., distances measured along the street network) were preferable to Euclidean (i.e., "as the crow flies") distances when determining the effect of facilities on crime. While a buffer based on a Euclidean distance looks like a circle, the shape of a buffer based on road distance varies depending on the nature of the existing street network. The use of street distances to create buffers may be regarded as a more realistic consideration of the environment because in any location there will be physical barriers that limit an individual's motion and direction (Groff, 2011). Consistent with this knowledge, and in line with Hart and

Miethe (2014), in this study the buffers were created based on road distances around the robberies.

Buffers following the street network were created in ArcGIS from the city's street network obtained through the City of Austin website. Using the service area network tool in ArcGIS, these buffers were created by, first, assigning each robbery to the nearest location within the street network and, second, generating the buffers by reaching out along the street network in all possible directions, as far as the road distance set in each case. Figure 1 shows an example of the three distance buffers surrounding a robbery that were created using this tool.

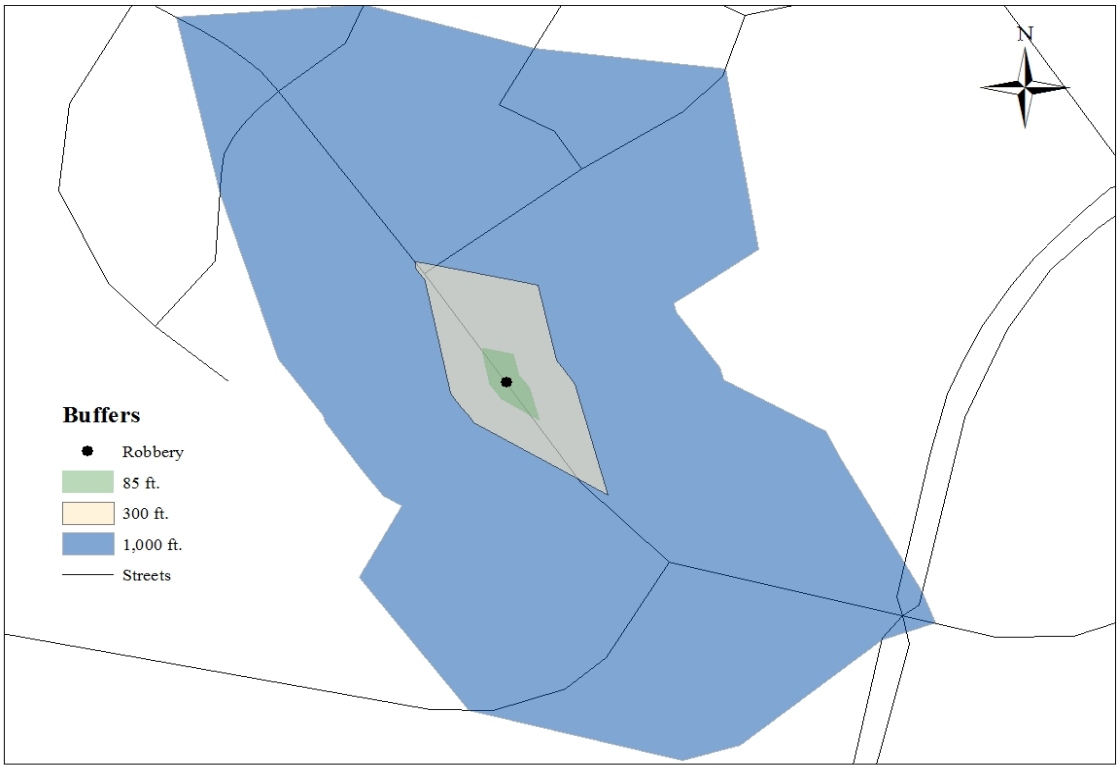

Figure 1. Three distance buffers around a robbery event.

The next step was to determine how many facilities of each type fell within these buffers. This was achieved by using the spatial join function in ArcMap. This process resulted in a data table where each row represented a separate robbery incident, and where columns were now available for the number of each type of facility present within each buffer radii (e.g., 48 additional columns in total; 16 facility types * 3 buffer sizes). As it was simply information about the presence or absence of each type of facility that was required for the analysis, the facility counts were recoded as 1 (present; 1+ facilities) and 0 (absent; 0 facilities).

This allowed for the determination of how often each particular type of facility was present in a robbery environment, and the selection of the eight facilities most closely associated with robbery. This is more appropriate than using the actual count of each type of facility because it is consistent with the function of conjunctive analysis. For example, if 20 fast food restaurants are located around one single robbery event and 10 ATMs are located within the buffers of *five* robbery events, using the raw number of facilities (rather than the number of times they were present or absent) would give the impression that fast food restaurants are more likely to be present around robberies than ATMs, even though ATMs are in the vicinity of a greater number of robbery events. For this reason it was necessary to code any businesses found within a buffer as one (1) and non-presence as zero (0). From this, the sum of each facility type for each buffer distance was determined and ranked (see Table 6).

Table 6. Frequency of facility presence at three buffer distances.

		85 ft.		300 ft.		1,000 ft.		
Facility type	Austin	N	Rank	N	Rank	N	Rank	H&M (2014)
Bus stops	2,699	39	1	215	1	465	1	x
Bars	1,463	37	2	103	3	282	3	x
Liquor stores	793	32	3	122	2	334	2	
Parking lots	698	14	6	63	4	181	5	
Fast food	513	2	12	33	8	159	7	x
ATMs	499	8	7	40	7	176	6	x
Gas stations	420	15	5	56	5	208	4	x
Parks / Recreation centers	299	16	4	41	6	140	8	
Storage facilities	193	3	10	7	11	39	12	
Check-cashing	166	6	8	20	9	105	9	x
Schools	166	0	15	2	14	38	13	
Pawn shops	58	2	12	8	10	56	10	
Smoke shops	53	3	10	5	12	42	11	x
Adult stores/entertainment	44	1	14	1	15	5	15	
Shopping plazas	26	4	9	5	12	16	14	x
Shopping malls	4	0	15	0	16	0	16	

H&M (2014) = Facility types shortlisted in Hart and Miethe's (2014) original study.

The rankings showed the same eight facility types were ranked highest for both the 300-foot and 1,000-foot buffers. In the 85-foot buffer, all but one were the same as the other two distances (i.e., check-cashing centers featured in the list, instead of fast food restaurants). More differences were found when comparing the top-ranking facilities with those in Hart and Miethe's (2014) study; while there was an overlap of five facility types, three of the facilities shortlisted in their study did not appear in the 1,000-foot buffer top eight here, namely check-cashing centers, smoke shops, and shopping plazas. A decision was made to replicate the process of shortlisting the facility types, rather than using the exact same facilities shortlisted by Hart and Miethe. For this reason, it was the eight facility types appearing in the 300-foot and 1,000-foot buffers in our study area that were shortlisted, namely: ATMs; bars; bus stops; fast food restaurants; gas stations; liquor stores; parking lots; and parks and recreation centers. Eight, rather than the original 16 types of facilities were considered in the original and in this study because otherwise the number of possible configurations would have been too large (2^8=256 vs. 2^{16}=65,536).

These eight facilities were then used in the conjunctive analysis of case configurations for comparison to the original study of the 1,000-foot distance. In conjunctive analysis every possible combination of facilities is placed in a large matrix or truth table. It is simply the absence or presence of each type of facility, rather than the actual number of facilities, that is recorded. The 1,000-foot environment around every robbery event is examined to determine what facility combination is present; it is then assigned to that configuration in the matrix. All configurations were then rank-ordered to

determine if street robbery incidents were closely associated with only a few specific configurations.

In line with Hart and Miethe (2014), decision rules were applied in order to distinguish dominant from non-dominant profiles. A minimum profile frequency of 10 robberies was used in this research to replicate the original study. This means that a profile was considered dominant if it was associated with at least 10 robberies. The study then systematically determined the effect of reducing the 1,000-foot area considered around each robbery incident by repeating the steps for the 85-foot and the 300-foot buffers.

CHAPTER IV

Findings

This chapter begins by describing robbery patterns in Austin, Texas. This will be followed by a review of individual facility types, a review of the results of the conjunctive analysis for each buffer size, and a comparison of these results to the original study.

Street Robbery in Austin, Texas

It is worth first providing a brief overview of how Austin compares to the rest of Texas, and also to other US cities, in relation to street robbery. Special emphasis will be made on how Austin compares to Henderson, Nevada, that is the setting for Hart and Miethe's (2014, 2015) research.

Austin is the fourth most populous city in Texas. As can be seen from Table 7, in 2013 Austin appeared to have a smaller violent crime and robbery problem than other cities of comparable size within the state (U.S. Department of Justice, 2014). For instance, Austin had a population in 2013 of just over 850,000 and experienced 763 robbery incidents, while Fort Worth had approximately 70,000 fewer residents and experienced 1,256 robbery incidents; the respective rates are 89 and 159 robberies per 100,000 population. When compared to Austin, the robbery rates were as much as five times greater in Houston (454 robberies per 100,000 population) and almost four times greater in Dallas (335). Among the top most populous cities in Texas, Laredo (84), El Paso (67), and Plano (38) had robbery rates lower than in Austin in 2013.

Table 7. Number of violent crimes and robberies reported in 2013 in the top 10 most populated cities in Texas.

City	Population	Violent crime	Robbery	Robbery per 100,000 pop
Houston	2,180,606	20,993	9,891	454
San Antonio	1,399,725	8,828	2,192	157
Dallas	1,255,015	8,330	4,202	335
Austin	859,180	3,123	763	89
Fort Worth	789,035	4,420	1,256	159
El Paso	679,700	2,522	457	67
Arlington	378,765	1,837	562	148
Corpus Christi	314,523	1,939	390	124
Plano	275,795	389	106	38
Laredo	247,353	1,027	207	84

Source: Uniform Crime Reports (UCR).

UCR robbery data just reported, however, includes both personal (street) and commercial robbery (U.S. Department of Justice, 2014). According to the Austin Police Department's Annual Crime and Traffic Report for 2013, 79 percent of reported robberies were committed against individuals, with the remaining 21 percent classified as commercial robberies. Table 8 shows the number of robberies as well as the robbery rate per 100,000 population in the city of Austin has declined since 2009 (Austin Police Department, 2010, 2010, 2011, 2012, 2013, 2014). This matches the FBI's Uniform Crime Report data (U.S. Department of Justice, 2014), that shows a decline in violent crime offenses for the United States over the last five years.

Table 8. Robbery Incidents and Rate in Austin (2008-2013).

Year	N	N per 100,000 pop
2008	1,119	177
2009	1,174	184
2010	997	155
2011	917	137
2012	772	117
2013	625	92

Source: Austin Police Department.

In 2013, the Henderson, Nevada, Police Department reported 160 robberies to the FBI in 2013 (U.S. Department of Justice, 2014). Henderson has around one third the population of Austin and a robbery rate of approximately 59 per 100,000 population. Due to the small number of robberies in Henderson, the original study needed to include three years' worth of robbery data for analysis. In contrast, the present research study only required data for one calendar year. This is seen as an advantage as the presence and location of facilities is less likely to change over a shorter time period.

Street Robbery in Austin during 2013: Spatial and Temporal Patterns

The next section summarizes the spatial and temporal patterns of street robbery in Austin, based on analyses on the data obtained from APD. There were 625 street robberies reported during 2013. Figure 2 shows June had the highest number of robberies. This is not surprising as during the summer many individuals' routines take

them outdoors to participate in social activities. It is interesting to note how the number of robberies is lowest during August, when perhaps it is too hot and many residents leave the city to go on holiday. Other notable peaks can be detected in March and October, when Austin holds the South by South West (SXSW) and Austin City Limits festivals, respectively. This increased number of potential victims out of their houses and around town would, according to routine activity theory, increase the criminal opportunity for offenders.

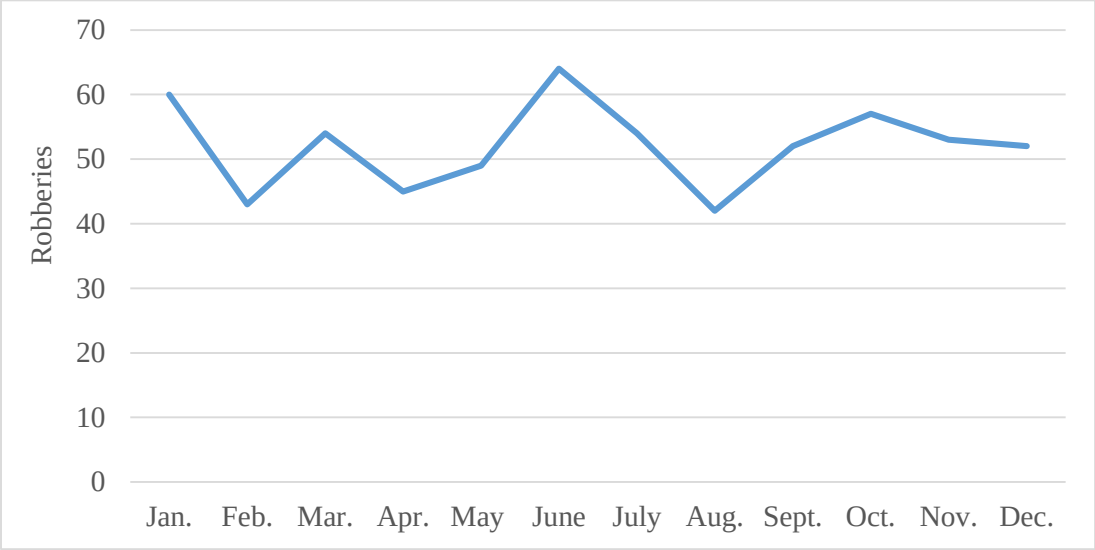

Figure 2. Street robberies in Austin, during 2013, by month.

Figure 3 and Figure 4 show the number of robberies by the day of week and the hour when they occurred, respectively. As can be seen from Figure 3, the greatest number of robberies occurred during the weekend, and Figure 4 shows robberies were most often reported between the hours of 8 pm to 2 am. This can be explained as before. Over the weekend and during evening hours many potential victims spend time out around the city engaging in social activities. During the week many individuals are at work so fewer opportunities for crime exist. While at work, potential victims are not only unlikely to come into contact with a motivated offender, but work environments often have many guardians.

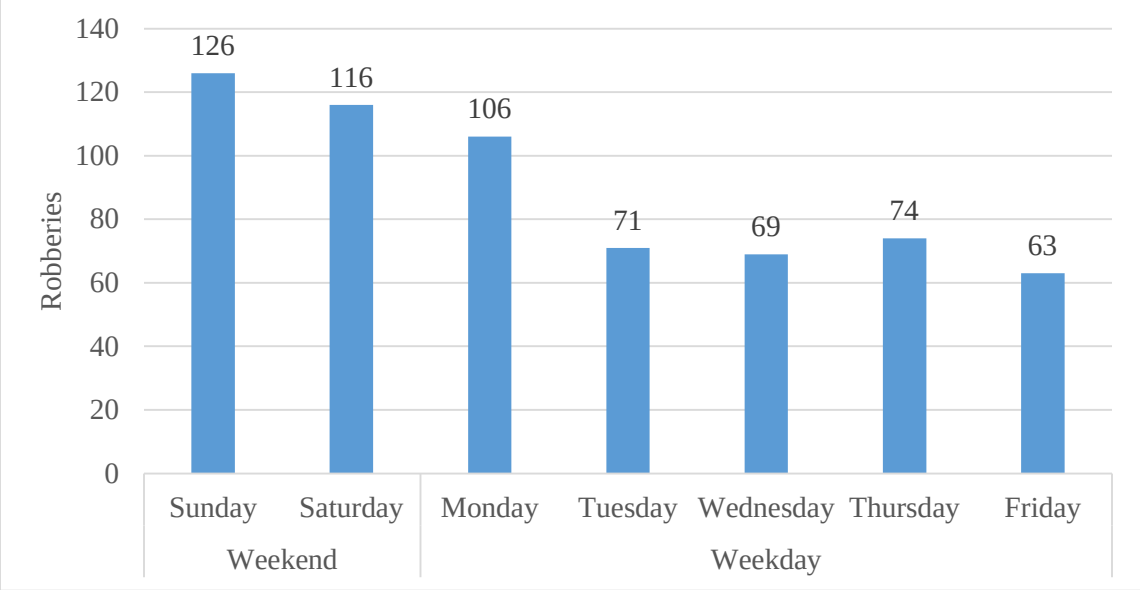

Figure 3. Street robberies in Austin, during 2013, by day of the week.

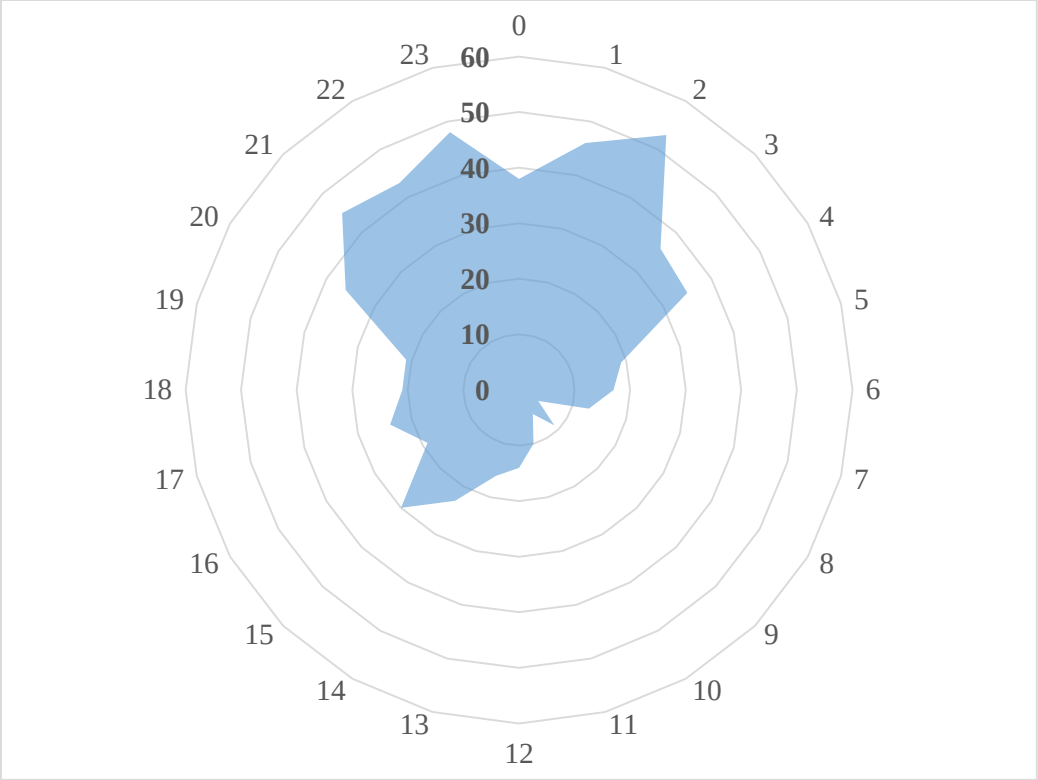

Figure 4. Street robberies in Austin, during 2013, by hour.

