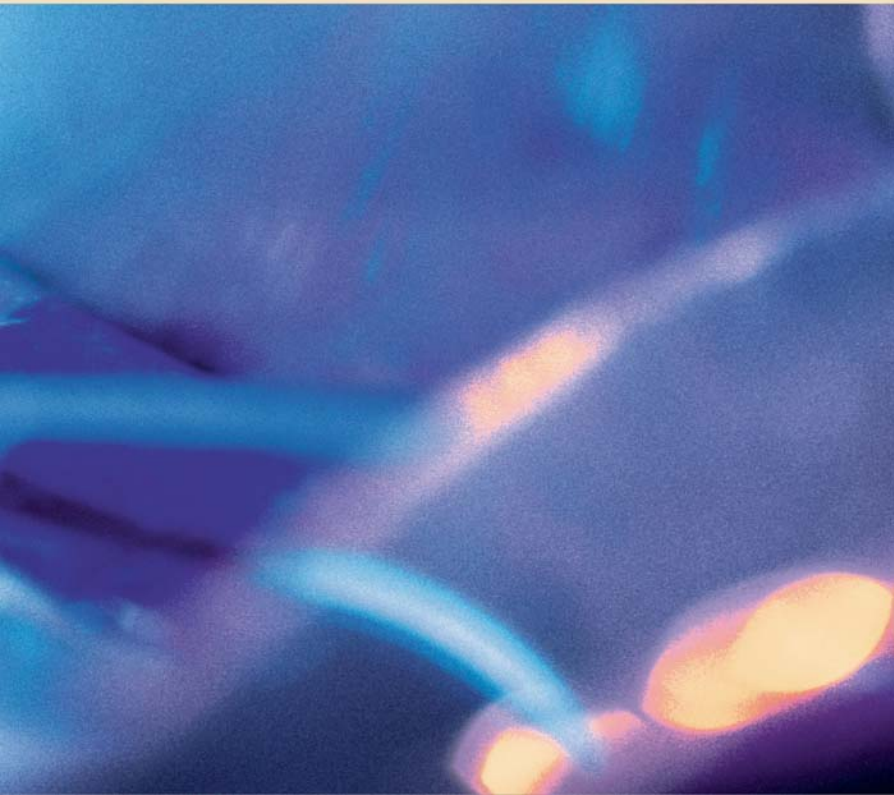
Brandon R. Kooi

POLICING PUBLIC TRANSPORTATION

An Environmental and Procedural Evaluation of Bus Stops



Criminal Justice
Recent Scholarship

Edited by
Marilyn McShane and Frank P. Williams III

A Series from LFB Scholarly

This page intentionally left blank

Policing Public Transportation
An Environmental and Procedural Evaluation of Bus Stops

Brandon R. Kooi

LFB Scholarly Publishing LLC
New York 2007

Library of Congress Cataloging-in-Publication Data

Kooi, Brandon R., 1973-
Policing public transportation : an environmental and procedural evaluation of bus stops / Brandon R. Kooi.
p. cm. -- (Criminal justice : recent scholarship)
Includes bibliographical references and index.
ISBN 978-1-59332-146-8 (alk. paper)
1. Local transit crime--United States. 2. Local transit--Security measures--United States. 3. Local transit crime--United States--Prevention. 4. Bus stops--Security measures--United States. I. Title.
HE4456.K66 2007
364.4'9--dc22

2007009786

ISBN 9781593321468

Printed on acid-free 250-year-life paper.

Manufactured in the United States of America.

To my family- Anna, Drew, Ella and Reagan. Thanks for all the love and support over the past years and years to come.

This page intentionally left blank

Contents

This page intentionally left blank

List of Tables

This page intentionally left blank

List of Figures

Acknowledgments

Throughout my childhood education, a few vivid memories remain etched in my mind from comments made by teachers that encouraged me to dream of higher aspirations academically than I would have ever discovered through my own aspirations. Specifically, my third and fifth grade teacher, the late Mary Moreno, remains instrumental in my desire to inspire others while continuing to learn from the experiences of my students. Unfortunately, too few academics today appreciate their abilities to inspire students and guide practitioners, but this is an area for which I remain committed.

This book is dedicated to the practitioners that I continue to learn from who work within and through our criminal justice agencies tirelessly and at times innovatively attempting to make a difference. For those who read this work, it is my hope that they will find some insight into directing their efforts towards problem solving and crime prevention more efficiently than what has been done in the past and these efforts will not be lost through a lack of assessment. Often this means changing the focus of policing away from being offender-focused and moving towards a more thorough discovery of the underlying conditions that criminal behavior stem.