When examining both the distribution of robbery by the day of the week and the hour of the day, a clearer picture emerges. Table 9 shows that between 1 am and 3 am on Saturday morning as well as from 11 pm Saturday to 4 am Sunday morning significantly more robberies occur. These patterns are consistent with routine activity theory; it is during those times that individuals are often found engaging in recreational activities related to the night-time economy, and when they might be particularly vulnerable. Also of note is the Saturday and Sunday 2 am periods have the highest number of robberies compared to all other times. Since bars in Austin close at 2 am, it is reasonable to consider that it is then that many individuals leave bars and head home, creating an increased number of potential victims on the street.

Table 9. Street robberies in Austin, during 2013, by day of the week and hour.

	MON	TUE	WED	THU	FRI	SAT	SUN
0	9	5	3	3	3	4	11
1	9	1	3	4	5	12	12
2	6	4	2	3	9	15	14
3	3	3	2	2	5	8	13
4	7	1	2	4		11	10
5	3	1		5		3	7
6	1	3	4	1	2	4	2
7	1	4		2	3		3
8		2	1			1	
9	2		2	2	3		
10			1		1	1	2
11	1		1	1		4	3
12	5	1	1	1	1	4	1
13	2	3	5	1	1	2	2
14	7	2	3	1	2	2	6
15	10	5	3	5	1	4	2
16	3	3	3	3		3	4
17	6	2	2	6	3	3	2
18	4	4	3	5	1	1	3
19	6	1	3	1	5	3	2
20	5	3	6	7	3	3	9
21	6	7	8	6	3	9	6
22	3	10	6	7	4	7	6
23	7	6	5	4	8	12	6

Street robbery has been repeatedly shown to spatially concentrate within a city, consistent with the patterns observed in Austin. Figure 5 displays a kernel density estimation (KDE) map of all reported street robberies during 2013. Three distinct areas of robbery concentration can be detected: a northern cluster in the Rundberg neighborhood; a cluster in downtown Austin; and a southern cluster just east of the I-35 Highway, south of the river. A nearest-neighbor analysis (NNA) revealed a NNA index of 0.45 ($Z=-26.15$, $p<.001$), indicative of statistically significant clustering. (An index of less than one indicates clustering, while an index greater than one indicates dispersion.) This index represents the ratio between the observed and the expected mean distances between closest neighbors.

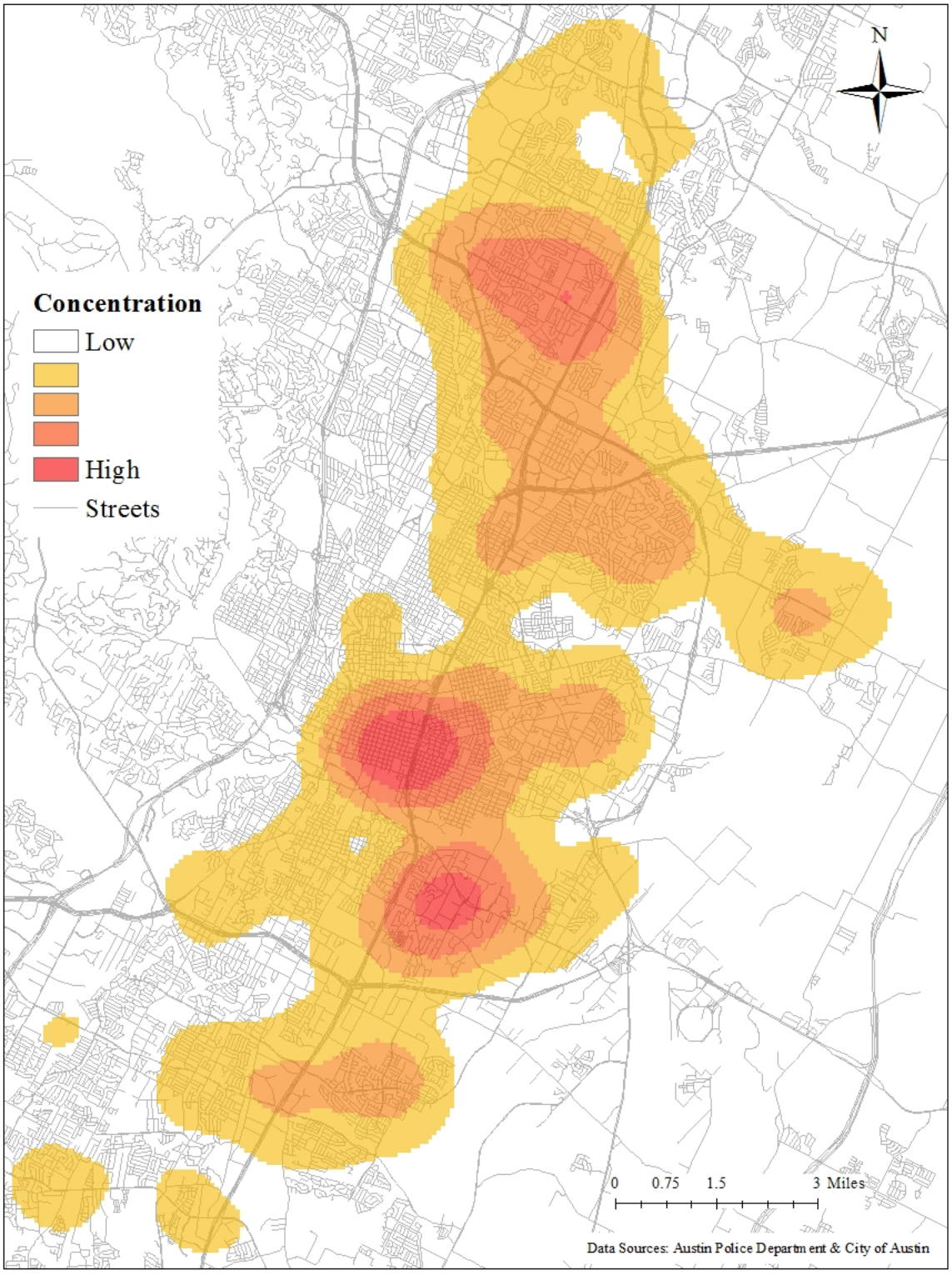

Figure 5. Street robbery density in Austin during 2013.

The three areas where street robberies clustered can be seen in greater detail in Figure 6, 7, and 8. Consistent with previous research (e.g., Sherman, Gartin, & Buerger, 1989), crime not only concentrates in certain areas in the city but also within smaller units of analysis in these areas such as street segments or street blocks. A nearest-neighbor analysis performed only in the downtown area resulted in an index of 0.64 (Z=-8.45, p<.001). As can be seen from Figure 6, the area of highest density is situated over Sixth Street that is well-known for an active night life due to the large number of bars and restaurants located there. The active night life that attracts so many individuals creates an environment rich in criminal opportunities. This area, with the bars and restaurants it contains, may be described as a crime generator.

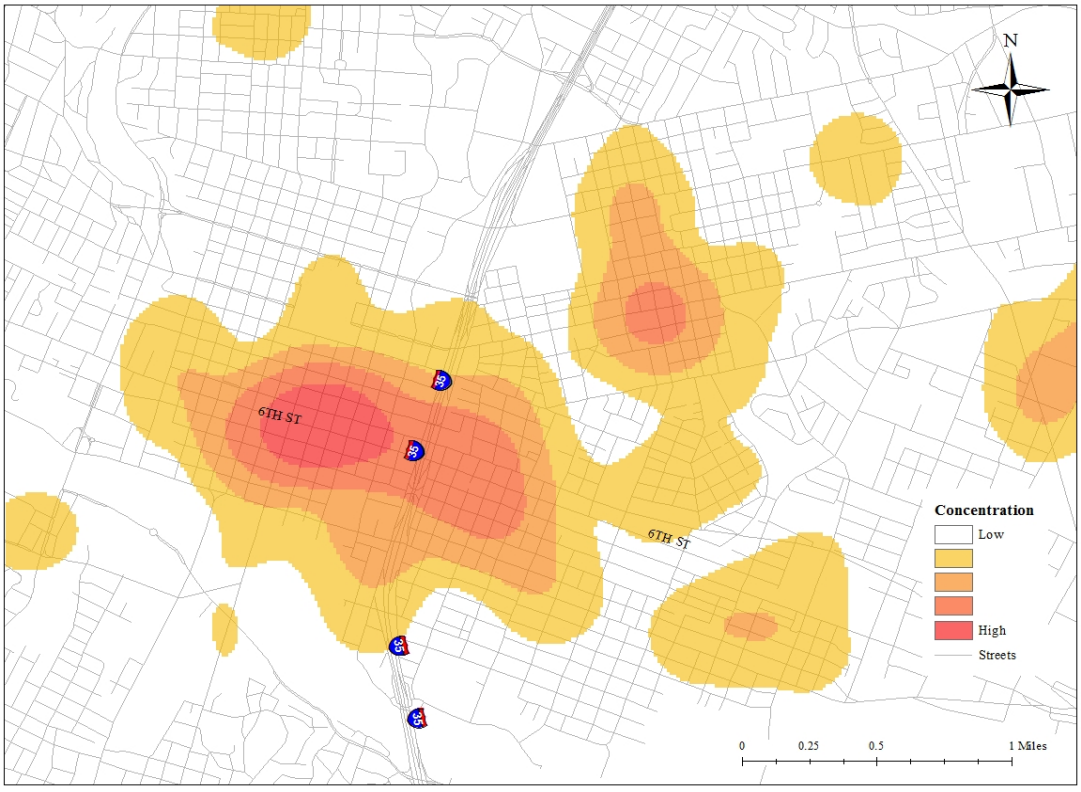

Figure 6. Downtown Austin street robbery hotspot.

The north Austin hotspot (see Figure 7) is situated in the North Austin Rundberg neighborhood, with the areas of highest density along Rundberg Lane. A nearest neighbor analysis of only this area resulted in a NNA index of 0.68 (Z=-7.87, p<.001). This clustering may be due to offenders living in the area. The Rundberg area is known to be high in crime with a large transient population. Prior research supports the idea that offenders tend to commit crimes within their awareness spaces, which are usually around their homes (e.g., Smith, Frazee, & Davison, 2000). According to a report by the city of Austin (2014), "many of the dwellings [in the Rundberg area] are rental units, either multi-family or single family" (p. 5).

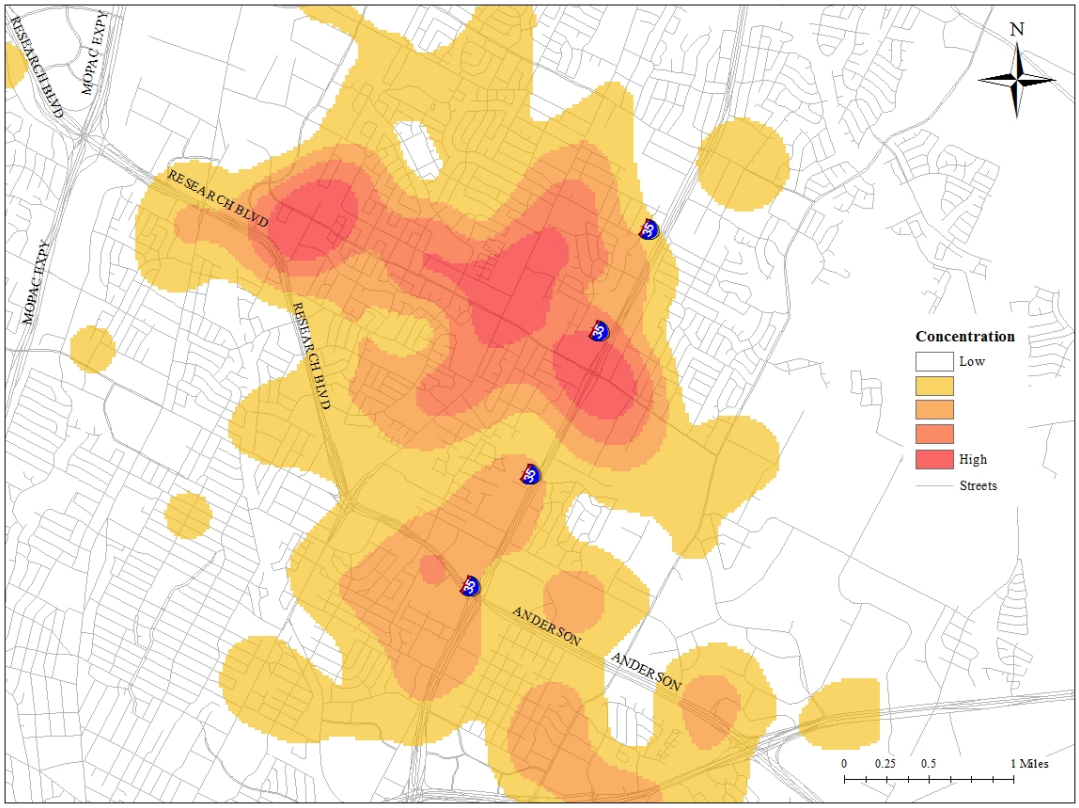

Figure 7. North Austin street robbery hotspot.

The street robbery cluster found in southeast Austin can be seen in detail in Figure 8. A nearest-neighbor analysis of only this area resulted in a NNA index of 0.67 (Z=-6.57, p<.001). Riverside Drive and East Oltorf Street seem to have had more robberies than the rest of the area. This location is full of apartment complexes and has a high student and Hispanic population. However, unlike Rundberg Lane, this area is adjacent to downtown Austin, where more people take public transportation. Transportation facilities have been found to be associated with high crime rates (e.g., Block & Davis, 1996). This helps explain why this area is a street robbery hotspot within Austin.

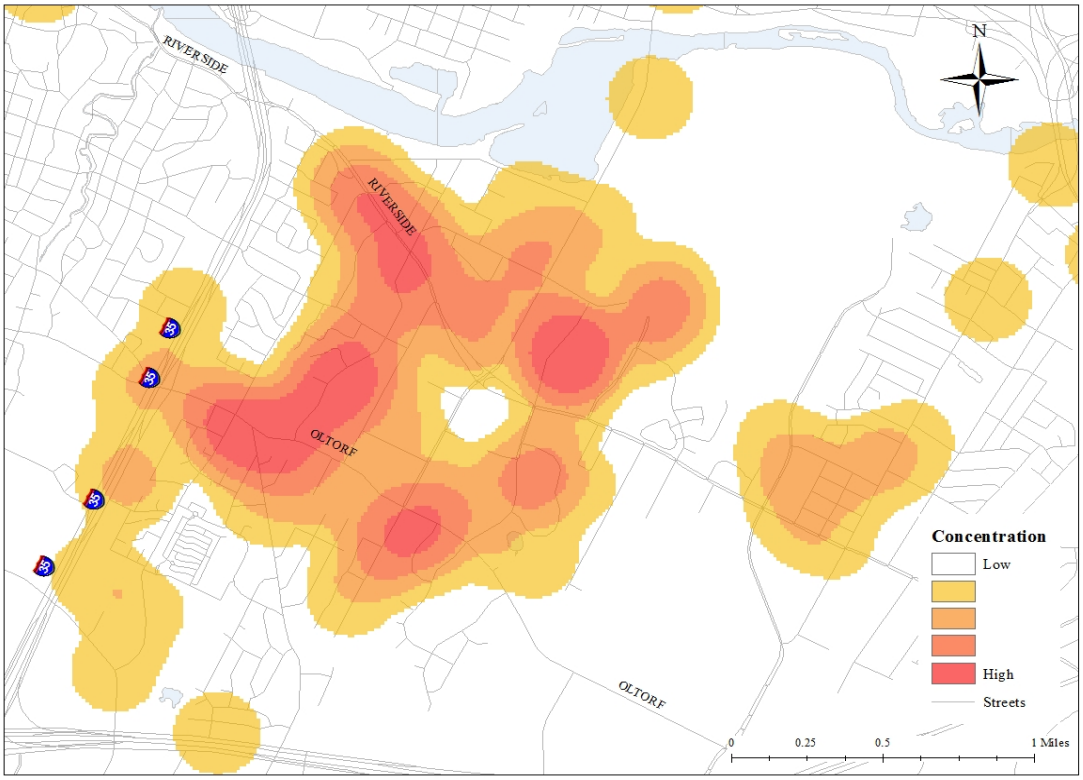

Figure 8. Southeast Austin street robbery hotspot.

Crime and Facilities

The spatial distributions of individual facility types in Austin are now considered in relation to robbery events. Table 10 shows the number of each facility type in the city, how often each facility type was the closest type to a robbery event, and the distance statistics for the nearest facilities to robberies. Bus stops was the facility type found to be closest to a robbery in the greatest number of cases (246 of 625 street robberies). This is unsurprising considering bus stops were the most numerous facility type in the city (2,699 bus stops; also see Figure 9). So it is possible that robberies were often found near bus stops not because bus stops are somehow criminogenic, but rather because there are more of this type of facility within the city. On average, facilities tended to be found around 300 feet away from a robbery, although variation exists across different facility types.

The second most common facility type found nearest to robbery events was parks and recreation centers, which are not as numerous as bus stops (299 parks and recreation centers vs. 2,699 bus stops). However, this may be, at least in part, influenced by parks and recreation centers being represented as polygons (rather than points), due to the large surface areas they covered. This would increase the chances of such facilities being closest to a robbery. Figure 10 shows the parks and recreation centers around Austin. Another facility type that was also represented by a polygon was parking lots; maps for the distribution of parking lots and all other facility types are presented in the Appendix B.

Table 10. Number of each type of facility, number of times each facility was the facility type closest to a street robbery (N=625 robberies in Austin during 2013), and distance descriptive statistics.

Facility type	# in city	# times nearest to robbery	Distance to robbery (feet)				
			Median	Mean	SD	Min	Max
Bus stops	2,699	246	217.2	288.5	283.4	6.8	2,191.8
Parks / Rec. centers	299	72	236.0	392.0	521.8	0.0	2,983.4
Bars	1,463	69	151.2	250.6	277.4	3.3	1,873.0
Parking lots	698	54	97.3	295.6	405.4	0.0	1,871.4
Fast food	513	43	96.7	262.7	414.1	0.0	2,366.4
Liquor stores	793	35	174.3	279.2	266.7	18.9	1,369.0
Gas stations	420	33	96.4	184.6	229.9	18.2	1,114.6
ATMs	499	31	200.0	341.5	258.4	66.9	861.8
Storage facilities	193	12	465.3	569.4	458.9	68.3	1,589.8
Schools	166	11	618.1	589.9	469.6	29.4	1,376.3
Pawn shops	58	8	155.1	159.2	53.9	104.5	263.0
Adult stores/entertainment	44	3	296.9	295.7	188.4	106.6	483.5
Check-cashing	166	3	101.2	226.5	247.9	66.2	512.0
Smoke shops	53	3	177.7	31.9	0.0	31.9	31.9
Shopping plazas	26	2	31.9	177.7	126.7	88.2	267.3
Shopping malls	4	0	N/A	N/A	N/A	N/A	N/A

ATM = automated teller machine. Rec. centers = Recreation centers.

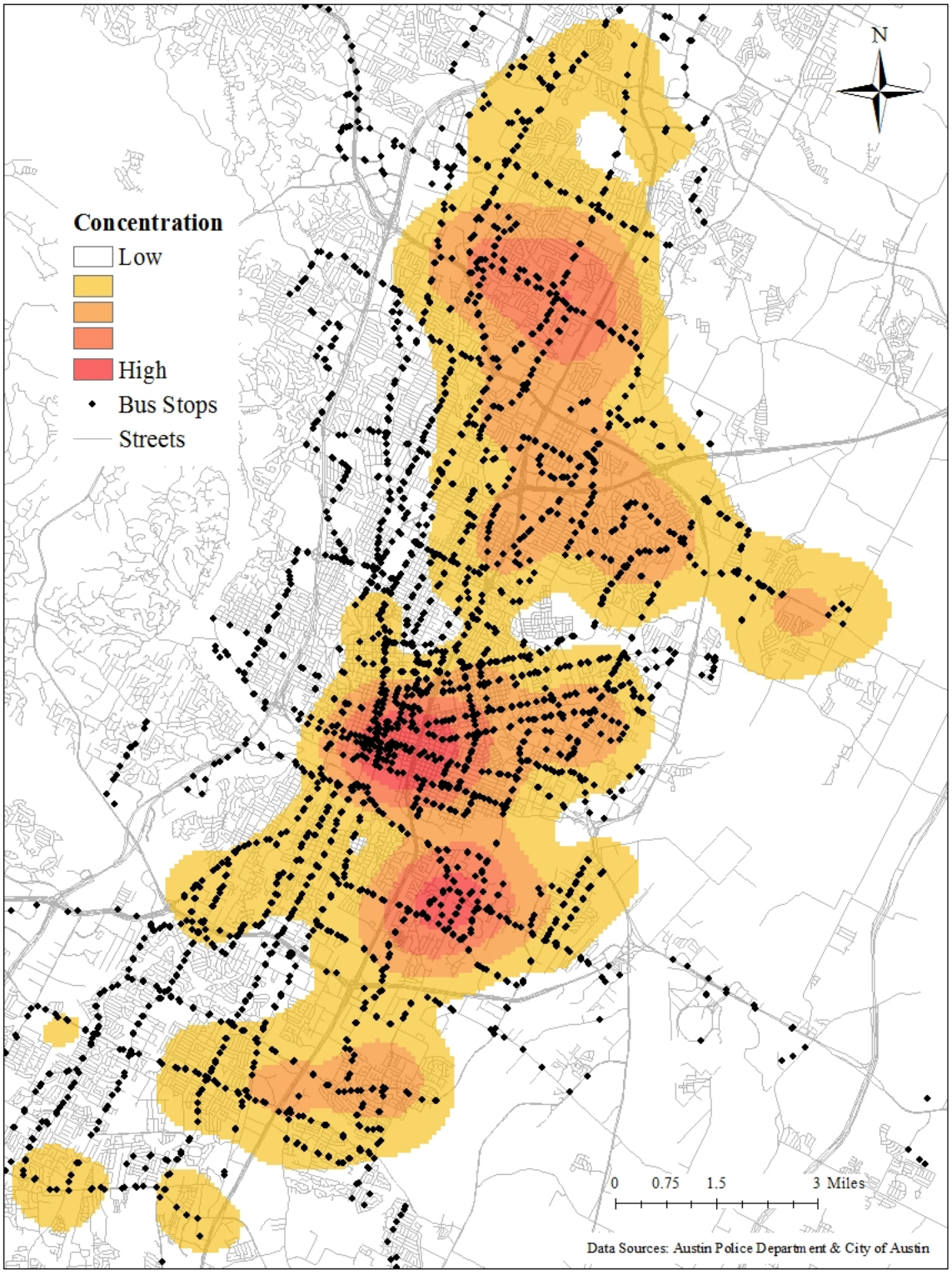

Figure 9. Bus stop locations against street robbery density in Austin during 2013.

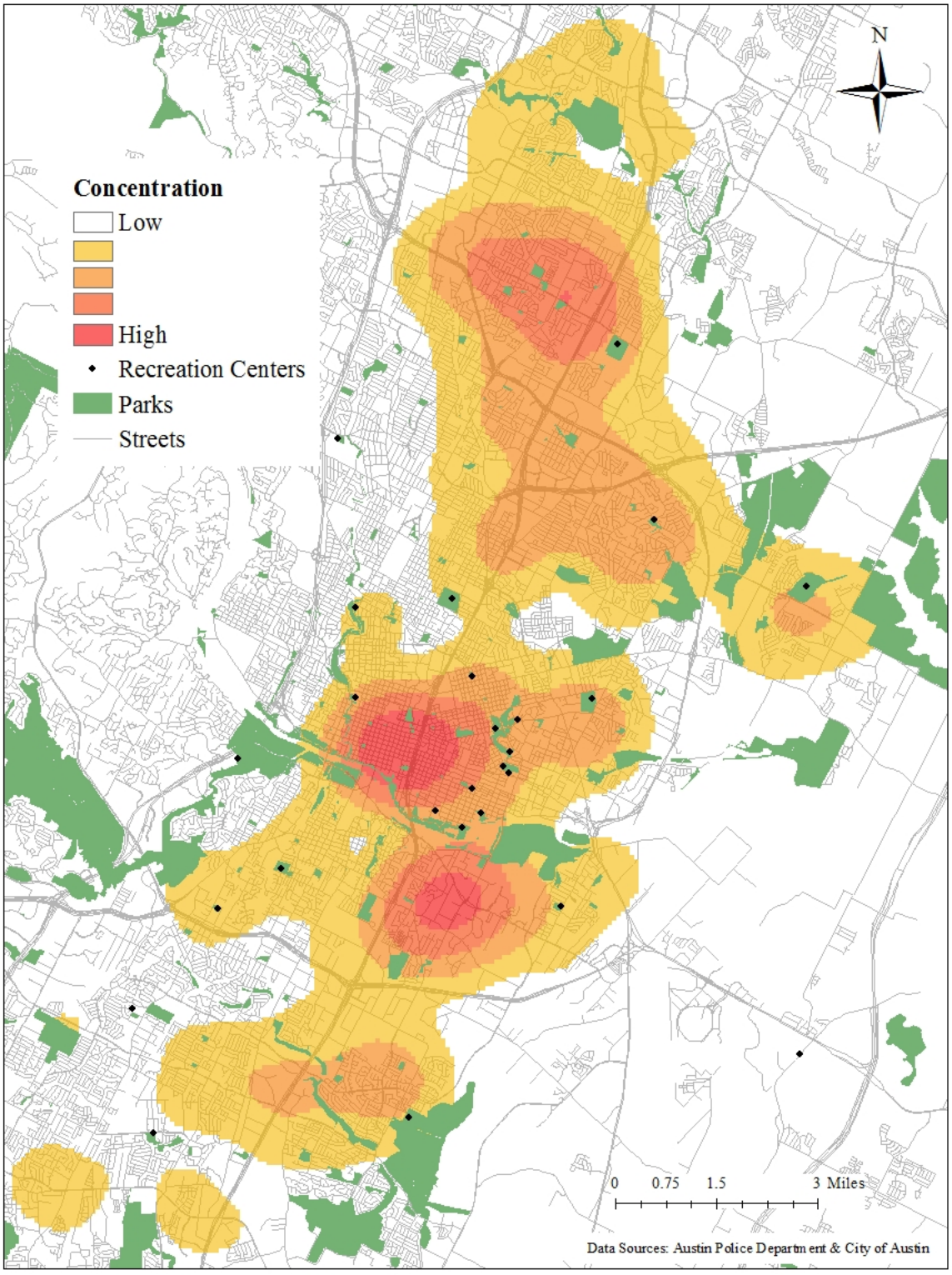

Figure 10. Park and recreation center locations against street robbery density in Austin during 2013.

Crime and Facility Configurations

As discussed in Chapter III, the eight facility types most often found in proximity to street robberies were shortlisted for the conjunctive analyses. These included (in alphabetical order): automatic teller machines (ATMs); bars; bus stops; fast food outlets; gas stations; liquor stores; parking lots; and parks and recreation centers. The facility configurations around each robbery were identified, using three buffers of varying distances, namely 85 feet, 300 feet, and 1,000 feet. As a reminder, the 85-foot buffer distance was selected based on a previous study that found the influence of bars on crime rates began to decay after that distance (Ratcliffe, 2002). The 300-foot distance was selected because it is approximately the average distance of a street block in Austin. Finally, the 1,000-foot distance was selected because it was the distance used in Hart and Miethe's (2014) original study. For each buffer distance, the eight different facility types led to 256 unique facility combinations (profiles).

For the 85-foot buffer, there were a total of 24 observed profiles; observed profiles are the facility configurations where at least one robbery took place within the buffer distance. Of these 24 observed profiles, only five are considered dominant; dominant profiles were determined to be those profiles with a minimum cell frequency of 10 robberies. Table 11 shows the street robbery frequencies observed for these five dominant profiles at the 85-foot buffer distance. A table including the street robbery frequencies for all 24 profiles can be found in Appendix C.

Table 11. Dominant facility configurations of Austin facilities at 85 feet.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N	%	Cum. %
1	N	N	N	N	N	N	N	N	507	81.1	81.1
2	N	N	**Y**	N	N	N	N	N	30	4.8	85.9
3	N	**Y**	N	N	N	N	N	N	22	3.5	89.4
4	N	N	N	N	N	N	N	**Y**	13	2.1	91.5
5	N	N	N	N	**Y**	**Y**	N	N	10	1.6	93.1
						5 dominant situational profiles			582	93.1	
						19 other situational profiles			43	6.9	
						24 total observed situational profiles			625	100.0	

A little over 93 percent of robberies occurred in these five dominant profiles. Although this appears to be a high concentration, it is worth noting that 81 percent of the robberies did not have any of the facilities present within the designated 85-foot buffer distance. One explanation for this is that the distance of 85 feet is very small. The second dominant profile for this buffer distance only had a single type of facility (bus stops) present. As argued earlier, this could simply be a reflection of the density of bus stops in Austin, although it is also possible that bus stops are somehow criminogenic (previous research has shown public transport hubs to be associated with greater robbery counts; e.g., see Stucky & Smith, 2014). This same reasoning could also apply to the third dominant profile, which only includes bars. Bars – and other alcohol outlets – have also been shown to influence the spatial distribution of street robbery (e.g., Roncek & Maier, 1991), but it is also true this was the facility type with the second highest frequency

(1,463 locations). The fourth dominant profile includes only parks and recreation centers. This could be due to the fact that parks are represented by polygons, although again previous research has demonstrated a positive association between parks and crime in general (e.g., Groff & McCord, 2012). The final dominant profile is the only one that includes two facility types: gas stations, and liquor stores. This is interesting, as neither gas stations nor liquor stores feature in any of the other dominant profiles. In the vast majority of the cases, this was due to gas stations selling liquor (so that a single facility would count as two); however, it is noteworthy that it was those gas stations selling liquor that are featured in the dominant profiles, while gas stations not selling liquor were not.

For the 300-foot buffer there were a total of 58 observed profiles. Of these profiles only 11 are considered dominant (i.e., minimum cell frequency of 10 robberies); these accounted for about 80 percent of all robberies. Table 12 shows the street robbery frequencies of the five dominant profiles at this buffer distance. Almost half of robbery events (45.4 percent) occurred in a location where no facilities were nearby. Four of the dominant profiles had only one facility type present, four of the dominant profiles had two facility types present, one profile had three facility types present, and one dominant profile had four facility types present. Liquor stores and gas stations were only found in the dominant profiles where at least one other facility could also be found. Further, gas stations only feature in a dominant profile when a liquor store was also present. Bus stops are present in five of the 11 dominant profiles; bars were present in four of the 11 dominant profiles.

Table 12. Dominant facility configurations of Austin facilities at 300 feet.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N	%	Cum. %
1	N	N	N	N	N	N	N	N	284	45.4	45.4
2	N	N	**Y**	N	N	N	N	N	93	14.9	60.3
3	N	N	N	N	N	N	N	**Y**	23	3.7	64.0
4	N	N	**Y**	N	N	**Y**	N	N	18	2.9	66.9
5	N	N	N	N	N	N	**Y**	N	17	2.7	69.6
6	N	**Y**	N	N	N	N	N	N	15	2.4	72.0
7	N	**Y**	N	N	N	N	**Y**	N	13	2.1	74.1
8	N	N	N	N	**Y**	**Y**	N	N	11	1.8	75.8
9	N	N	**Y**	N	**Y**	**Y**	N	N	11	1.8	77.6
10	N	**Y**	**Y**	N	N	N	N	N	11	1.8	79.4
11	N	**Y**	**Y**	N	**Y**	**Y**	N	N	10	1.6	81.0
						11 dominant situational profiles			506	81.0	
						15 other situational profiles			119	19.0	
						58 total observed situational profiles			625	100.0	

It should be noted that the first two dominant profiles when applying the 85-foot buffer are the same at those for the 300-foot buffer, namely no facilities, and only bus stops present. The remaining three dominant profiles at 85 feet are all included among the 11 dominant profiles at 300 feet, although the rank order is slightly different.

For the 1,000-foot buffer there were a total of 97 observed profiles. Of these profiles, only 15 are considered dominant (see Table 13). Using the 1,000-foot buffer distance, robbery events again appeared to occur most often in environments without facility types present, or when there was only a bus stop. Bus stops were again prevalent among the dominant profiles; in this case, they were present in 12 of the 15 dominant configurations. Three dominant profiles had only one facility type present. ATMs, bars, fast food restaurants, gas stations and liquor stores were only seen in profiles with at least one other facility type. In all profiles in which ATMs were present, liquor stores and bus stops were also nearby. This could be influenced by liquor stores having ATMs, but does not fully explain why ATMs were only found in the dominant profiles at the 1,000-foot distance.

Table 13. Dominant facility configurations of Austin facilities at 1,000 feet.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N	%	Cum. %
1	N	N	N	N	N	N	N	N	71	11.4	11.4
2	N	N	**Y**	N	N	N	N	N	61	9.8	21.1
3	N	N	**Y**	N	**Y**	**Y**	N	N	32	5.1	26.2
4	N	N	**Y**	N	N	N	N	**Y**	28	4.5	30.7
5	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	23	3.7	34.4
6	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	23	3.7	38.1
7	N	N	N	N	N	N	N	**Y**	20	3.2	41.3
8	N	N	**Y**	N	N	**Y**	N	N	16	2.6	43.8
9	N	**Y**	**Y**	N	N	N	N	N	16	2.6	46.4
10	N	**Y**	**Y**	N	**Y**	**Y**	N	N	16	2.6	49.0
11	N	**Y**	**Y**	**Y**	N	**Y**	N	N	13	2.1	51.0
12	N	N	N	N	N	N	**Y**	N	11	1.8	52.8
13	N	**Y**	**Y**	N	N	**Y**	**Y**	N	11	1.8	54.6
14	N	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	11	1.8	56.3
15	**Y**	N	**Y**	N	**Y**	**Y**	N	N	10	1.6	57.9
						15 dominant situational profiles			362	57.9	
						82 other situational profiles			263	42.1	
						97 total observed situational profiles			625	100.0	

The top two dominant profiles at 1,000 feet are the same as with the 85-foot and the 300-foot distances. Additionally, gas stations are only present when liquor stores are present; this was also seen with the 85-foot and 300-foot distances. The bar-only and gas-station-and-liquor-store profiles that were dominant at the 85-foot and 300-foot distances were not among the dominant configurations at the 1,000-foot distance; this is likely to be the direct result of increasing the buffer size, which expands the surface area searched significantly, so that more complex configurations become more prevalent.

The patterns reported here are largely consistent with those reported in Hart and Miethe's (2014) original study, which used a 1,000-foot buffer. No-facility and bus-stop-only configurations were the most prevalent in their analysis, accounting for 17.7 percent and 10.8 percent of all robberies, respectively (as compared to 11.4 percent and 9.8 percent in the present study). The eight facilities they considered were slightly different, though. While both their study and the present research considered ATMs, bars, bus stops, fast food outlets, and gas stations, Hart and Miethe also included check-cashing centers, shopping plazas, and smoke shops, while the current research also considered liquor stores, parking lots, and park and recreation centers, as these were more closely associated with street robbery. In the interest of completeness, additional conjunctive analyses were conducted using the original list of eight facility types (the frequency configuration tables are presented in Appendix D).

CHAPTER V

Discussion

The purpose of this study was to examine how the spatial distribution of street robbery related to the spatial configurations of certain facility types. An attempt was made to explore whether the findings from Hart and Miethe's (2014) study — that certain facility configurations were to be found around robbery events — could be replicated in a different city. The study also aimed at determining whether changing the study size area around the robbery event changed the patterns for the most dominant facility configurations.

Original Study Comparison

In line with Hart and Miethe (2014), this study found certain facility configurations were found in the environment around robberies. Specifically, the two top-ranking facility configurations were no facilities present and only bus stops present that were also the top two configurations in Hart and Miethe's study. Although Austin is a larger city than Henderson, usually bus stops are spread fairly widely and evenly around cities, making the likelihood that bus stops featured more prevalently in the robbery environs than other facility types, both for Henderson and Austin. This may imply bus stops may not be exerting a criminogenic effect in which they provide opportunities for robbery, but rather a reflection of how bus stops are dispersed.

The other dominant configurations varied slightly across the two studies. For example, while the third ranked configuration in Hart and Miethe's (2014) study was one where every single facility type was present, this was not a configuration that was

classified as dominant (i.e., associated with more than 10 robberies) in the present study. ATMs featured in just three of the 15 dominant configurations when the 1,000-foot buffer was applied, and never by itself (i.e., other facility types were always present). In contrast, ATMs featured in six of the nine dominant configurations in Hart and Miethe's study. Based on the data available, it is unclear whether these differences simply reflect variations in the urban landscape across the cities, or differences in the way the setting may mediate the relationship between the facilities and the spatial distribution of robbery.

Effect of Buffer Size

The differently sized buffers were evaluated and then compared in two ways: by the number of dominant/non-dominant facility configurations; and by the similarities/dissimilarities between the dominant facility configurations.

The number of total observed situational profiles at a distance of 85 feet was 24, of which five were dominant. The most dominant configuration was the absence of all facility types, which accounted for 81.1 percent of robberies. This is a very high concentration and is likely explained simply by the small size of the area. Since 85 feet is a small distance, the number of facilities that could be found in the robbery environs would be expected to be limited. Three of the dominant profiles had only one facility type present. Bars, bus stops, and parks and recreation centers featured in the dominant configurations in the absence of other facility types. Parks are likely overrepresented due to the way in which they were represented during analysis (i.e., parks were represented as polygons instead of points; polygons take up more area and therefore had more of a chance to intersect a buffer). Only one configuration had more than one facility type (gas stations and liquor stores).

Depending on the offender's MO and the dynamics of the robbery event, 85 feet may be too small a distance to analyze. For example, an offender may find a potential victim and follow him or her to a side street or a less guarded area, referred to by Angel (1968) as a critical intensity zone. What is present at the location of the actual event may reflect the "attack" rather than the "encounter" site (Rossmo, 2000). A distance of 85 feet may not then encompass all the facilities that may have played a role. This buffer size might be more relevant to other crime types, such as assault, wherein the sequence of stages in the crime commission may be restricted to a single site. Overall, the limited size of this buffer zone does not offer much insight into whether there could be a pattern among situational profiles.