It has been said that those that do not prevent crime ultimately encourage it. This stance too often becomes confrontational with the traditional law enforcer. However, recent progress in criminology provides adequate challenges for many of the assumptions that we have held in terms of defining the narrow focus of police officers as simply enforcing criminal statutes. Ultimately, this work is dedicated towards those who will implement these challenges in the future, both in and outside of government law enforcement, and that they will be directed

towards analytical responses based upon creative techniques to understand their local problems and adequately respond to the unique challenges they are facing.

Although the list could be endless, I wanted to also thank the following people for helping me to edit this and past work and/or continually inspiring me. Michigan State University- Mahesh Nalla, David Carter, John McCluskey, Joe Darden, Chris & Shelia Maxwell, Frank Horvath, Ed McGarrel, Christina DeJong-Schwitzer, Peter Manning, Merry Morash, Justin Patchin, Sameer Hinduja, Cedrick Heraux, Beth Huebner, Pete Blair, Joe Schafer, Tom Martinelli, Amanda Burgess-Proctor, and Sean Varano; Illinois State University- Tom Ellsworth, Beverly Smith, Frank Morn, Mark Fleisher, Ed Wells, David Falcone, and Ralph Weisheit; Lakeland College- President Stephen Gould, Dean Tim Fulop, Vice President Joe Botana, Alan Mock, Don Francis, Elizabeth Stroot, Greg Smith, Scott Niederjohn, Katie Shumway, Marta Loyola, Tom Padron, Jim Kudek, Chuck Stockman, Rick Gaumer, Karl Kuhn, Paul White, Susan Gould, Pete Rogers, Lisa Stephan, and Chelsy Cegielski; Lansing, Michigan- Chief Mark Alley; Port Washington, Wisconsin- Chief Richard Thomas; Waukesha, Wisconsin- Chief Les Sharrock; Madison, Wisconsin- Assistant Attorney General Cheri Maples; Sheboygan, Wisconsin- Chief David Kirk, Officer Todd Priebe, and Lieutenant Jeff Johnston; John Jay College- David Kennedy; and from the Center for Problem-Oriented Policing- Rana Sampson, Herman Goldstein, Nancy Leach and Mike Scott. Lastly, I would like to thank Leo Balk and LFB Scholarly Publishing for his persistent feedback and acceptance of countless excuses, alibis, and the finality of the given product. Errors and statements that are counterintuitive are the fault of the author and should not be attributed to anyone who assisted in this endeavor.

CHAPTER 1

Public Transportation Safety: An Introduction

Crime and violence within public transportation has received increased attention since the horrific events of September 11, 2001 with far reaching implications. According to recent reports published by the U.S. Transportation Department, buses and trains in the United States are becoming inviting targets for terrorists acts (Macko, 1998). The U.S. Transportation Department's intelligence office was created directly after the December 1988 bombing of Pan Am Flight 103 and continues to work with local transit agencies to improve overall security. Outside of terrorism, general disorder and high crime that surrounds public transportation in urban areas has a direct impact on overall community health. Violence and disorder, whether actual or perceived, undermine the value and potential for public transit (Needle and Cobb, 1997). Current national economic conditions and energy conservation policies have served to heighten the need for efficient, safe, and secure public transportation systems. However, high crime rates and general disorder has been shown to deter the use of mass public transit (Levine, Wachs, and Shirazi, 1986) at a time when responsible public officials are recognizing that increased use of public transit is one of the best ways to reduce excessive dependence on foreign oil. High rates of victimization have been found among transit users, which greatly impede governmental efforts to promote the use of public transportation. For example, one study found that transit users run twice the risk of being victimized as non-transit users in the same city (Thrasher and Schnell, 1974).

RESEARCH ON PUBLIC TRANSPORTATION

National attention towards increased security within public transportation is not new. In fact, since the early 1900s security has been a concern for transit companies with some allowing vehicle drivers to carry weapons in order to protect themselves from the public (Siegel, 1979). Widespread public attention to transit crime occurred in the 1960s and was directed at areas such as the New York City subway system and the Washington, DC metro. In 1980, the New York Senate Committee on Transportation held a National Conference to look more seriously at issues surrounding mass transit crime and problems with vandalism. The National Conference was led by the Urban Mass Transportation Administration of the U.S. Department of Transportation and 150 participants were in attendance from across the United States and Canada (Office of Transportation Management, 1980). This conference was the first and only of its kind on a national scale that focused on crime and disorder problems surrounding public transportation.

Today, it is now common for transit companies to hire their own transit police or contract private security companies for full-time deployment in response to increased crime and public concern surrounding public transportation. Responses to a recent survey conducted by the National Transportation Research Board found that transit security professionals recommend uniformed patrol as the "most effective" strategy for controlling crime on buses and trains. These patrols include fixed-post assignments at heavily trafficked transit centers, task forces, truancy sweeps, and a variety of other "high visibility" strategies (Needle and Cobb, 1997). Several research studies have found that basic problem-solving approaches have had a dramatic impact on crime within public transit.

Subway Systems

Major urban subway systems represent the public transportation systems that have received the most amount of academic attention. Some examples included New York City subway system. Throughout the 1970s, public restrooms in the New York City subway system were closed to combat crime. Vigilante groups patrolling the subway system known as the guardian angels became infamous due to the high crime. However, research showed the guardian angels had no real impact on

crime within the New York City subway during this time (Kenney, 1986). Today, the restrooms remain open to the public and the New York City subway system has reported 30-year lows in crime while ridership is experiencing 50-year highs. While it may be expected that more riders should equate to more chances for victimization, this has not been the case throughout the New York City subway system (Kelling & Coles, 1996). Design features included new fare gates causing a significant decline in fare evasions (Weidner, 1997) followed by drops in violent crime.

The London underground subway system has also experienced a great deal of academic and practitioner attention that has shown promising results. Design changes included a modification of ticket vending machines (Clarke, Cody, and Nataranjan, 1991) and like New York City automatic gates to prevent fare evasion (Clarke, 1993) leading to significant decreases in fare evasion and slug use followed by drops in crime. In addition, the implementation of closed-circuit television and new patrol techniques causes an 11% to 28% reduction in robberies throughout the London underground (Webb and Laycock, 1992).

In Australia improved cleaning, quickly covering up vandalism and immediate repair of anything broken led to a 45% improvement in train availability and a 42% decrease in crimes against transit employees (Carr and Spring, 1993). Others have found simply adding trained personnel to check tickets during rush hours can cause a 20% decrease in fare evasion (DesChamps, Brantingham and Brantingham, 1992). In the Netherlands, 1100 young unemployed people were recruited to monitor metro trains and buses in three large cities. Their efforts had a varied effect of 18% to 78% reduction in fare evasion and a 60% decline in general disorder crimes (vanAndel, 1989). One of the more significant studies on an urban subway system was conducted with the Washington, DC metro and although no preintervention measures were conducted, the Crime Prevention through Environmental Design (CPTED) approach was shown to be effective (LaVigne, 1997). The Metro subway system experiences lower crime rates than reported above ground.

Taxis

Taxi drivers face considerable risk of being victimized on the job. Mayhew (2000) reports taxi drivers have up to 15 times the average exposure to occupational violence. Wright (2000) from the Occupational Safety and Health Administration (OSHA) reports that taxi drivers were 60 times more likely than other workers to be murdered on the job. According to the Bureau of Justice Statistics, taxi drivers suffered from nonfatal assaults at a rate of 183.8 per 1,000 drivers- matched only by police officers (306 per 1,000) and private security guards (217.8 per 1,000) (Warchol, 1998).

The Center for Problem-Oriented Policing published a research guide that looked into robbery of taxi drivers (Smith, 2005) indicating what we know about most research on public transportation- lack of data and incomplete data. Despite this problem, the guide was written to assist law enforcement and taxi cab services to improve safety for the drivers and provides one of the most thorough reviews of crime against taxi drivers.

The 2006 Herman Goldstein award winner of the 17th annual problem-oriented policing conference went to the Deputy Director of Transport Policing and Enforcement for London, England Mr. Steve Burton. The project was entitled safer travel at night and was directed towards female passenger sexual assaults from unlicensed taxi cabs. The issue arose around who was responsible for addressing the rise in sexual assaults within the illegal taxi cab services. The issue of who is responsible for transportation safety is more fully addressed in Chapter 10 under conclusions and recommendations. A well developed marketing campaign directed towards the illegal cab service and educating women frequenting London's bar district not to utilize unlicensed taxis resulted in a three year decrease of 18 women to 10 women a month being attacked in illegal taxis and use of illegal taxis falling from 18% to 7% over the same time period (Burton, 2006).

Buses

Drivers of public transportation throughout the world face considerable risk. For example, Machado and Levenstein (2004) reported high rates of robbery and violent crimes against bus drivers throughout Brazil. However, most research on bus transportation has focused on the main terminals. Palmer, Hollin, and Caulfield (2005) evaluated a local

initiative in the city of Dunham (northeast England) in which probation officers used offenders to clean and redecorate the bus terminal after it was discovered that this location was a main hot spot for criminal activity. Pre- and post-test survey/interviews were conducted by the probation officers on transit users. Post scores showed significant changes in transit users' expectations of seeing a variety of deviant and criminal behaviors at the terminal and one-third believed crime was decreasing after the clean-up project. Transit users were found to exercise more informal social control over deviant behavior once they were less fearful and more comfortable at the terminal.