At a distance of 300 feet, there were 58 observed situational profiles of which 11 were dominant. This number of profiles is slightly more than double that seen at the 85-foot distance. Increasing the size of the buffer radius also increased the possible number of complex configurations (i.e., configurations with more than one facility type present). The size of this buffer was selected because it is the average city block size. Considering that some robbers may follow their target to a less busy location, this is likely a good choice for analysis. For example, a robber might see a potential victim and decide to follow him or her to a less populated area, that Angel (1968) argued may not be far from the busier area. The 300-foot distance allows for such dynamics without being so large as to possibly include facility types that do not truly impact the environment.

The top two dominant profiles at this buffer distance were still the no-facilities and bus-stop-only configurations and, together, accounted for 60.3 percent of all robberies. Within the other nine dominant profiles, gas stations are only present when a

liquor store is present, which could be a direct result of many gas stations selling liquor. In this case, a single business would count as two separate types of facilities, a coding rule that was adopted to faithfully replicate Hart and Miethe's procedures.

The application of the 1,000-foot buffer resulted in 97 observed profiles, of which 15 were dominant. The most dominant profile accounted for 11.4 percent of the robberies, and had no facility types present. The distance of 1,000 feet may be too large to offer insight into the influence of facility configurations on street robbery. This is because only a proportion of robbers may walk as far as 1,000 feet when following a potential victim to a less busy location, which may dilute the patterns observed (if most robbers attack on encounter or follow their targets for a smaller distance).

As with the two smaller buffer distances, the top two dominant profiles, with no facilities present and bus stop only, respectively, maintained the same rankings. At this distance, ATMs can be seen in the dominant profiles, however, never on their own. Bus stops are present in the majority of profiles most likely due to the many bus stops in the city. Fast food restaurants were only present in configurations that also included bars, bus stops, and liquor stores.

Limitations

Like all research, this study has some limitations. The data does not include unreported robberies and many crimes go unreported. Still, police-record crime data remain the best source of information for this type of study, because they contain location information.

For some facility locations, the status of the business was not listed as active, but it was unclear as to whether the inactivity began before, during, or after 2013. These questionable facilities were included in the study, after sensitivity analysis showed that removing them did not markedly affect the findings. Also, some businesses were identified as either opening or closing during the year of 2013. Again, these were included in the study, but there may have been other facilities that were present then but are no longer in existence. If there is an error concerning this, it is likely random, and should not bias the results in any particular way.

The 16 facility types initially considered for this study were selected based on previous research that found them related to crime. These types may influence crime, but it is possible that other facilities or environmental factors were omitted.

Another limitation relates to how different facility types were physically represented. For most facility types, a point was used to designate its location. However, the physical location of a business takes up a larger area than a simple dot on a map. Future studies could use polygons for all facilities instead of points to more accurately represent the true physical space taken up by a facility.

The most crucial shortcoming of the present study, and any research utilizing conjunctive analysis, is that it does not determine significance. The frequencies in the ranked configuration matrix suggests that large crime frequencies associated with a given configuration may be indicative of such configurations being criminogenic in some manner, but this may not necessarily be the case. Most studies assume that each of the 256 configurations (or however many possible configurations there are) should have an equal number of robberies associated with them. This was the assumption made by Hart

and Miethe (2015), who performed a chi-square analysis on the frequencies observed. However, it is reasonable to assume that the number of expected frequencies for each facility configuration would vary across such configurations, and depend on how such facility types are spatially distributed across the study area.

A more informative statistical test would involve the creation of a distribution of 625 points (or as many robberies or crimes there are in the study) that are randomly positioned around the city's street network. A conjunctive analysis table could then be created for this random distribution of points. After repeating this process 1,000 times using a Monte Carlo simulation approach, a random "population" of expected frequencies would be available for each facility configuration. The observed frequencies could then be compared to the expected frequency distribution to determine how the observed frequencies differ from what would be expected given the urban landscape of the study area. This is the next logical step in the conjunctive analysis field.

Future studies should also incorporate a time locus. The time of day of robbery events in relation to the situational profiles was not examined in this study, but future studies could break down robberies by time and examine if there are facility combinations more often present during certain hours of the day.

Implications

The findings from conjunctive analysis research could be useful to law enforcement and city planners. Police departments could make more efficient use of their resources to prevent robberies. This descriptive study shows that robberies concentrate around certain profiles. If further studies — using simulation approaches to determine the

statistical significance of the findings — find this to be due to more than random chance, the findings could be used by law enforcement to identify areas with dominant facility combinations as another form of hot spot policing. For example, the configuration of bus stop, gas station, and liquor store was a dominant profile for all three distances. Areas where this profile is present could be given more police attention.

City planners could create ordinances that apply to zoning changes or new zoning decisions. For example, these ordinances could include requiring certain facility types not be built within 300 - 1,000 feet of each other. Additionally, if bus-stop-only profiles are found to be as criminogenic as these data suggest, city officials could increase surveillance around bus stops by adding lighting or security cameras.

Conclusion

According to the Austin Police Department's Annual Crime and Traffic Report (2013), the robbery rate for 2013 was 92 robberies per 100,000 residents, down from the previous year. Problem-oriented policing is a useful strategy to handling crime. This research has added to the evidence base of the influence of facility configurations on robbery by substantiating the previous study's findings regarding robbery concentrations in areas with certain facility configurations. Additionally, by comparing the three distances, it is proposed that the buffer distance of 85 feet is too small to capture the entire spatial environment, while the buffer distance of 1,000 feet is too large. Suggestions for future research have been made, the most crucial of which is to incorporate simulations into the methodology to determine whether the observed patterns are simply a reflection of the urban landscape, or if indeed certain facility configurations influence the spatial distribution of street robbery.

APPENDIX SECTION

Appendix A

The following tables show the dominant profile results of the sensitivity test of businesses with statuses other than “active”.

Table A-1. Dominant profile configurations at 85 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	510
2	N	N	**Y**	N	N	N	N	N	30
3	N	**Y**	N	N	N	N	N	N	20
4	N	N	N	N	N	N	N	**Y**	13
5	N	N	N	N	**Y**	**Y**	N	N	10
6	N	N	N	N	N	**Y**	N	N	8
7	N	N	N	N	N	N	**Y**	N	6
8	N	**Y**	N	N	N	**Y**	N	N	4
9	N	**Y**	**Y**	N	N	N	**Y**	N	3
10	**Y**	**Y**	N	N	N	N	N	N	3
11	N	N	**Y**	N	N	N	**Y**	N	2
12	N	N	**Y**	N	N	**Y**	N	N	2
13	N	**Y**	N	N	N	N	**Y**	N	2
14	**Y**	N	N	N	N	N	N	N	2
15	**Y**	N	N	N	**Y**	**Y**	N	N	2
16	N	N	N	N	N	N	**Y**	**Y**	1
17	N	N	N	N	**Y**	N	N	N	1
18	N	N	N	N	**Y**	**Y**	N	**Y**	1
19	N	N	N	**Y**	N	N	N	N	1
20	N	N	N	**Y**	N	**Y**	N	N	1
21	N	N	**Y**	N	N	N	N	**Y**	1
22	N	N	**Y**	N	**Y**	**Y**	N	N	1
23	**Y**	**Y**	N	N	N	**Y**	N	N	1
									625

Table A-2. Dominant profile configurations at 300 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	286
2	N	N	**Y**	N	N	N	N	N	97
3	N	N	N	N	N	N	N	**Y**	23
4	N	N	N	N	N	N	**Y**	N	17
5	N	N	**Y**	N	N	**Y**	N	N	16
6	N	**Y**	N	N	N	N	N	N	14
7	N	**Y**	N	N	N	N	**Y**	N	13
8	N	N	N	N	**Y**	**Y**	N	N	12
9	N	N	**Y**	N	**Y**	**Y**	N	N	11
10	N	**Y**	**Y**	N	**Y**	**Y**	N	N	10
11	N	**Y**	**Y**	N	N	N	N	N	9
12	N	N	**Y**	N	N	N	N	**Y**	8
13	N	N	**Y**	N	N	N	**Y**	N	8
14	N	**Y**	**Y**	N	N	**Y**	N	N	8
15	N	**Y**	N	N	N	**Y**	N	N	6
16	N	N	N	N	N	**Y**	N	N	5
17	N	**Y**	**Y**	N	N	N	**Y**	N	5
18	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	5
19	**Y**	N	N	N	**Y**	**Y**	N	N	5
20	N	N	N	**Y**	**Y**	**Y**	N	N	4
21	**Y**	N	N	N	N	N	N	N	4
22	**Y**	N	**Y**	N	**Y**	**Y**	N	N	4
23	**Y**	**Y**	**Y**	N	N	**Y**	N	N	4
24	N	N	N	**Y**	N	N	N	N	3
25	N	N	**Y**	**Y**	N	**Y**	N	N	3
26	N	N	**Y**	**Y**	**Y**	**Y**	N	N	3
27	**Y**	N	**Y**	N	N	N	N	N	3
28	**Y**	**Y**	N	N	N	N	N	N	3
29	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	3
30	N	N	**Y**	**Y**	N	N	N	N	2

Table A-2 (Continued). Dominant profile configurations at 300 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
31	N	**Y**	N	N	N	N	N	**Y**	2
32	N	**Y**	N	N	N	**Y**	**Y**	N	2
33	N	**Y**	**Y**	**Y**	N	**Y**	N	N	2
34	**Y**	N	**Y**	N	N	**Y**	N	N	2
35	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	N	2
36	N	N	N	N	N	N	**Y**	**Y**	1
37	N	N	N	N	N	**Y**	N	**Y**	1
38	N	N	N	N	N	**Y**	**Y**	N	1
39	N	N	N	N	**Y**	**Y**	N	**Y**	1
40	N	N	N	N	**Y**	**Y**	**Y**	N	1
41	N	N	N	**Y**	N	N	N	**Y**	1
42	N	N	**Y**	N	N	N	**Y**	**Y**	1
43	N	N	**Y**	**Y**	**Y**	N	N	N	1
44	N	**Y**	N	**Y**	N	**Y**	N	N	1
45	N	**Y**	**Y**	N	N	N	**Y**	**Y**	1
46	N	**Y**	**Y**	N	N	**Y**	**Y**	N	1
47	**Y**	N	N	N	**Y**	**Y**	N	**Y**	1
48	**Y**	N	**Y**	N	N	N	**Y**	N	1
49	**Y**	N	**Y**	N	**Y**	**Y**	**Y**	**Y**	1
50	**Y**	N	**Y**	**Y**	N	N	N	N	1
51	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	1
52	**Y**	**Y**	N	N	N	N	**Y**	N	1
53	**Y**	**Y**	N	N	**Y**	**Y**	N	N	1
54	**Y**	**Y**	N	**Y**	N	**Y**	N	N	1
55	**Y**	**Y**	**Y**	N	N	N	**Y**	N	1
56	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	N	1
									625

Table A-3. Dominant profile configurations at 1,000 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	71
2	N	N	**Y**	N	N	N	N	N	61
3	N	N	**Y**	N	**Y**	**Y**	N	N	34
4	N	N	**Y**	N	N	N	N	**Y**	29
5	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	23
6	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	22
7	N	N	N	N	N	N	N	**Y**	20
8	N	N	**Y**	N	N	**Y**	N	N	16
9	N	**Y**	**Y**	N	N	N	N	N	16
10	N	**Y**	**Y**	N	**Y**	**Y**	N	N	14
11	**Y**	N	**Y**	N	**Y**	**Y**	N	N	13
12	N	N	N	N	N	N	**Y**	N	11
13	N	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	11
14	N	**Y**	**Y**	N	N	**Y**	**Y**	N	9
15	N	**Y**	**Y**	**Y**	N	**Y**	N	N	9
16	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	9
17	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	9
18	N	**Y**	N	N	N	N	N	N	8
19	N	**Y**	**Y**	N	N	N	**Y**	N	8
20	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	8
21	N	N	**Y**	N	N	N	**Y**	N	7
22	N	N	**Y**	**Y**	N	**Y**	N	N	7
23	N	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	7
24	N	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	7
25	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	7
26	N	N	**Y**	N	**Y**	**Y**	N	**Y**	6
27	N	N	**Y**	N	**Y**	**Y**	**Y**	N	6
28	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	N	6
29	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	**Y**	6
30	N	N	N	N	**Y**	**Y**	N	N	5

Table A-3 (Continued). Dominant profile configurations at 1,000 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
31	N	N	N	**Y**	N	N	N	N	5
32	**Y**	**Y**	**Y**	N	N	N	**Y**	N	5
33	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	5
34	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	5
35	N	N	**Y**	N	N	N	**Y**	**Y**	4
36	N	N	**Y**	N	N	**Y**	N	**Y**	4
37	N	**Y**	N	N	N	**Y**	N	N	4
38	N	**Y**	**Y**	N	N	N	**Y**	**Y**	4
39	N	**Y**	**Y**	N	N	**Y**	N	N	4
40	**Y**	N	N	N	N	N	N	N	4
41	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	4
42	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	N	4
43	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	4
44	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	**Y**	4
45	N	N	N	N	N	N	**Y**	**Y**	3
46	N	N	N	N	N	**Y**	N	N	3
47	N	N	**Y**	N	N	**Y**	**Y**	N	3
48	N	N	**Y**	**Y**	N	N	N	N	3
49	N	N	**Y**	**Y**	**Y**	**Y**	N	**Y**	3
50	N	**Y**	N	N	**Y**	**Y**	**Y**	N	3
51	N	**Y**	**Y**	N	N	**Y**	N	**Y**	3
52	N	**Y**	**Y**	N	**Y**	**Y**	N	**Y**	3
53	N	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	3
54	**Y**	N	**Y**	N	N	N	N	N	3
55	**Y**	N	**Y**	N	**Y**	**Y**	N	**Y**	3
56	**Y**	N	**Y**	N	**Y**	**Y**	**Y**	N	3
57	**Y**	N	**Y**	**Y**	N	N	N	N	3
58	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	3
59	**Y**	**Y**	**Y**	**Y**	N	N	N	N	3
60	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	3

Table A-3 (Continued). Dominant profile configurations at 1,000 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
61	N	N	**Y**	N	**Y**	**Y**	**Y**	**Y**	2
62	N	N	**Y**	**Y**	**Y**	**Y**	N	N	2
63	N	**Y**	N	N	N	N	N	**Y**	2
64	N	**Y**	N	N	**Y**	**Y**	N	N	2
65	N	**Y**	N	N	**Y**	**Y**	N	**Y**	2
66	N	**Y**	**Y**	N	N	N	N	**Y**	2
67	**Y**	N	N	N	**Y**	**Y**	N	N	2
68	**Y**	N	N	**Y**	**Y**	**Y**	N	N	2
69	**Y**	**Y**	N	N	**Y**	**Y**	N	N	2
70	**Y**	**Y**	**Y**	N	N	N	N	N	2
71	**Y**	**Y**	**Y**	N	N	N	**Y**	**Y**	2
72	**Y**	**Y**	**Y**	N	N	**Y**	N	N	2
73	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	N	2
74	N	N	N	N	N	**Y**	**Y**	**Y**	1
75	N	N	N	N	**Y**	N	N	N	1
76	N	N	N	N	**Y**	**Y**	**Y**	N	1
77	N	N	N	**Y**	N	N	N	**Y**	1
78	N	N	N	**Y**	N	N	**Y**	N	1
79	N	N	**Y**	N	N	**Y**	**Y**	**Y**	1
80	N	N	**Y**	N	**Y**	N	N	N	1
81	N	**Y**	N	N	N	N	**Y**	N	1
82	N	**Y**	N	N	**Y**	N	N	N	1
83	N	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	1
84	N	**Y**	**Y**	**Y**	N	N	N	**Y**	1
85	N	**Y**	**Y**	**Y**	N	N	**Y**	N	1
86	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	1
87	N	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	1
88	**Y**	N	N	**Y**	**Y**	N	**Y**	N	1
89	**Y**	N	**Y**	N	N	N	**Y**	N	1
90	**Y**	N	**Y**	N	N	N	**Y**	**Y**	1

Table A-3 (Continued). Dominant profile configurations at 1,000 feet using eight "active" Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
91	**Y**	N	**Y**	**Y**	N	**Y**	N	N	1
92	**Y**	N	**Y**	**Y**	**Y**	N	N	N	1
93	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	**Y**	1
94	**Y**	N	**Y**	**Y**	**Y**	**Y**	**Y**	N	1
95	**Y**	**Y**	N	N	N	N	N	N	1
96	**Y**	**Y**	N	N	N	N	**Y**	**Y**	1
97	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	N	1
98	**Y**	**Y**	**Y**	N	N	N	N	**Y**	1
99	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	N	1
									625

Appendix B

The following kernel density maps show the location of each different facility type in Austin, Texas.

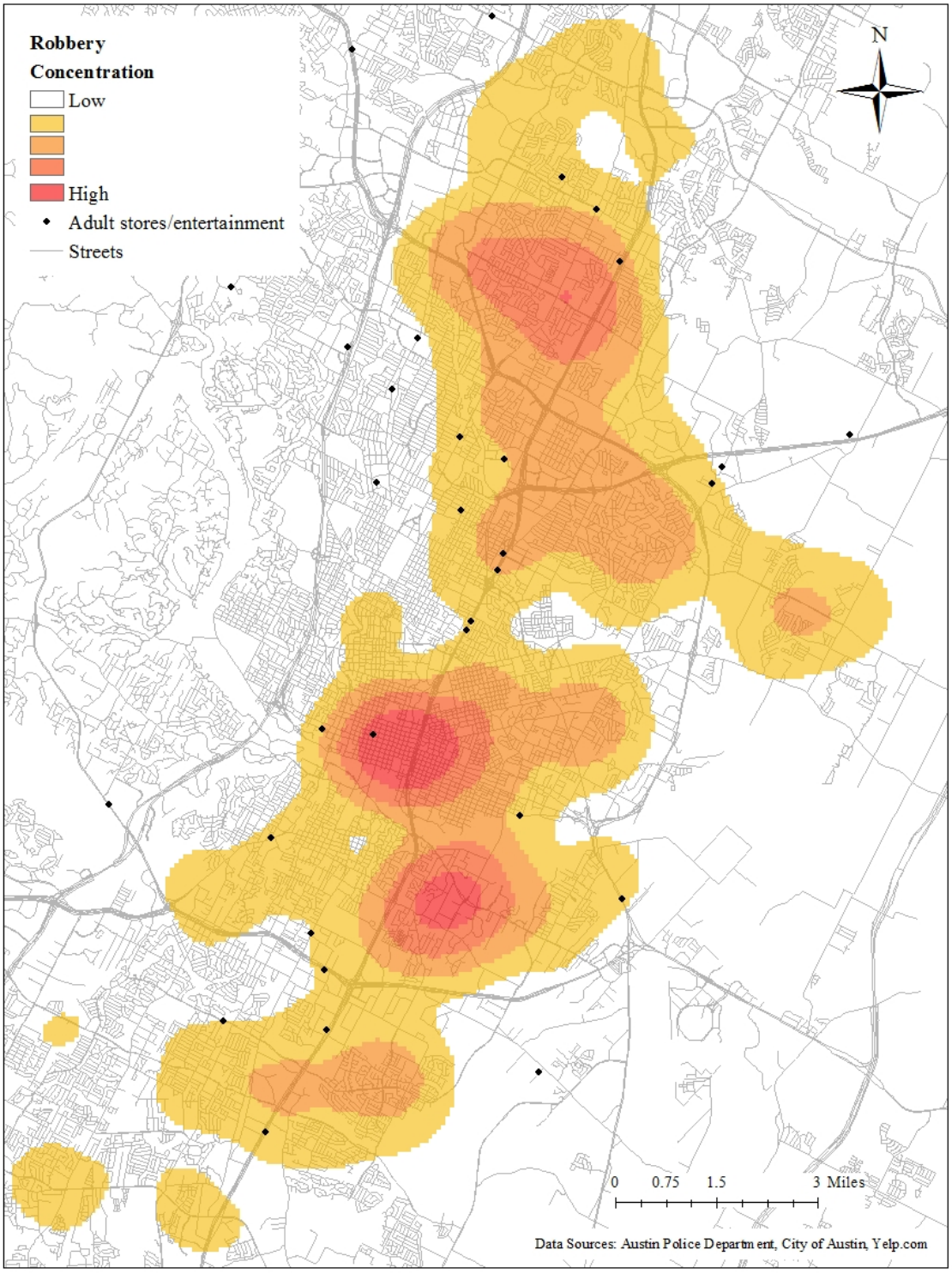

Figure B-1. Adult stores/entertainment against street robbery density in Austin, Texas, during 2013.