Felson et al. (1997) used a variety of criminal justice students to research the Port Authority main bus terminal in New York City. They analyzed 63 different reengineered environmental and patrol tactics and found a reduction in robberies, assaults, and general disorder. Previous to these innovative tactics the design of the bus terminal facilitated crime and allowed a safe haven for offenders and their customers (Felson, 2006).

Poyner (1988) analyzed closed-circuit television being hooked up to some buses and not others. Riders were generally deterred since they did not know what buses were actually videotaping their behaviors causing a steady decline in vandalism. Poyner and Warne (1988) also found that protective screens for drivers resulted in a 90% reduction in assaults on bus drivers.

The 2001 Tilley Award (England's version of the Herman Goldstein award for most innovative use of problem-oriented policing) went to Operation Seneca for analyzing and responding to crime surrounding bus stops from southeast London to Lewisham. Analysis of mapped data found that 75% of robberies and gang related violence occurred near five London bus routes. Responses to this problem included increased patrol of high truancy and gang/youth locations, overt closed-circuit security cameras monitoring high crime locations, shared mapped data with beat patrol, debriefing meetings with beat patrol, and leaflets distributed condemning illegal "selfish" parking and shaming robbers as "cowards." An assessment of these responses found 40 less calls for service per day and 50 less crime incidents reported each week. See: www.popcenter.org/LibraryTilley/2001/01-53.pdf

Despite these sporadic research initiatives, there is still ambivalence towards analyzing crime problems surrounding mass transit, especially in America where the automobile remains the primary means of transportation (Clarke, 1996). This ambivalence has led to conflicts

over policing and funding crime prevention projects within public transit systems, often at the cost of increased crime, especially as it relates to local bus transportation.

Most urban areas fail to adequately address transportation safety issues. The academic attention on public transit crime has been primarily focused on centralized bus terminals and underground subway systems rather than on wider and more plentiful bus stop locations. As previously demonstrated, most of these studies have analyzed the effects of cleaning up vandalism, increasing patrol, or eliminating fare beating. While new policing strategies directed towards fare beating and minor offenses have been attributed to a reduction in less serious crime (Kelling and Coles, 1996) these same initiatives have generally not been directed towards the open ecological locations of bus stops.

EXTENT OF CRIME WITHIN PUBLIC TRANSPORTATION

Thrasher and Schnell (1971) completed one of the earliest studies measuring the number of crimes within public transit. The study included 37 U.S. and 4 Canadian systems. The study concluded that the risk of being involved in a criminal incident is at least 2 times greater when riding in most major transit systems than in using other means of private transportation. Conclusions from the study indicate that personal security is an important factor in the decision making for people choosing to utilize public transportation and transit users will be deterred if the system seems to be unsafe. Further, transit crime is extensive in most large U.S. cities and the magnitude of the problem is far greater than is shown in published statistics (Thrahser and Schnell, 1971).

In one of the few studies that did focus on the risk of being victimized at bus stop locations, Levine and Wachs (1986) examined three bus stop locations where the largest number of crimes had occurred. Their findings indicated the factors contributing to crime differed for each bus stop location, suggesting that a site-specific analysis is required to determine the individualized security problem. The researchers suggested that each location should be examined separately to determine the root cause of the problem so that individualistic or unique countermeasures can be implemented to correct the situation.

Within most urban areas throughout the United States, mass public transit is more likely to be a public bus system. Unlike urban subway/train systems, there is far less information concerning bus crime and what research does exist has focused primarily on the interior of buses or fare dodging at the central terminal. Little research has been directed towards the open environments of bus stop locations in terms of analyzing the effects of ecological and physical attributes that surround bus stop locations. One exception is research conducted through the UCLA School of Public Policy and Social Research, which analyzed crime surrounding Los Angeles bus stop locations (Sideris, 1999). However, most of this research is limited by methodologies that do not take into consideration model testing, the use of official data, or the impact of latent social ecological attributes. Unlike the research conducted on bus stop locations by the UCLA School of Public Policy and Social Research, my research project quantitatively measured the social ecological correlates of crime as well as qualitatively analyze the physical attributes that surround specific bus stop locations.

A study released in January 2003 was conducted on the perception of crime among bus riders within Michigan, the same state utilized for my local research project. This research took place over a 2 ½-year period from 1998 through 2001 (Lusk, 2003). The research consisted of a case study approach and utilized several federal, state, and local funding agencies. This type of initiative highlights the desire for additional research directed towards urban bus safety. The research methodology included interviews, site visits, observations, surveys of bus riders, picture preference surveys and focus group discussions. Survey participants were asked about their perceptions of bus design features in relation to crime. Next, bus riders were shown pictures of buses in an effort to find reliability in the former survey perceptions of bus safety. Results from the study indicated that the appearance of buses and bus stop locations could be altered in a way that increases the perception of personal security for riders and potential riders (Lusk, 2003). While the design of buses and bus stop locations appear to effect fear of crime, the study does not test for the impact of surrounding social characteristics on bus stop crime or make use of measuring any type of official crime data that could further be used to rate the actual risk of specific bus stop locations. The research used for this book did make use of official crime data.