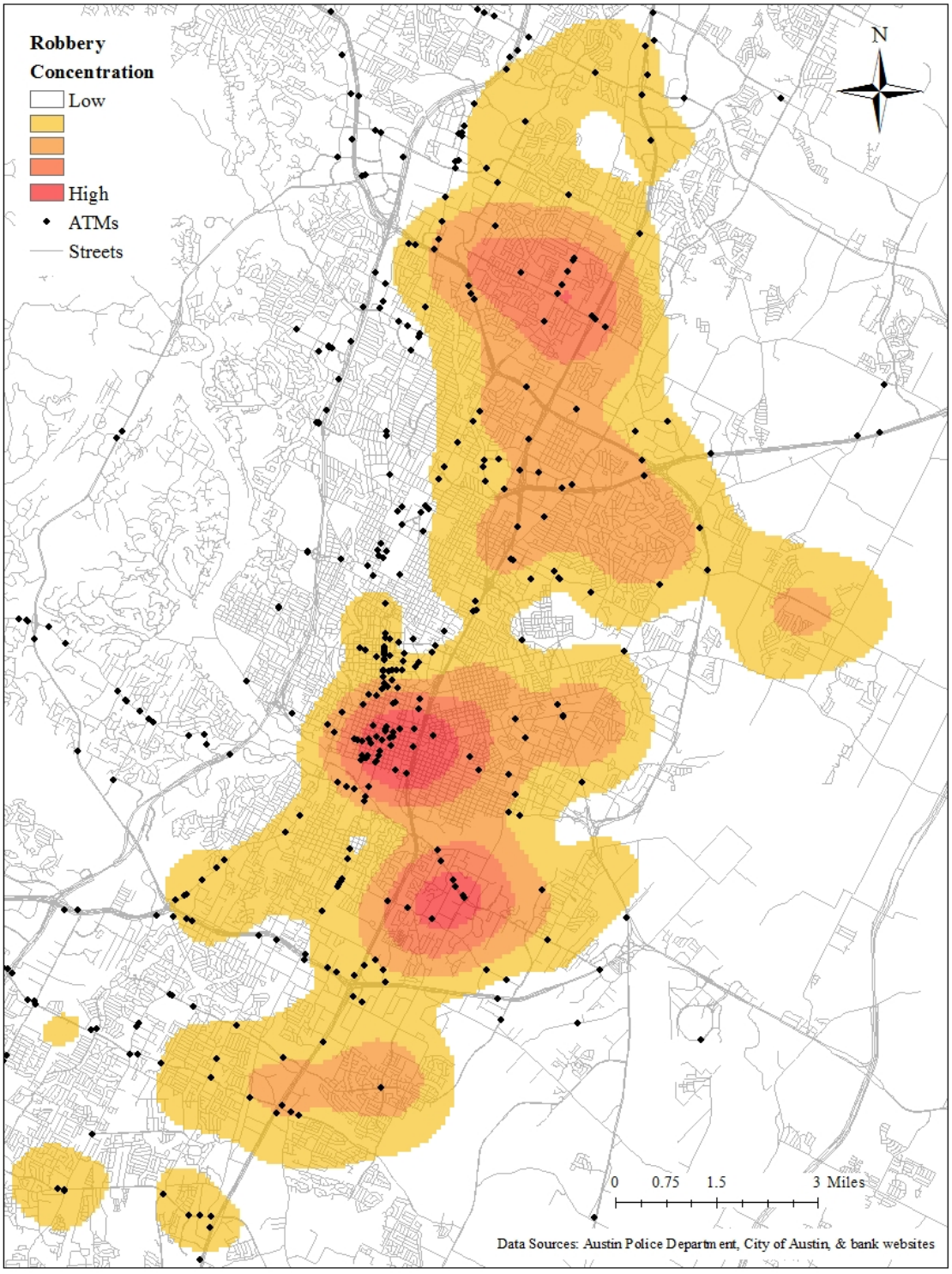

Figure B-2. ATMs against street robbery density in Austin, Texas, during 2013.

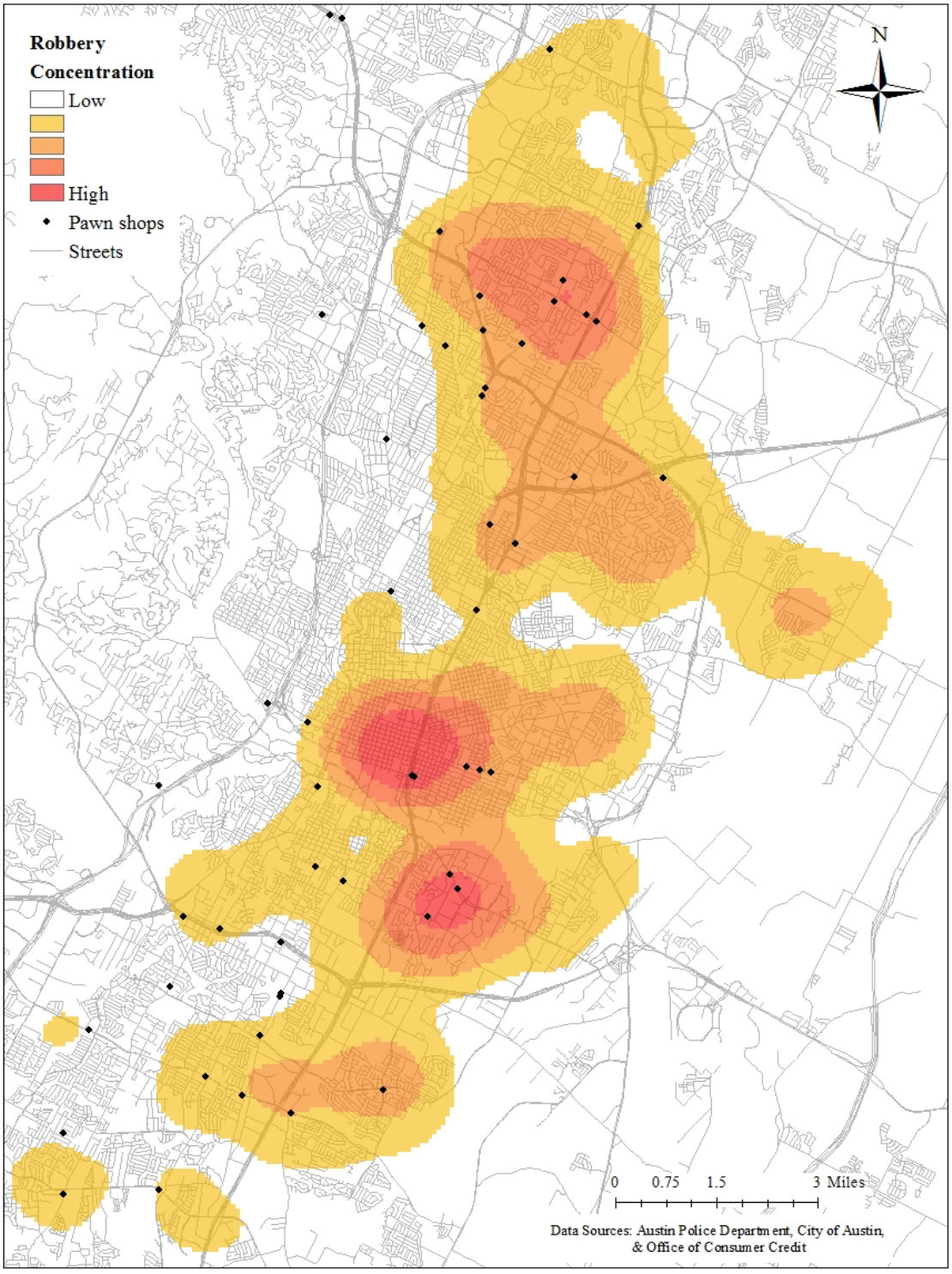

Figure B-3. Pawn shops against street robbery density in Austin, Texas, during 2013.

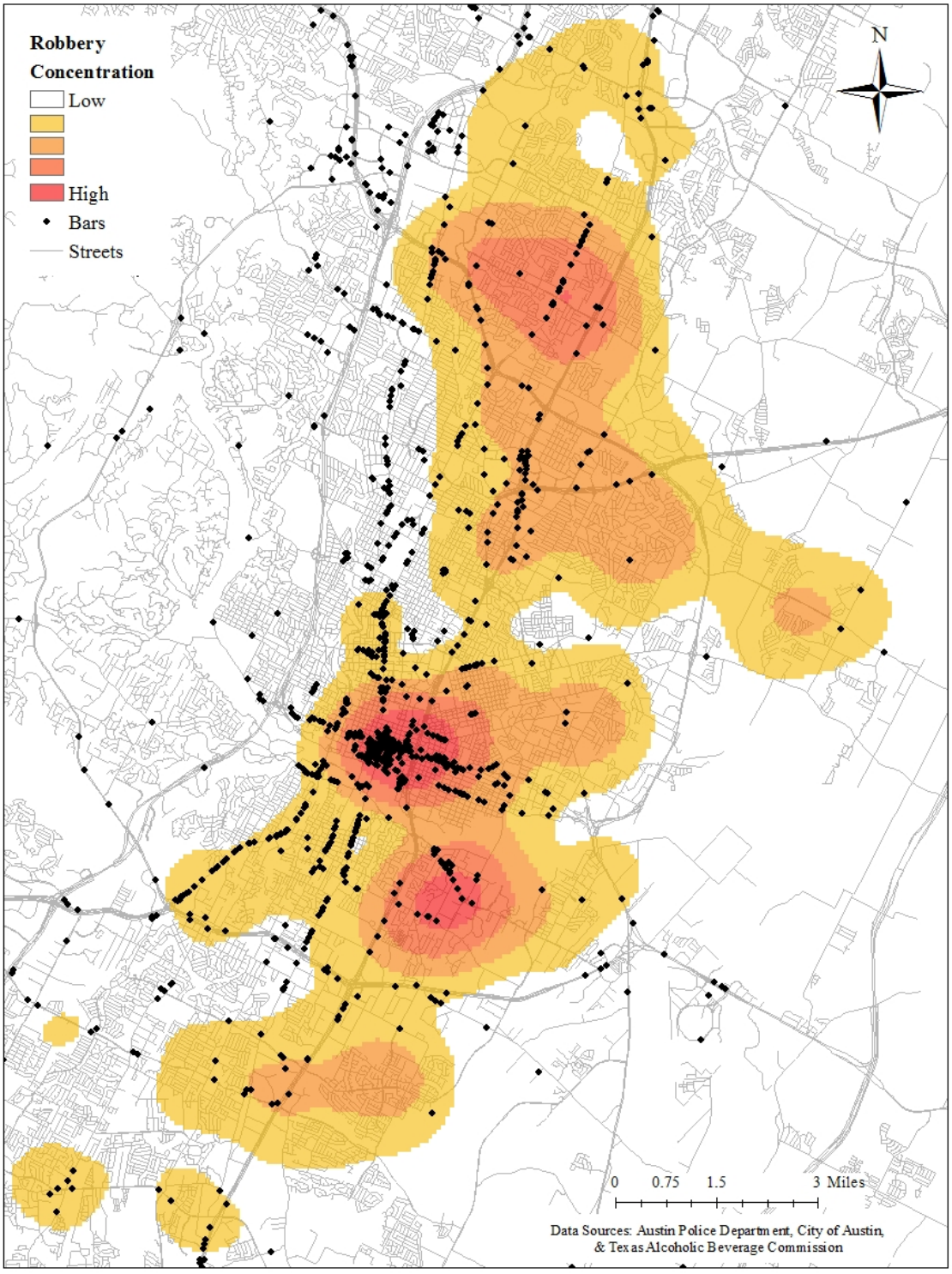

Figure B-4. Bars against street robbery density in Austin, Texas, during 2013.

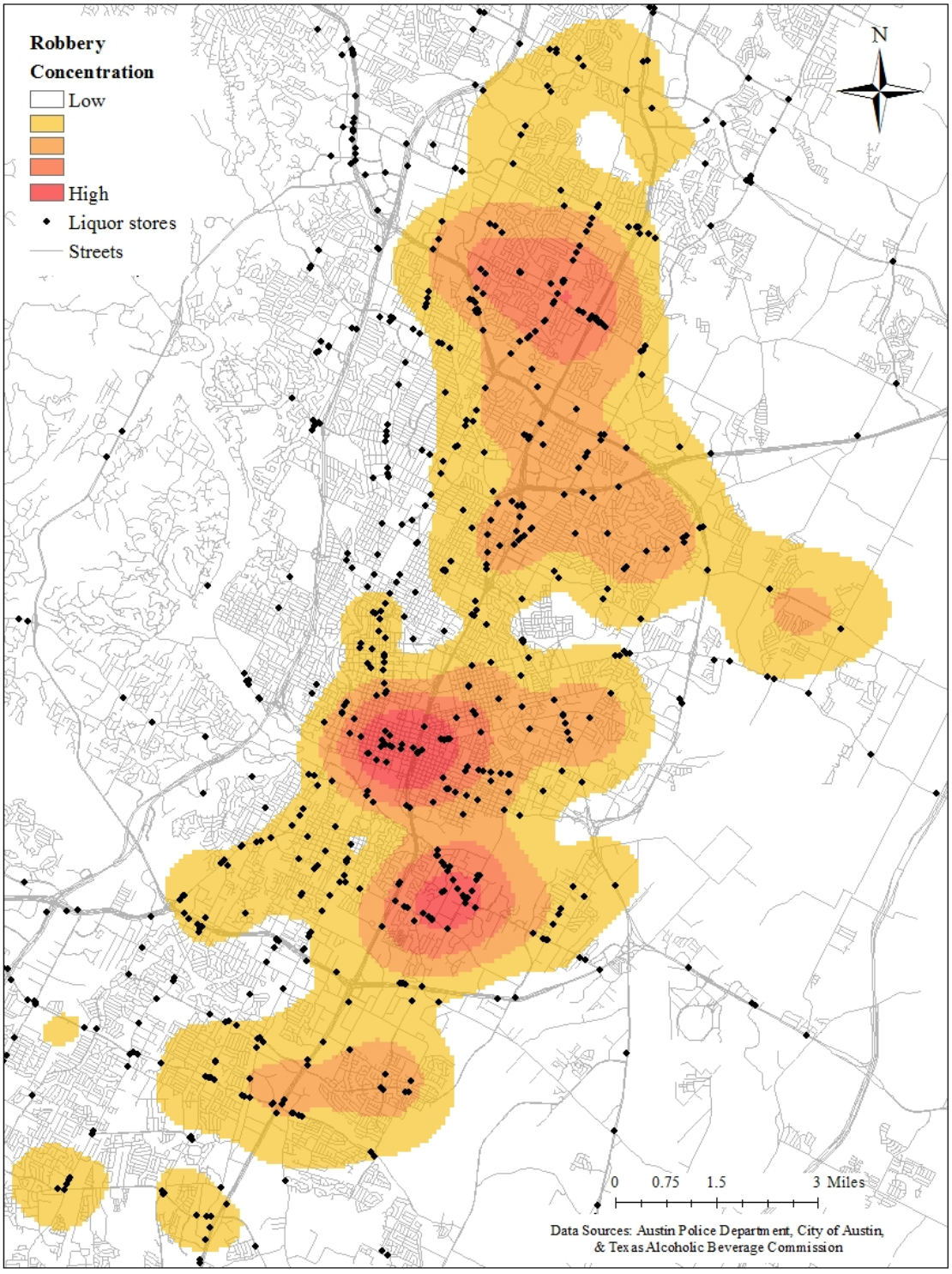

Figure B -5. Liquor stores against street robbery density in Austin, Texas, during 2013.

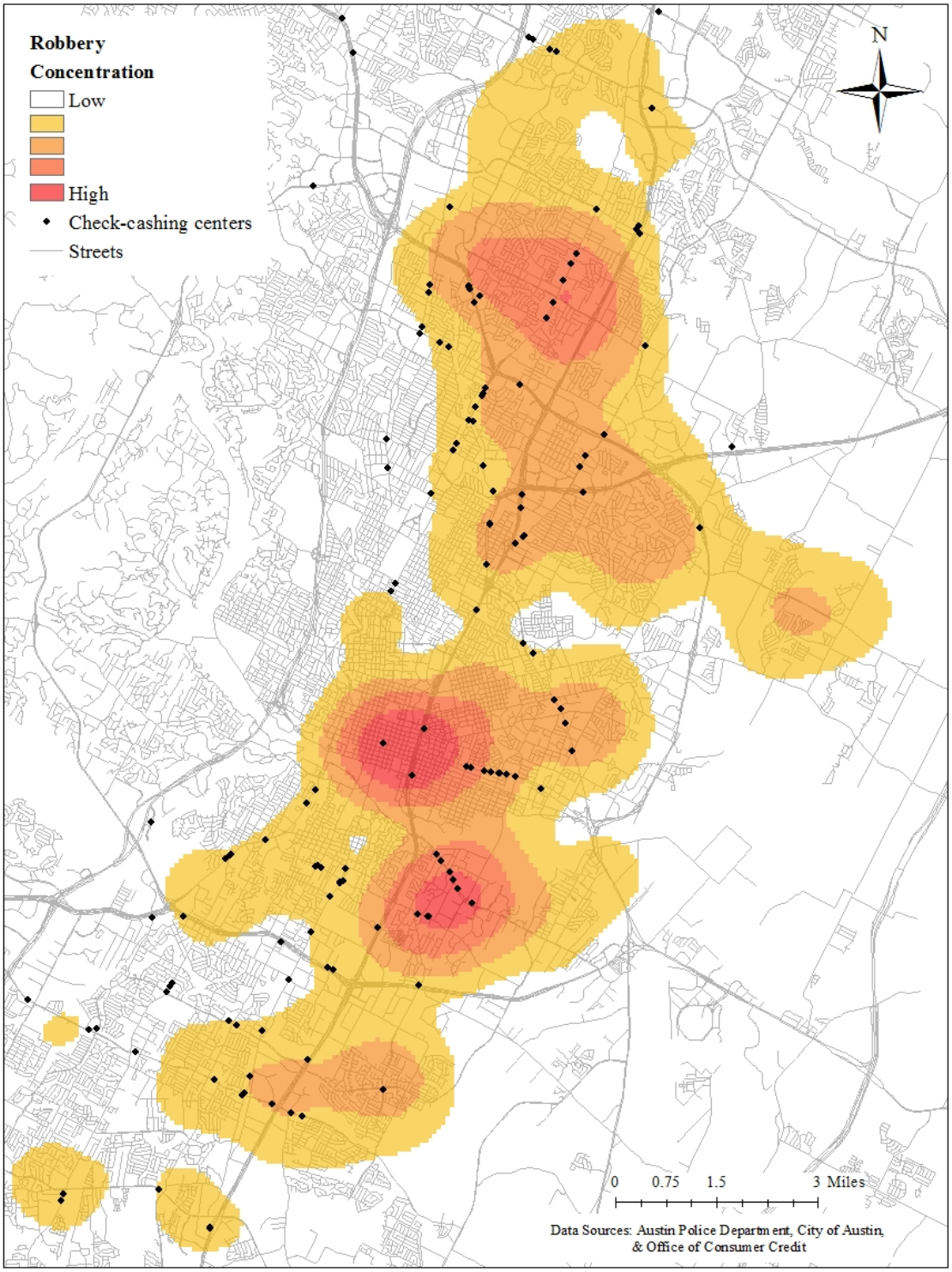

Figure B-6. Check-cashing centers against street robbery density in Austin, Texas, during 2013.

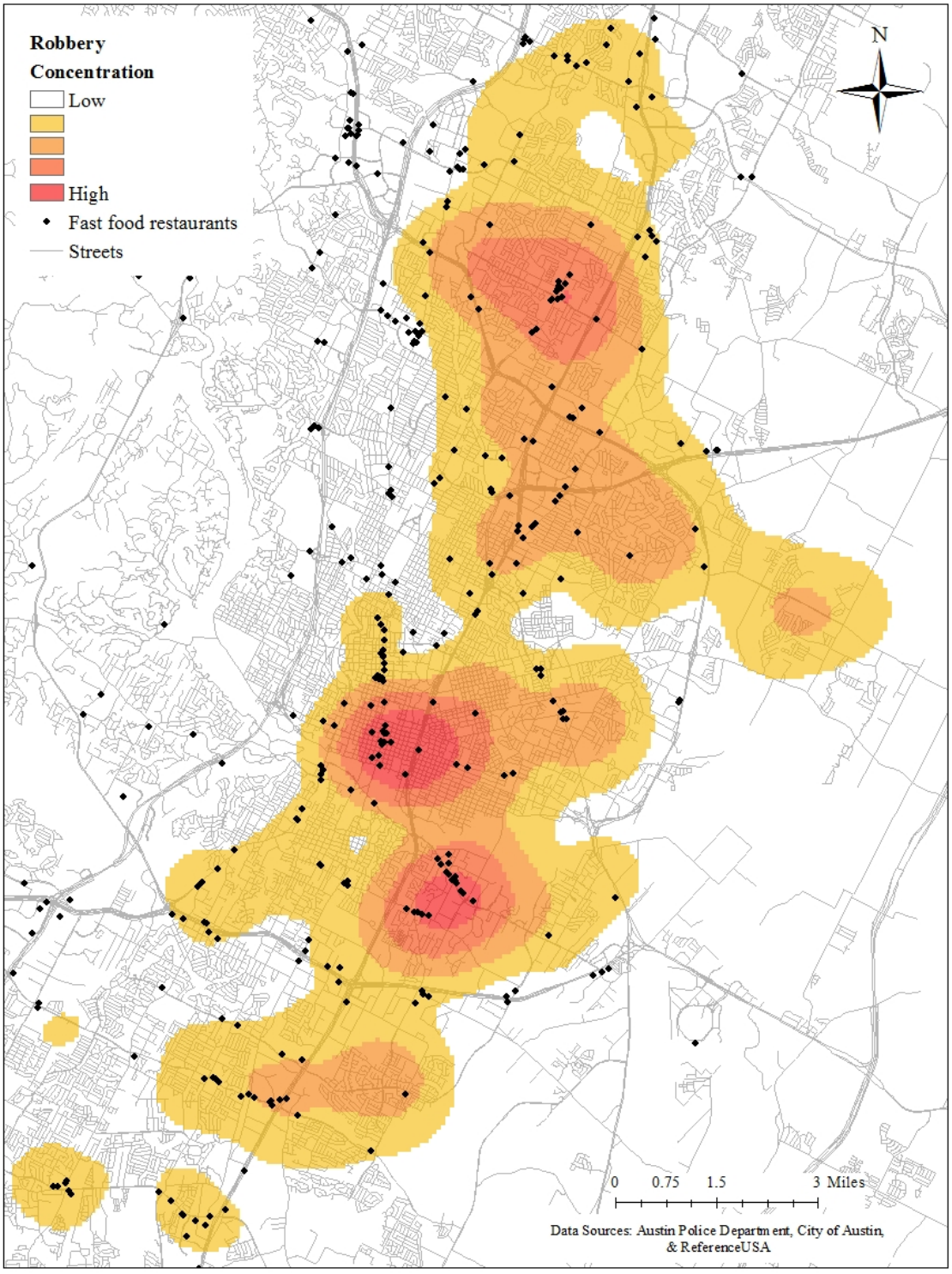

Figure B-7. Fast food restaurants against street robbery density in Austin, Texas, during 2013.

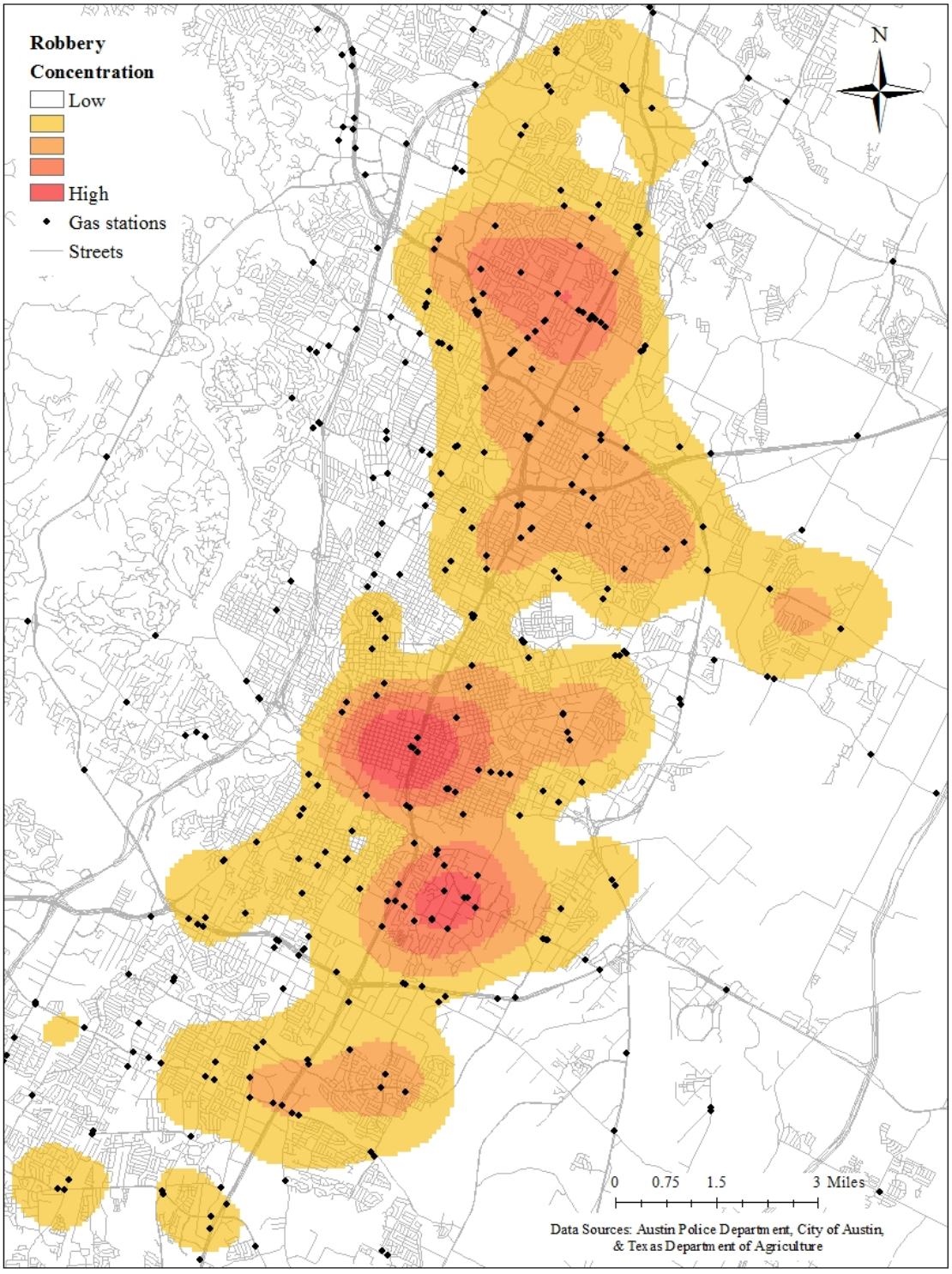

Figure B-8. Gas stations against street robbery density in Austin, Texas, during 2013.

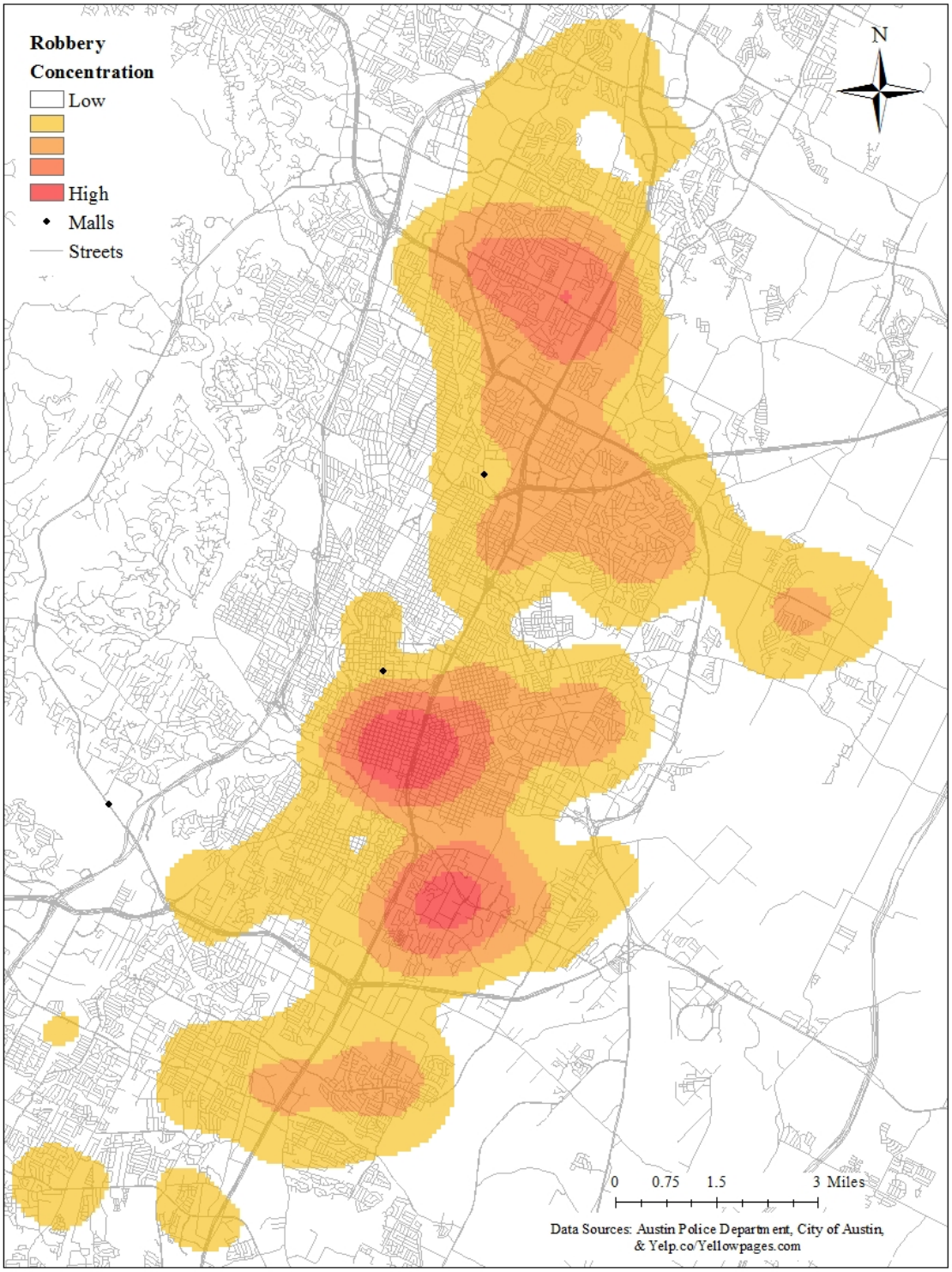

Figure B-9. Malls against street robbery density in Austin, Texas, during 2013.

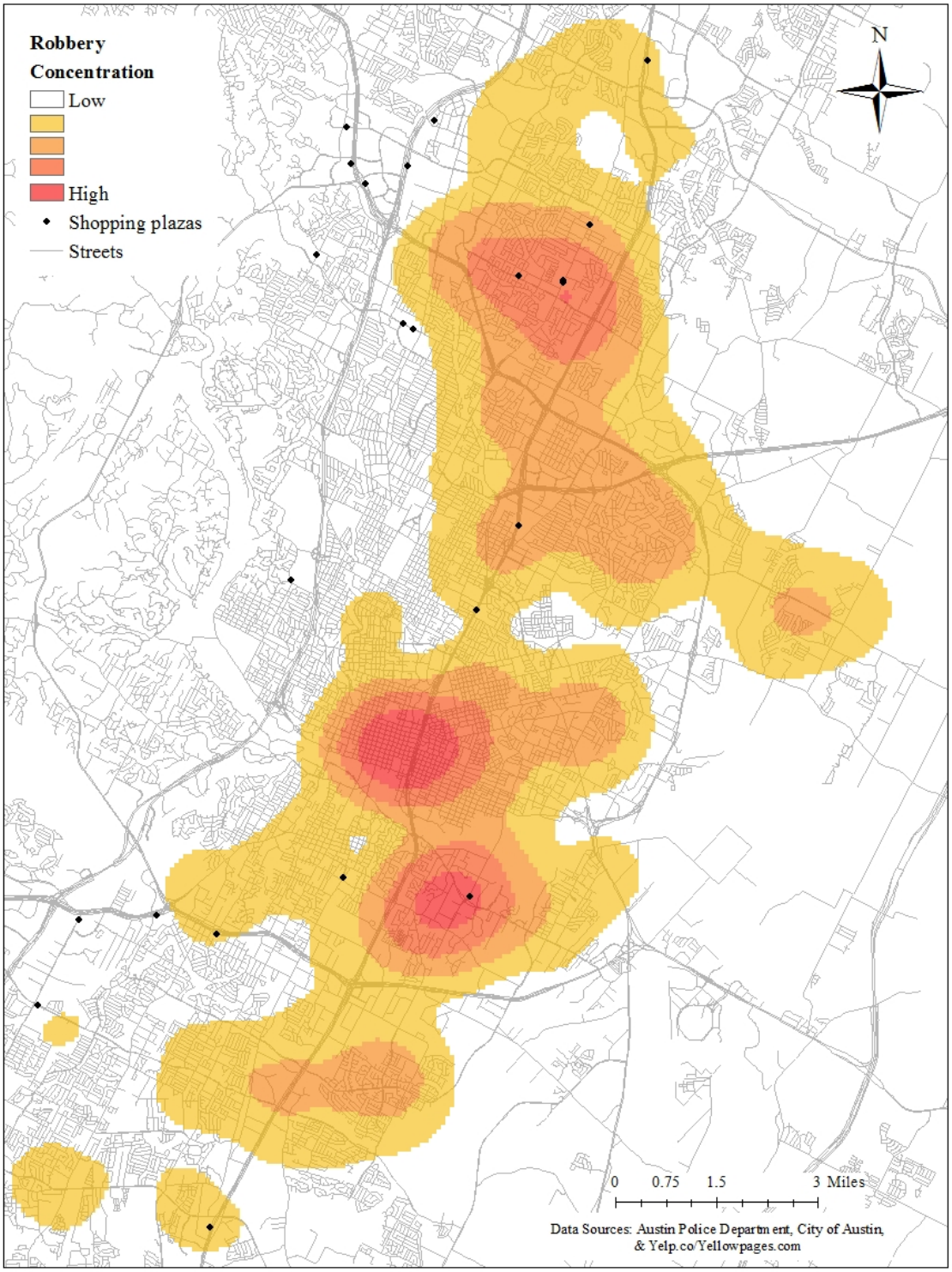

Figure B-10. Shopping plazas against street robbery density in Austin, Texas, during 2013.