PURPOSE OF RESEARCH

Understanding geographic physical and social disorder in public spaces is fundamental to understanding urban environments (Sampson and Raudenbush, 2001). The research project used the 114 urban block group locations in Lansing, Michigan containing 638 bus stop locations as the main units of analysis. Block groups is used interchangeably with neighborhoods through this book. My main proposition states that crime stems from social disorder and the structural characteristics of certain locations throughout the city of Lansing, Michigan. Disorder and crime can be measured within specific neighborhood block group attributes. These attributes consisted of macro-sociological or structural determinants of crime (i.e., neighborhood disorganization and residential instability). In addition, the physical characteristics of bus stops can either promote or deter crime and direct correlations can be seen between crime rates and the built environment (Sideris, 1999). Perhaps the most promising implication of this type of research is that unlike railway transit stations, bus stops are not typically permanently fixed to the urban landscape and can be moved based on the results of spatial crime analysis. This allows for an inexpensive alternative for designing out crime.

In an effort to understand and measure social disorder surrounding bus stop locations, demographic data gathered from the US Census was mapped within block group locations of a Midwestern city. In addition, official crime statistics were mapped within these block group locations. An analysis of the impact of disorganization variance on crime consisted of testing a modified model of variables hypothesized by Sampson, Raudenbush, and Earls (1997) within the city of Chicago. The given demographics of Lansing, Michigan did not allow for an exact replication of the Sampson and colleagues (1997) factored latent constructs but every attempt was made to formulate a model that closely matched the constructs developed in the Chicago neighborhood research. The comparison model from Lansing, Michigan tested direct as well as mediating effects of informal social control on social disorganizations variables.

Next, a quasi-experimental design was used to spatially test the impact of bus stop locations on crime within a single urban environment. Areas with bus stop locations were compared to areas without bus stop locations after statistically matching the control and experimental areas according to predefined social disorganization vari

disorganization variables. Crime in areas with bus stop locations were matched and compared to areas without bus stop locations to determine if bus stops influence crime in the surrounding area. Lastly, this research references Brantingham and Brantingham's (1981, p. 25) advice for "drilling down into the data" or narrowing the focus within place-based research. In an attempt to empirically empirically support findings from the model test and bus stop versus non bus stop neighborhood comparisons, qualitative observations of hot spot bus stop locations took place during a seven-month period (June 2003 – December 2003). A predefined checklist of physical attributes and social patterns that represented defensible space and crime pattern concepts was used in a windshield survey during the observational periods. The windshield survey was designed to record visual and spatial impressions that define the bus stop location. The built environments surrounding the hot spot bus stops were analyzed to see if defensible space and crime pattern concepts were supported. This three-part mixed methodological analysis strategy included a holistic account of the ecosystem surrounding the bus stop locations, which extends research that would otherwise be limited by only including one specific methodology

A NOTE ON THE PLACEMENT OF BUS STOP LOCATIONS

The geocoding of bus stop locations throughout Lansing, Michigan was completed after a series of meetings with state and local governmental boards and private businesses. Most state government agencies have a separate Department of Transportation division. Public transportation planners consider attributes such as travel time, cost, comfort, convenience, and availability when evaluating and designing the location of bus stops but usually underestimate the safety aspect (Hoel, 1992). These branches of government focusing on transportation determine the amount of funding provided to local areas that is supposed to be spent on upkeep, route design, and potential safety programs. City bus routes often experience changes based on road construction, new area businesses, budget cuts, or community feedback. Funding for this service comes from state tax dollars and is dependent on governmental transportation budgets. Although several studies have been conducted at the state level strategically analyzing traffic flow, usage patterns, and bus maintenance scheduling, very few published studies exist that look specifically at safety issues

surrounding the location of bus stops. In essence, bus stop locations appear to be politically defined rather than located due to rider safety concerns.

The limited research conducted on bus transportation has found high rates of crime and disorder to be quite persistent (Levine, et al., 1986; Sideris, 1999) and a serious concern for public community officials. In fact, the roots of this book arose during a neighborhood action meeting I attended in which several community citizens expressed their displeasure towards police administrators and local politicians regarding crime and public disorder that surrounded several bus stop locations throughout the city used for this research. Attendees of the meeting included representatives from the city bus company, the Chief of Police and several other high-ranking police administrators, owners of a local contract private security company, streets and sanitation managers, several elected politicians, and area business owners. At this meeting, two local politicians requested that some specific high crime bus stop locations in the city be eliminated because it was their belief that the disorder and crime within the area could be attributed to the bus stop locations. However, these bus stops were not removed due to the need for public accessibility and an untested assumption that the bus stop itself was generating higher rates of crime and disorder. No scientific evidence existed at the time of this meeting to determine if these bus stop locations had actually impacted crime within the area surrounding the bus stop locations.