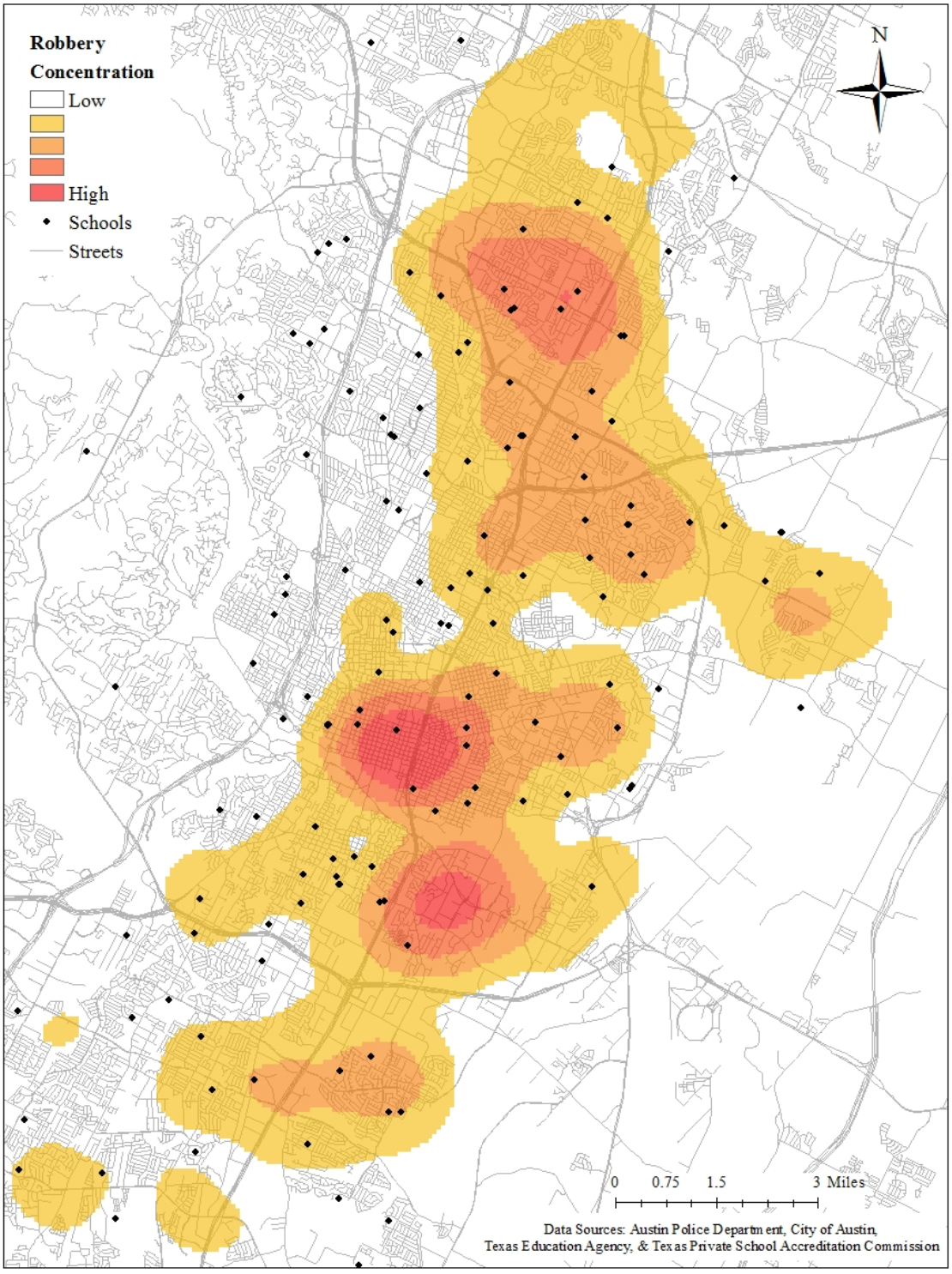

Figure B-11. Schools against street robbery density in Austin, Texas, during 2013.

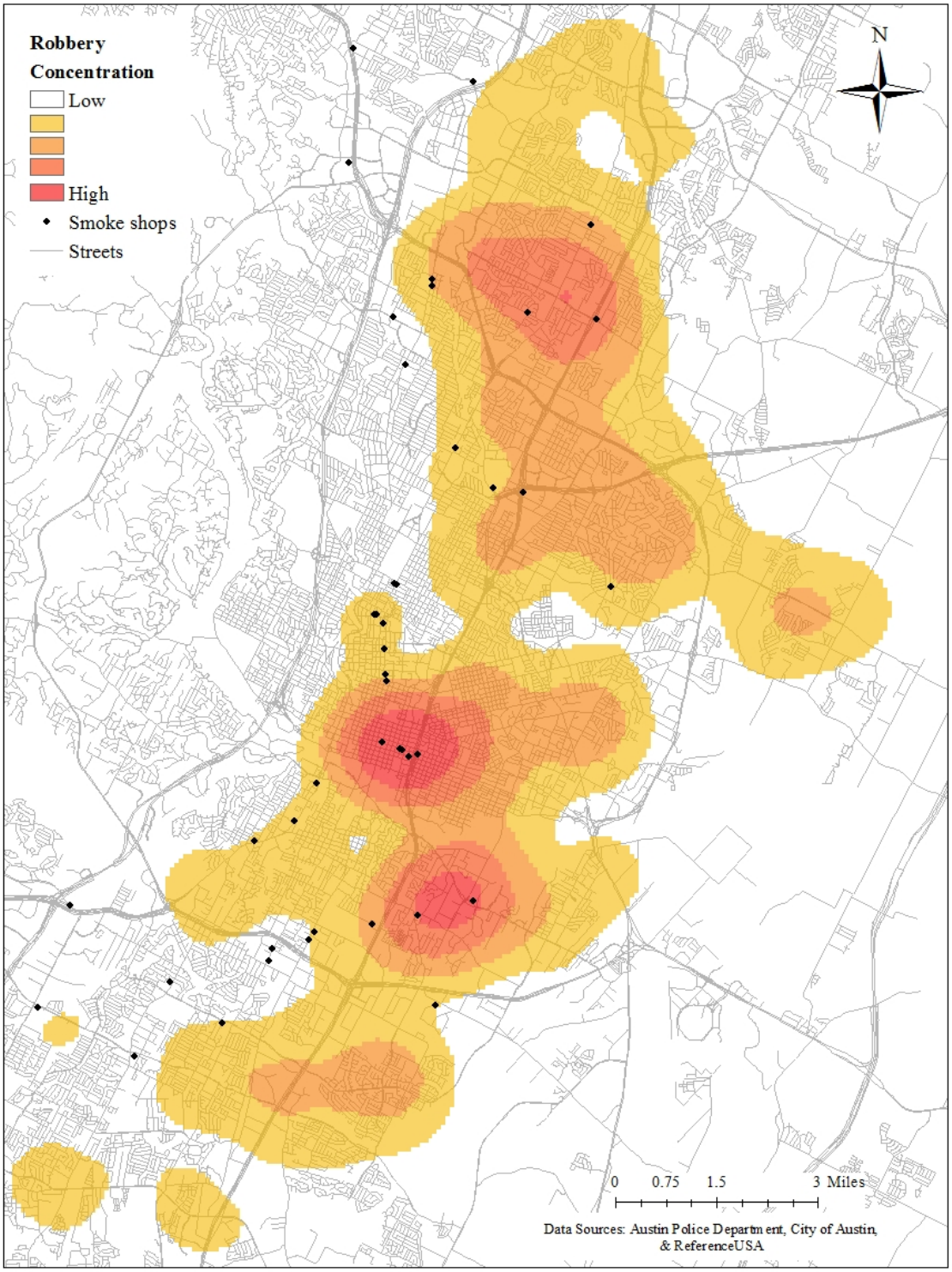

Figure B-12. Smoke shops against street robbery density in Austin, Texas, during 2013.

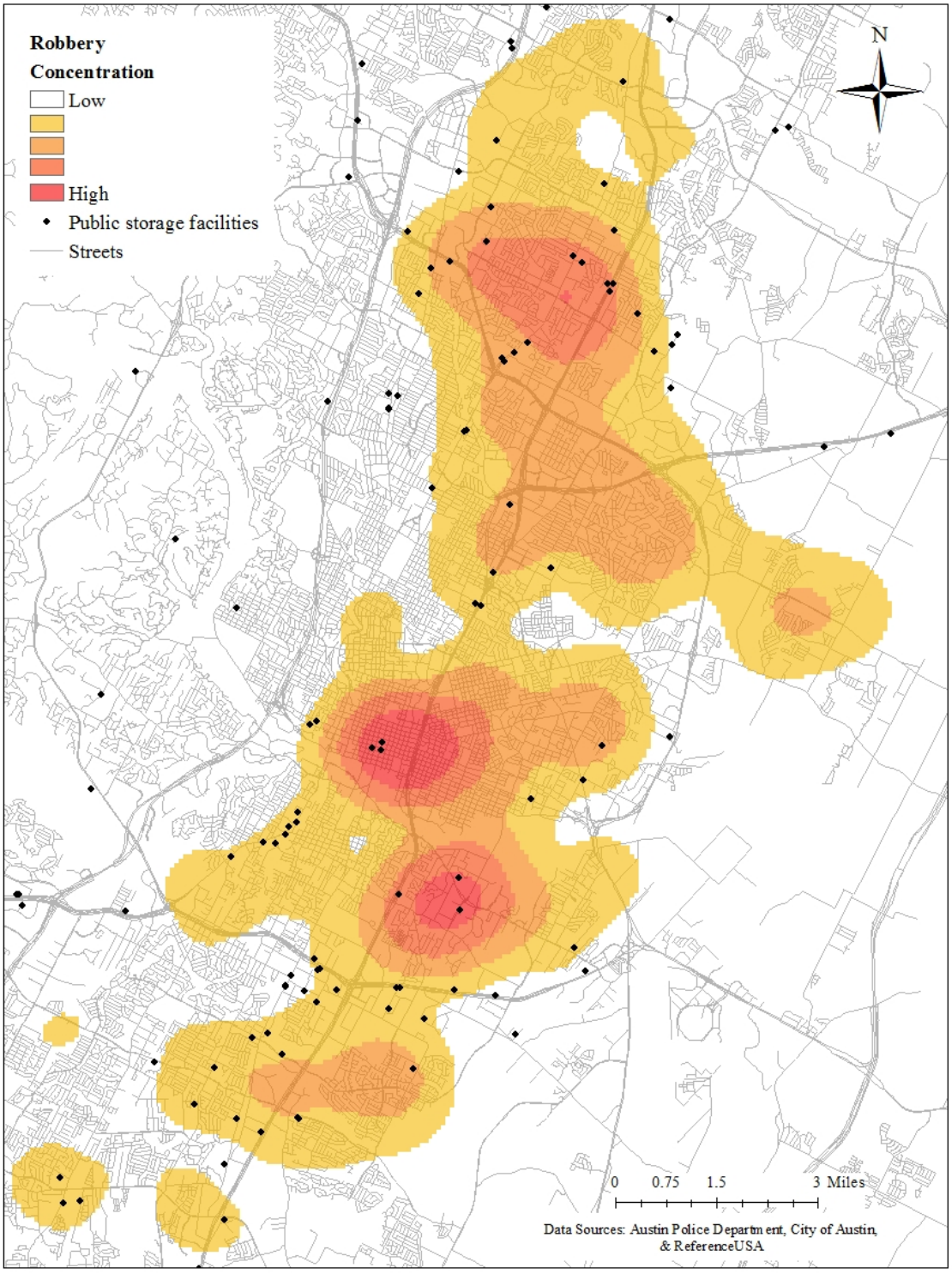

Figure B-13. Public storage facilities against street robbery density in Austin, Texas, during 2013.

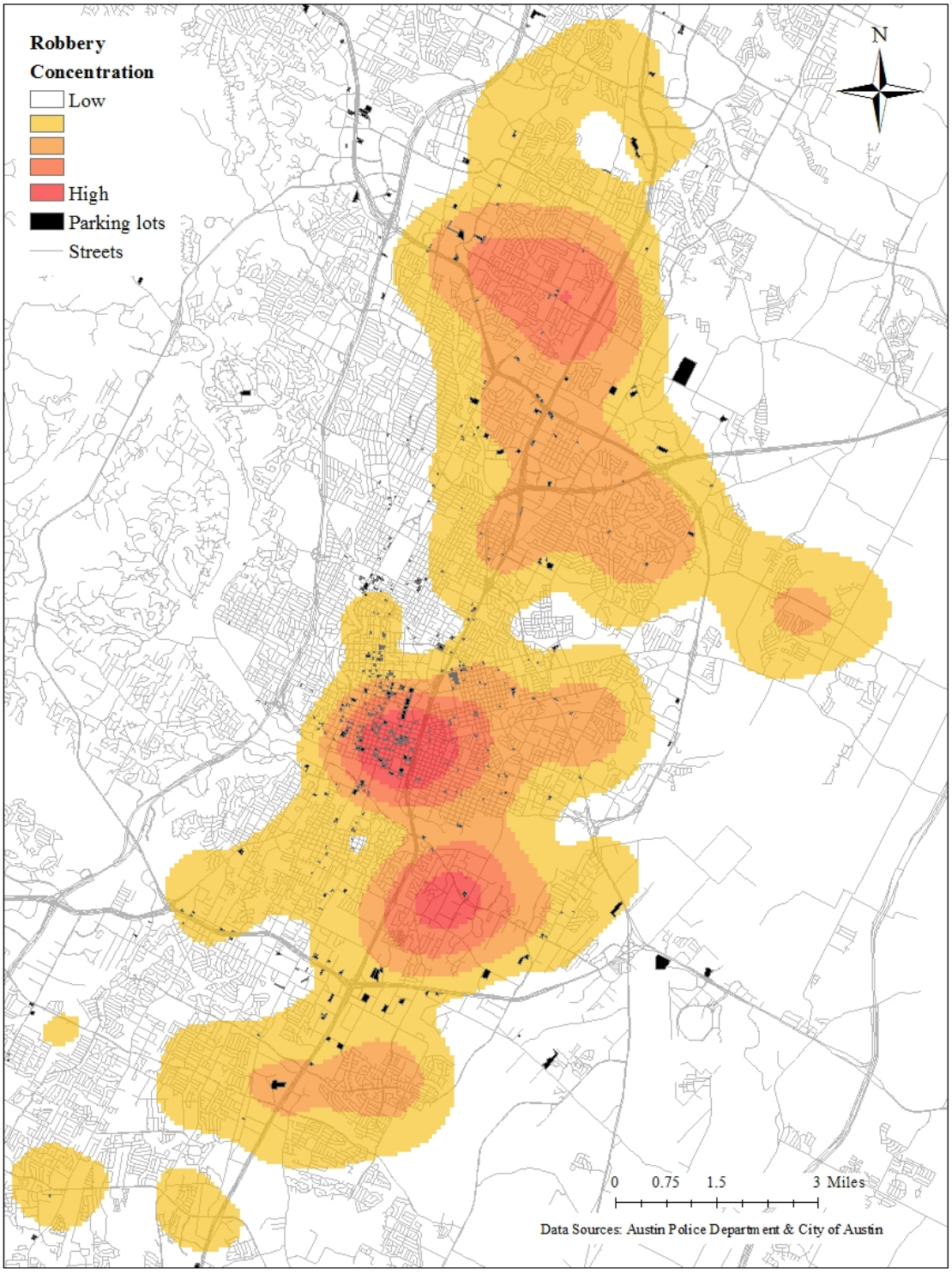

Figure B-14. Parking lots against street robbery density in Austin, Texas, during 2013.

Appendix C

The following tables show all observed profile configurations (i.e., not just the dominant profiles) for the 85-foot, 300-foot, and 1,000-foot buffer distances in Austin, Texas.

Table C-1. All profile configurations at 85 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	507
2	N	N	**Y**	N	N	N	N	N	30
3	N	**Y**	N	N	N	N	N	N	22
4	N	N	N	N	N	N	N	**Y**	13
5	N	N	N	N	**Y**	**Y**	N	N	10
6	N	N	N	N	N	**Y**	N	N	9
7	N	N	N	N	N	N	**Y**	N	6
8	N	**Y**	N	N	N	**Y**	N	N	4
9	N	**Y**	**Y**	N	N	N	**Y**	N	3
10	**Y**	**Y**	N	N	N	N	N	N	3
11	N	N	**Y**	N	N	N	**Y**	N	2
12	N	N	**Y**	N	N	**Y**	N	N	2
13	N	**Y**	N	N	N	N	**Y**	N	2
14	**Y**	N	N	N	N	N	N	N	2
15	N	N	N	N	N	N	**Y**	**Y**	1
16	N	N	N	N	**Y**	**Y**	N	**Y**	1
17	N	N	N	**Y**	N	N	N	N	1
18	N	N	N	**Y**	N	**Y**	N	N	1
19	N	N	**Y**	N	N	N	N	**Y**	1
20	N	N	**Y**	N	**Y**	**Y**	N	N	1
21	N	**Y**	N	N	**Y**	**Y**	N	N	1
22	**Y**	N	N	N	**Y**	**Y**	N	N	1
23	**Y**	**Y**	N	N	N	**Y**	N	N	1
24	**Y**	**Y**	N	N	**Y**	**Y**	N	N	1
									625

Table C-2. All profile configurations at 300 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	284
2	N	N	**Y**	N	N	N	N	N	93
3	N	N	N	N	N	N	N	**Y**	23
4	N	N	**Y**	N	N	**Y**	N	N	18
5	N	N	N	N	N	N	**Y**	N	17
6	N	**Y**	N	N	N	N	N	N	15
7	N	**Y**	N	N	N	N	**Y**	N	13
8	N	N	N	N	**Y**	**Y**	N	N	11
9	N	N	**Y**	N	**Y**	**Y**	N	N	11
10	N	**Y**	**Y**	N	N	N	N	N	11
11	N	**Y**	**Y**	N	**Y**	**Y**	N	N	10
12	N	N	**Y**	N	N	N	N	**Y**	8
13	N	N	**Y**	N	N	N	**Y**	N	8
14	N	**Y**	**Y**	N	N	**Y**	N	N	8
15	N	N	N	N	N	**Y**	N	N	6
16	N	**Y**	N	N	N	**Y**	N	N	6
17	N	**Y**	**Y**	N	N	N	**Y**	N	5
18	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	5
19	N	N	N	**Y**	**Y**	**Y**	N	N	4
20	N	N	**Y**	**Y**	**Y**	**Y**	N	N	4
21	**Y**	N	N	N	N	N	N	N	4
22	**Y**	N	N	N	**Y**	**Y**	N	N	4
23	**Y**	**Y**	**Y**	N	N	**Y**	N	N	4
24	N	N	N	**Y**	N	N	N	N	3
25	N	N	**Y**	**Y**	N	**Y**	N	N	3
26	**Y**	N	**Y**	N	N	**Y**	N	N	3
27	**Y**	N	**Y**	N	**Y**	**Y**	N	N	3
28	**Y**	**Y**	N	N	N	N	N	N	3
29	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	3
30	N	**Y**	N	N	N	N	N	**Y**	2

Table C-2 (Continued). All profile configurations at 300 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
31	N	**Y**	N	N	N	**Y**	**Y**	N	2
32	N	**Y**	**Y**	**Y**	N	**Y**	N	N	2
33	**Y**	N	**Y**	N	N	N	N	N	2
34	**Y**	**Y**	N	N	**Y**	**Y**	N	N	2
35	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	N	2
36	N	N	N	N	N	N	**Y**	**Y**	1
37	N	N	N	N	N	**Y**	N	**Y**	1
38	N	N	N	N	N	**Y**	**Y**	N	1
39	N	N	N	N	**Y**	**Y**	N	**Y**	1
40	N	N	N	N	**Y**	**Y**	**Y**	N	1
41	N	N	N	**Y**	N	N	N	**Y**	1
42	N	N	**Y**	N	N	N	**Y**	**Y**	1
43	N	N	**Y**	**Y**	N	N	N	N	1
44	N	**Y**	N	N	**Y**	**Y**	N	N	1
45	N	**Y**	N	**Y**	N	**Y**	N	N	1
46	N	**Y**	**Y**	N	N	N	**Y**	**Y**	1
47	N	**Y**	**Y**	N	N	**Y**	**Y**	N	1
48	N	**Y**	**Y**	**Y**	N	N	N	N	1
49	**Y**	N	N	N	**Y**	**Y**	N	**Y**	1
50	**Y**	N	**Y**	N	N	N	**Y**	N	1
51	**Y**	N	**Y**	N	**Y**	**Y**	**Y**	**Y**	1
52	**Y**	N	**Y**	**Y**	N	N	N	N	1
53	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	1
54	**Y**	**Y**	N	N	N	N	**Y**	N	1
55	**Y**	**Y**	N	**Y**	N	**Y**	N	N	1
56	**Y**	**Y**	**Y**	N	N	N	**Y**	N	1
57	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	N	1
58	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	N	1
									625