According to the bus company transit officials, bus stop locations are determined by public necessity. Officials further reported that police official statistics or other transit safety issues have never been utilized in determining the location of bus stops throughout the city. Police departments across the nation have not traditionally shared their crime data with the public or other government agencies. In fact, most departments do not analyze or geographically map data for their own purposes leaving them unable to determine if particular locations are found to be correlated to crime and disorder. Therefore, it is not customary for transportation officials to be knowledgeable about crime data surrounding public transportation (other than anecdotally), nor is it customary for police agencies to analysis and/or openly report crime data to outside agencies. However, recent arguments have called for the police to become more directed towards analyzing their crime data and become more assertive at sharing and shifting responsibilities to a

wider audience in relation to the crime data as well as non-criminal social disorder events (see Scott and Goldstein, 2005).

Throughout the research process, meetings took place with officials from the transportation authority that manages the bus system that was used for data collection purposes. These meetings took place in order to discuss the breadth of the given research project and to obtain the locations of each bus stop location throughout the given unit of analysis, Lansing, Michigan. Each of these bus stop locations was aggregated spatially to block group locations. During these meetings officials from the transportation authority stated that no one has ever researched crime problems surrounding the bus stop locations and safety/crime issues are not considered when determining where to locate bus stops. The process of selecting bus stop locations is typically made by Michigan's Department of Transportation that looks at data such as population density, area business needs, and public demand. Some of this same data is used throughout this book. For example, data from the decennial census provided information such as the percentage of people who report using public transportation to get to work or the percentage of people who do not own a car.

If an analysis of demographic data were done in regards to selecting bus stop locations, we could expect that bus stops would be concentrated around the highest percentage of individuals who do not own a car or report using public transportation to get to work. On the proceeding page, Figure 1.1 shows a map of block group locations for the areas with the heaviest concentration of bus stop locations, concentration of the highest percentages that use public transportation and clustering of the highest percentages that do not own a car. Four block groups made up the highest neighboring clustering for those that do not own a car (26-51% of residents in these block groups). Only one block group showed a high clustering of those who reported use of public transportation to get to work or for recreational purposes (12% of residents) and two block groups showed a high clustering of 19-25 bus stop locations.

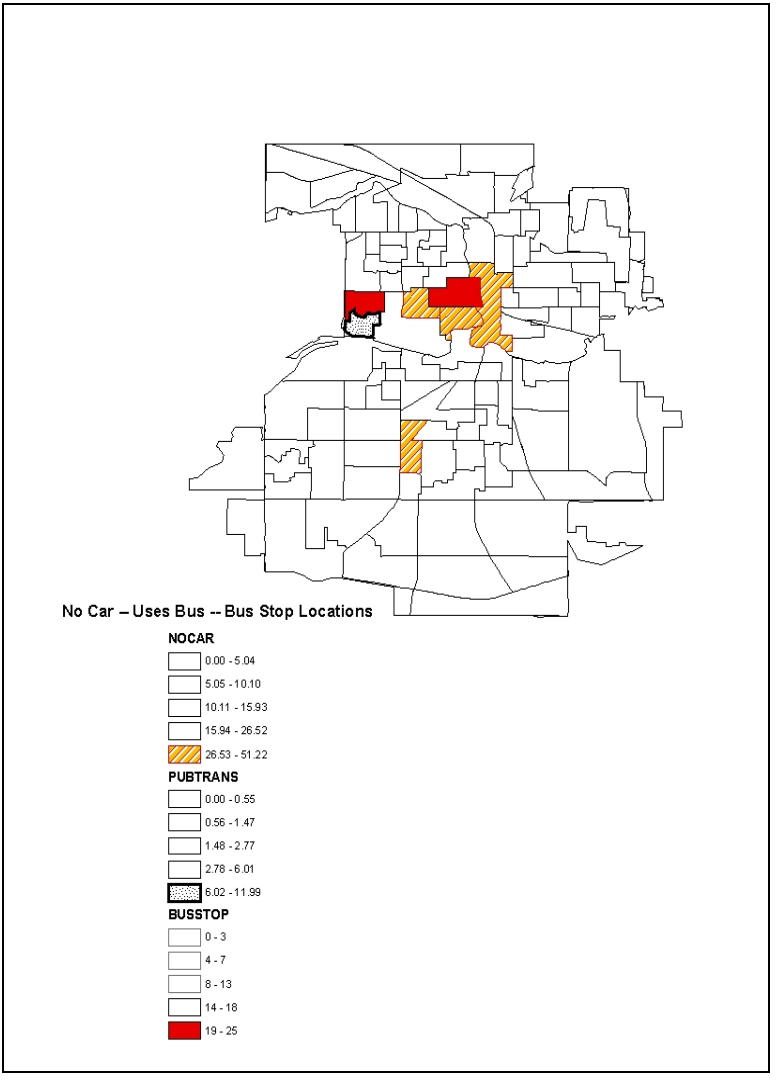
According to the given map shown in Figure 1.1 the clustering of bus stop locations appears to be well matched for providing services to those who report using or in need of public transportation. However, there is one block group where the population reports high rates of not owning a car that does not appear close to a clustering of bus stop locations. It is quite possible that this area has increased bus overcrowding, although this possibility was not tested for within the

given analysis. It is also quite possible that residents near the high clustering of bus stops report using public transportation because there are more available bus stop locations near their residency.

The limited amount of research directed at bus stops has shown that crime is spatially concentrated and temporally ordered (Levine et al., 1986; Sideris, 1999). This means that crime linked to bus stop locations has been found to occur nonrandomly in terms of space and time. Research for this book attempts to extend and test the reliability of these findings. Such evidence would indicate that resource allocation could be better served through use of past incident data analysis once an understanding of current demographic information is taken into account. Spatial analysis of crime will often utilize ecological theories that account for hot spot analysis and researching why some spatial areas become crime generators. However, spatial research focusing specifically on crime surrounding public transportation while accounting for both physical as well as social attributes surrounding bus stop locations is indeed unique and potentially useful for police resource allocation, transportation officials, businesses surrounding public transportation, and the general public.

Not taking into account crime and safety issues surrounding public transportation could be considered an ethical dilemma for police administrators as well as transit authorities. Thus, a concluding remark following the research presented throughout this text is for police agencies across the country to more effectively analyze their crime data, push for preventative policing responses following a thorough analysis of their data, and become more open as well as systematic in terms of providing organized data to all interested parties.

Figure 1.1. Clustering of bus stop locations, percentage not owning a car, percentage of residents reporting use of public transit.



Within the framework of needing more in depth data analysis and spatial crime research, it also became necessary to determine the effects of the social ecology surrounding bus stop locations. Although bus stops are public places, results from the research provided in this text argues that these locations are invariably affected by block group level social and specific place-based physical attributes that surround each location. Thus, the objective of the research was to test the impact of social attributes on crime within block group locations, compare bus stop locations and locations without bus stops, and qualitatively and systematically analyze those bus stop locations with the highest concentration of criminal incidents.

.

CHAPTER 2

Evolving Theoretical Discussions

A recent revitalization by environmental criminologists has refocused attention towards mapping out spatial characteristics of crime settings (Brantingham and Brantingham, 1991, 1993; Geason, 1989; Eck and Weisburd, 1995; Perkins et al.1993; Taylor and Harrell, 1996). Within spatial crime research, neighborhood units of analysis contain specific areas that are reserved for a narrow range of function. An example of one specific area that serves a particular function is a bus stop location. Most crime is highly concentrated around a small number of places (Brantingham and Brantingham, 1981) and routine activities theory (Cohen and Felson, 1979; Felson, 1994) predicts that crime will cluster in a few specific place locations. This clustering also remains relatively stable over time (Spelman, 1995). These findings suggest that there is something about a specific place location and the attributes that surround those locations that facilitate a disproportionate amount of crime, and something about other places that successfully prevents crime. Research data in the current study analyzed crime concentration in and around bus stop locations and drew heavily on opportunistic theories as proposed by environmental criminologists and social disorganization theories as proposed by social ecologists.

A timeline of environmental criminological research is hereby presented in terms of introducing the relevance of physical and social attributes that surround crime locations. The roots of spatial crime analysis began with early French mapping in the early 19th Century and 100 years later in the United States with the Chicago School ecological research. Criticisms of the Chicago School led to other techniques for conducting social area research, which were followed by the

environmental design movement. The environmental design movement was preceded by the spatial school with relevant analysis of street and traffic flow in terms of conducting research on bus stop locations. This research led to a closer analysis of community organization and crime locations through routine activities, situational crime prevention, and extensions of social disorganization theory. An understanding of the research progression provides the foundation for further analysis of bus stop locations as proposed through my project. Table 2.1 presents a summary of the historical evolution of environmental criminology beginning with early crime mapping initiatives in France and concluding with contemporary extensions of social disorganization theory that include mediating effects of informal social control. A more detailed analysis of these theories and research follows Table 2.1.