Table C-3. All profile configurations at 1,000 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
1	N	N	N	N	N	N	N	N	71
2	N	N	**Y**	N	N	N	N	N	61
3	N	N	**Y**	N	**Y**	**Y**	N	N	32
4	N	N	**Y**	N	N	N	N	**Y**	28
5	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	23
6	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	23
7	N	N	N	N	N	N	N	**Y**	20
8	N	N	**Y**	N	N	**Y**	N	N	16
9	N	**Y**	**Y**	N	N	N	N	N	16
10	N	**Y**	**Y**	N	**Y**	**Y**	N	N	16
11	N	**Y**	**Y**	**Y**	N	**Y**	N	N	13
12	N	N	N	N	N	N	**Y**	N	11
13	N	**Y**	**Y**	N	N	**Y**	**Y**	N	11
14	N	**Y**	**Y**	**Y**	**Y**	**Y**	N	N	11
15	**Y**	N	**Y**	N	**Y**	**Y**	N	N	10
16	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	9
17	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	**Y**	9
18	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	9
19	N	**Y**	N	N	N	N	N	N	8
20	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	8
21	N	N	**Y**	N	N	N	**Y**	N	7
22	N	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	7
23	N	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	7
24	**Y**	**Y**	**Y**	N	**Y**	**Y**	N	N	7
25	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	7
26	N	N	**Y**	N	**Y**	**Y**	N	**Y**	6
27	N	N	**Y**	N	**Y**	**Y**	**Y**	N	6
28	N	**Y**	**Y**	N	N	N	**Y**	N	6
29	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	N	6
30	N	N	N	N	**Y**	**Y**	N	N	5

Table C-3 (Continued). All profile configurations at 1,000 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
31	N	N	N	**Y**	N	N	N	N	5
32	**Y**	**Y**	**Y**	N	N	N	**Y**	N	5
33	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	5
34	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	5
35	N	N	**Y**	N	N	**Y**	N	**Y**	4
36	N	**Y**	N	N	N	**Y**	N	N	4
37	N	**Y**	**Y**	N	N	N	**Y**	**Y**	4
38	N	**Y**	**Y**	N	N	**Y**	N	N	4
39	**Y**	N	N	N	N	N	N	N	4
40	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	4
41	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	4
42	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	**Y**	4
43	N	N	N	N	N	N	**Y**	**Y**	3
44	N	N	N	N	N	**Y**	N	N	3
45	N	N	**Y**	N	N	N	**Y**	**Y**	3
46	N	N	**Y**	N	N	**Y**	**Y**	N	3
47	N	N	**Y**	**Y**	N	N	N	N	3
48	N	N	**Y**	**Y**	N	**Y**	N	N	3
49	N	N	**Y**	**Y**	**Y**	**Y**	N	**Y**	3
50	N	**Y**	N	N	**Y**	**Y**	N	N	3
51	N	**Y**	N	N	**Y**	**Y**	**Y**	N	3
52	N	**Y**	**Y**	N	N	N	N	**Y**	3
53	N	**Y**	**Y**	N	N	**Y**	N	**Y**	3
54	N	**Y**	**Y**	N	**Y**	**Y**	N	**Y**	3
55	N	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	3
56	**Y**	N	**Y**	N	**Y**	**Y**	**Y**	N	3
57	**Y**	N	**Y**	**Y**	N	N	N	N	3
58	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	3
59	**Y**	**Y**	**Y**	**Y**	N	N	N	N	3
60	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	3

Table C-3 (Continued). All profile configurations at 1,000 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
61	N	N	**Y**	N	N	**Y**	**Y**	**Y**	2
62	N	N	**Y**	N	**Y**	**Y**	**Y**	**Y**	2
63	N	N	**Y**	**Y**	**Y**	**Y**	N	N	2
64	N	**Y**	N	N	N	N	N	**Y**	2
65	N	**Y**	N	N	**Y**	**Y**	N	**Y**	2
66	**Y**	N	N	N	**Y**	**Y**	N	N	2
67	**Y**	N	N	**Y**	**Y**	**Y**	N	N	2
68	**Y**	N	**Y**	N	N	N	N	N	2
69	**Y**	**Y**	N	N	**Y**	**Y**	N	N	2
70	**Y**	**Y**	**Y**	N	N	N	N	N	2
71	**Y**	**Y**	**Y**	N	N	N	**Y**	**Y**	2
72	**Y**	**Y**	**Y**	N	N	**Y**	N	N	2
73	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	N	2
74	N	N	N	N	N	**Y**	**Y**	**Y**	1
75	N	N	N	N	**Y**	N	N	N	1
76	N	N	N	N	**Y**	**Y**	**Y**	N	1
77	N	N	N	**Y**	N	N	N	**Y**	1
78	N	N	N	**Y**	N	N	**Y**	N	1
79	N	N	**Y**	N	**Y**	N	N	N	1
80	N	**Y**	N	N	N	N	**Y**	N	1
81	N	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	1
82	N	**Y**	**Y**	**Y**	N	N	N	**Y**	1
83	N	**Y**	**Y**	**Y**	N	N	**Y**	N	1
84	N	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	1
85	N	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	1
86	**Y**	N	N	**Y**	**Y**	**Y**	**Y**	N	1
87	**Y**	N	**Y**	N	N	N	**Y**	N	1
88	**Y**	N	**Y**	N	N	N	**Y**	**Y**	1
89	**Y**	N	**Y**	N	N	**Y**	N	N	1
90	**Y**	N	**Y**	**Y**	N	**Y**	N	N	1

Table C-3 (Continued). All profile configurations at 1,000 feet using eight Austin facility types.

ID	ATM	Bar	Bus stop	Fast food	Gas station	Liquor store	Parking lot	Park/Rec. center	N
91	**Y**	N	**Y**	**Y**	**Y**	N	N	N	1
92	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	**Y**	1
93	**Y**	N	**Y**	**Y**	**Y**	**Y**	**Y**	N	1
94	**Y**	**Y**	N	N	N	N	N	N	1
95	**Y**	**Y**	N	N	N	N	**Y**	**Y**	1
96	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	N	1
97	**Y**	**Y**	**Y**	N	N	**Y**	N	**Y**	1
									625

Appendix D

The following tables show the dominant profile configurations in Austin, Texas, when the facility types used are the eight from the original study by Hart and Miethe (2014).

Table D-1. Dominant profile configurations at 85 feet using eight facilities from Hart and Miethe (2014).

ID	ATM	Bar	Bus	Fast food	Gas station	Check-cashing	Shopping plaza	Smoke shop	N	%	Cum. %
1	N	N	N	N	N	N	N	N	533	85.3	85.3
2	N	N	Y	N	N	N	N	N	35	5.6	90.9
3	N	Y	N	N	N	N	N	N	21	3.4	94.2
4	N	N	N	N	Y	N	N	N	11	1.8	96.0
					4 dominant situational profiles				600	96.0	
					15 other situational profiles				25	4.0	
					19 total observed situational profiles				625	100.0	

Table D-2. Dominant profile configurations at 300 feet using eight facilities from Hart and Miethe (2014).

ID	ATM	Bar	Bus	Fast food	Gas station	Check-cashing	Shopping plaza	Smoke shop	N	%	Cum. %
1	N	N	N	N	N	N	N	N	332	53.1	53.1
2	N	N	Y	N	N	N	N	N	126	20.2	73.3
3	N	Y	N	N	N	N	N	N	33	5.3	78.6
4	N	Y	Y	N	N	N	N	N	21	3.4	81.9
5	N	N	N	N	Y	N	N	N	12	1.9	83.8
6	N	N	Y	N	Y	N	N	N	11	1.8	85.6
					6 dominant situational profiles				535	85.6	
					35 other situational profiles				90	14.4	
					41 total observed situational profiles				625	100.0	

Table D-3. Dominant profile configurations at 1,000 feet using eight facilities from Hart and Miethe (2014).

ID	ATM	Bar	Bus	Fast food	Gas station	Check-cashing	Shopping plaza	Smoke shop	N	%	Cum. %
1	N	N	Y	N	N	N	N	N	122	19.5	19.5
2	N	N	N	N	N	N	N	N	109	17.4	37.0
3	N	N	Y	N	Y	N	N	N	45	7.2	44.2
4	N	Y	Y	N	N	N	N	N	40	6.4	50.6
5	N	Y	Y	N	Y	N	N	N	21	3.4	53.9
6	Y	Y	Y	N	N	N	N	N	20	3.2	57.1
7	Y	Y	Y	Y	Y	Y	N	N	20	3.2	60.3
8	Y	Y	Y	Y	N	N	N	N	19	3.0	63.4
9	N	Y	Y	Y	N	N	N	N	17	2.7	66.1
10	N	Y	N	N	N	N	N	N	15	2.4	68.5
11	Y	Y	Y	Y	N	Y	N	Y	12	1.9	70.4
12	Y	Y	Y	N	Y	Y	N	N	11	1.8	72.2
					12 dominant situational profiles				451	72.2	
					51 other situational profiles				174	27.8	
					63 total observed situational profiles				625	100.0	

REFERENCES

Angel, S. (1968). *Discouraging crime through city planning* (Working Paper no. 75). Berkeley, CA: University of California at Berkeley, Center for Planning and Development Research.

Austin Police Department. (2014). Annual crime and traffic report: 2013 Preliminary report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Austin Police Department. (2013). Annual crime and traffic report: 2012 Final report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Austin Police Department. (2012). Annual crime and traffic report: 2011 Final report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Austin Police Department. (2011). Annual crime and traffic report: 2010 Final report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Austin Police Department. (2010). Annual crime and traffic report: 2009 Final report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Austin Police Department. (2010). Annual crime and traffic report: 2008 Final report. Retrieved from http://www.austintexas.gov/page/annual-crime-traffic-reports

Barker, R. G. (1968). *Ecological psychology*. Stanford, CA: Stanford University Press.

Bernasco, W., & Block, R. (2011). Robberies in Chicago: A block-level analysis of the influence of crime generators, crime attractors, and offender anchor points. *Journal of Research in Crime and Delinquency, 48*, 33-57.

Bichler, G., Malm, A., & Enriquez, J. (2010). Magnetic facilities: Identifying the convergence settings of juvenile delinquents. *Crime & Delinquency, 60*, 971-998.

Block, R., & Davis, S. (1996). The environs of rapid transit stations: A focus for street crime or just another risky place. In R. V. Clarke (Ed.), *Preventing mass transit crime* (pp. 237-257). Monsey, NY: Willow Tree Press.

Brantingham, P. J., & Brantingham, P. L. (1984). *Patterns in crime*. New York: Macmillan.

Brantingham, P., & Brantingham, P. (1995). Criminality of place. *European Journal on Criminal Policy and Research*, *3*, 5-26.

Calthorpe, P. (1993). *The next American metropolis: Ecology, community, and the American dream*. Princeton Architectural Press.

Caplan, J. M. (2011). Mapping the spatial influence of crime correlates: A comparison of operationalization schemes and implications for crime analysis and criminal justice practice. *Cityscape*, 57-83.

Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, *44*, 588-608.

Franklin, F. A., II, LaVeist, T. A., Webster, D. W., & Pan, W. K. (2010). Alcohol outlets and violent crime in Washington, DC. *Western Journal of Emergency Medicine*, *11*, 283.

Groff, E. (2011). Exploring 'near': Characterizing the spatial extend of drinking place influence on crime. *Australian & New Zealand Journal of Criminology*, *44*, 156-179.

Groff, E., & McCord, E. S. (2012). The role of neighborhood parks as crime generators. *Security Journal*, *25*, 1-24.

Groff, E. R., & Lockwood, B. (2014). Criminogenic facilities and crime across street segments in Philadelphia uncovering evidence about the spatial extent of facility influence. *Journal of Research in Crime and Delinquency, 51*, 277-314.

Harper, D. W., Khey, D. N., & Nolan, G. M. (2013). Spatial patterns of robbery at tourism sites: A case study of the Vieux Carré in New Orleans. *American Journal of Criminal Justice*, *38*, 589-601.

Hart, T. C., & Miethe, T. D. (2008). Exploring bystander presence and intervention in nonfatal violent victimization: when does helping really help? *Violence and Victims*, *23*, 637-651.

Hart, T. C., & Miethe, T. D. (2009). Self-defensive gun use by crime victims: A conjunctive analysis of its situational contexts. *Journal of Contemporary Criminal Justice*, *25*, 6-19.

Hart, T. C., & Miethe, T. D. (2011). Violence against college students and its situational contexts: Prevalence, patterns, and policy implications. *Victims and Offenders*, *6*, 157-180.

Hart, T. C., & Miethe, T. D. (2014). Street robbery and public bus stops: A case study of activity nodes and situational risk. *Security Journal*, *27*, 180-193.

Hart, T. C., & Miethe, T. D. (2015). Configural behavior settings of crime event locations toward an alternative conceptualization of criminogenic microenvironments. *Journal of Research in Crime and Delinquency*. doi: 10.1177/0022427814566639

Karson, M. K. (2007). Nomothetic versus idiographic. In N. Salkind (Ed.), *Encyclopedia of measurement and statistics* (pp. 685-686). doi: http://dx.doi.org.libproxy.txstate.edu/10.4135/9781412952644.n312

Kooi, B. R. (2013). Assessing the correlation between bus stop densities and residential crime typologies. *Crime Prevention & Community Safety*, *15*, 81-105.

Kurland, J., Johnson, S. D., & Tilley, N. (2013). Offenses around stadiums: A natural experiment on crime attraction and generation. *Journal of Research in Crime and Delinquency*, *51*, 5-28.

Lockwood, D. (2007). Mapping crime in Savannah: Social disadvantage, land use, and violent crimes reported to the police. *Social Science Computer Review*, *25*, 194-209.

Meier, R. F., Kennedy, L. W., & Sacco, V. F. (2001). *The process and structure of crime: Criminal events and crime analysis (Vol. 9)*. New Brunswick, NJ: Transaction Publishers.

Mieczkowski, T., & Beauregard, E. (2010). Lethal outcome in sexual assault events: A conjunctive analysis. *Justice Quarterly*, *27*, 332-361.

Miethe, T. D., & Drass, K. A. (1999). Exploring the social context of instrumental and expressive homicides: An application of qualitative comparative analysis. *Journal of Quantitative Criminology*, *15*, 1-21.

Miethe, T. D., Hart, T. C., & Regoeczi, W. C. (2008). The conjunctive analysis of case configurations: An exploratory method for discrete multivariate analyses of crime data. *Journal of Quantitative Criminology*, *24*, 227-241.

Murray, R. K., & Swatt, M. L. (2010). Disaggregating the relationship between schools and crime: A spatial analysis. *Crime & Delinquency*, *59*, 163-190.

Newton, A. D., Partridge, H., & Gill, A. (2014). Above and below: Measuring crime risk in and around underground mass transit systems. *Crime Science*, *3*, 1.

Ragin, C. (1987). *The comparative method: Moving beyond qualitative and quantitative methods.* Berkeley: University of California.

Ratcliffe, J. H. (2012). The spatial extent of criminogenic places: A changepoint regression of violence around bars. *Geographical Analysis*, *44*, 302-320.

Reitzel, J. D., Piquero, N. L., & Piquero, A. R. (2010). Problem-oriented policing. In R. G. Dunham & G. P. Alpert (Eds.), *Critical issues in policing* (pp. 450-462). Long Grove, IL: Waveland Press.

Roncek, D. W., & Maier, P. A. (1991). Bars, blocks, and crimes revisited: Linking the theory of routine activities to the empiricism of "hot spots". *Criminology*, *29*, 725-753.

Rossmo, D. K. (2000). *Geographic profiling*. Boca Raton, FL: CRC Press.

Sherman, L. W. (1995). Hot spots of crime and criminal careers of places. In J. Eck and D. Weisburd (Eds.), *Crime and place: Crime prevention studies 4* (pp. 35-52). Monsey, NY: Willow Tree Press.

Sherman, L. W., Gartin, P. R., & Buerger, M. E. (1989). Hot spots of predatory crime: Routine activities and the criminology of place. *Criminology, 27,* 27-56.

Shiode, S. (2011). Street-level Spatial Scan Statistic and STAC for Analysing Street Crime Concentrations. *Transactions in GIS, 15,* 365-383.

Smith, W. R., Frazee, S. G., & Davison, E. L. (2000). Furthering the integration of routine activity and social disorganization theories: Small units of analysis and the study of street robbery as a diffusion process. *Criminology, 38,* 489-524.

Springer, D.W., Lauderdale, M.L., Landuyt, N.G., & Cole, H. (2014). *City of Austin Byrne Criminal Justice Innovation Program Implementation Plan and Research Report*. Retrieved from http://www.austintexas.gov/sites/default/files/files/Police/RestoreRundberg/Restore_Rundberg_Implementation_Plan_and_Research_Report_03052014.pdf

Stucky, T. D., & Smith, S. L. (2014). Exploring the conditional effects of bus stops on crime. *Security Journal*. Advance online publication, doi: 10.1057/sj.2014.16

Taylor, B., Koper, C., & Woods, D. (2011). A randomized controlled trial of different policing strategies at hotspots of violent crime. *Journal of Experimental Criminology, 7,* 149-181.

Toomey, T. L., Erickson, D. J., Carlin, B. P., Lenk, K. M., Quick, H. S., Jones, A. M., & Harwood, E. M. (2012). The association between density of alcohol establishments and violent crime within urban neighborhoods. *Alcoholism: Clinical and Experimental Research, 36,* 1468-1473.

U.S. Census Bureau. (2014). *Incorporated places and minor civil divisions datasets: Subcounty resident population estimates: April 1, 2010 to July 1, 2013*. Retrieved from http://www.census.gov/popest/data/cities/totals/2013/SUB-EST2013.html

U.S. Department of Justice, Federal Bureau of Investigation. (2014) *Crime in the United States, 2013*. Retrieved Feb. 28, 2014, from http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2013/crime-in-the-u.s.-2013/tables/table-8/table-8-state-cuts/table_8_offenses_known_to_law_enforcement_texas_by_city_2013.xls

Weisburd, D., Bushway, S., Lum, C., & Yang, S. M. (2004). Trajectories of crime at places: A longitudinal study of street segments in the city of Seattle. *Criminology, 42*, 283-322.

Weisburd, D., Telep. C. W., Hinkle, J.C., & Eck, J. E. (2010). Is problem-oriented policing effective in reducing crime and disorder? Findings from a Campbell systematic review. *Criminology & Public Policy*, *9*, 139-172.

Wright, R. T., & Decker, S. H. (1997). *Armed robbers in action: Stickups and street culture*. Boston: Northeastern University Press.