Table 2.1. Summary of environmental criminology.

Researchers – Theory	Methodology
Guerry 1833 & Quetelet 1842- Probability Theory	Mapping violent and property crime and compared spatial variance according to available social statistics
Shaw & McKay 1942- Social ecology, concentric zone model	Mapped official data and conducted life history case studies on selected subjects (offender focus)
Landers 1954; Bordua 1958; Shevsky & Bell 1955; Chilton 1964- Social area analysis, social disorganization	Multiple and partial correlation analysis, factor analysis (spatial focus)
Jacobs 1961- Social control with urban renewal and city planning	Anecdotal content- case study arguing that patterns of street and building architectural designs contribute to crime patterns
Jeffery 1971- Crime prevention through environmental design (CPTED)	Argued that certain blocks have the highest crime rates due to negative environmental attributes
Newman, 1975- Defensible space, territoriality	Regression analysis measuring social and physical variables
Cohen & Felson, 1979- Routine activities and rational choice	Macro-level proportions and risk ratios that spans space and time with emphasis on victim behavior/decisions

Researchers – Theory	Methodology
Brantingham & Brantingham 1991- Crime pattern, rational choice	Spatial analysis of crime through aggregate-level and micro-level analysis
Sampson, Raudenbush, and Earls 1997- Social ecology and social disorganization	Factor analysis, hierarchical modeling, surveys, interviews, systematic social observations of face blocks
Guerry 1833 & Quetelet 1842- Officially recorded violent and property crimes and social demographic data	Crime not homogeneously distributed, property and violent crimes geographically stable but varied spatially and seasonally
Shaw & McKay 1942- Arrests of juveniles over three different time periods, census data, housing and welfare records	Higher rates of social disorganization and transition correlate with higher crime
Landers 1954; Bordua 1958; Shevsky & Bell 1955; Chilton 1964- Education levels, rental property concentration, number of persons per room, percentage of vacant buildings and minority concentration	Findings mixed in terms of how significantly socioeconomic variables and ethnic segregation contributed to crime rates
Jacobs 1961- New York City housing and neighborhood design	Advised improving urban vitality through increased natural surveillance and clear demarcation between private and public space
Jeffery 1971- Focused on the physical design and physical environment	Small environmental design projects seen as more successful than defensible space projects (1990)

Researchers – Theory	Methodology
Newman, 1975- Residential welfare, number of entrances, structure size	Social variables predicted more crime than physical attributes but mediated or interacted with social variables
Cohen & Felson, 1979- Macro-level property crime rates over a 30 year time frame	Amount of time spent away from home significantly related to level of victimization.
Brantingham & Brantingham 1991- Varies by unit of analysis and includes physical and social indicators	Crime is not direct result of motivation but mediated by opportunity. Crime is not random and is predictable
Sampson, Raudenbush, and Earls, 1997- Census demographics factored to concentrated disadvantage, immigrant concentration, residential stability, and violent crime	Collective efficacy mediates the effects of social disorganization

HISTORICAL TIMELINE OF ENVIRONMENTAL CRIMINOLOGY

1830s (Guerry and Quetelet)

Beginning in the 1830s, French sociologists (Guerry and Quetelet) conducted some of the first research in scientific criminology (Vold, 2002). The French scholars were one of the first to use shaded maps of urban areas and analyze regional differences in property and violent crime (Sylvester, 1984). They were also interested in analyzing and explaining differences in crime based on varying social conditions of the residential population. They found that crime was not homogeneously distributed across the country, and that spatial differences existed. For example, Guerry tested the poverty-crime relationship and found that the wealthiest areas had higher rates of property offenses but only half the rate of violent crime, leading to the conclusion that opportunity was a more critical factor in criminality than poverty (Vold, 2002). Guerry attempted to account for the variation in crime by the differences in social conditions and changes in the legislation (Sylvester, 1984). The spatial variation in crime is the underlying discovery of environmental criminologists that seek an explanation. These findings were also of interest due to the stability of crime rates over time, a finding that was supported a century later in the United States through the University of Chicago.

1930s-1940s (Shaw and McKay)

The second wave of interest in spatial criminology began in the United States (Brantingham and Brantingham, 1981). Researchers at the University of Chicago developed a framework for an ecological approach to understanding the interaction between neighborhood environments and crime causation. The sociological emphasis at the university developed around studies of migration and city growth patterns. In their study *Juvenile Delinquency and Urban Areas* (1942), Shaw and McKay theorized that social relations and urban social structure relates to crime patterns in Chicago. Their original data came from records obtained from the Cook County (Illinois) Juvenile Court. They mapped the residencies of known juvenile delinquents in Chicago and found their neighborhoods were characterized by very high rates of residential turnover, low rates of home ownership, poverty, and high

unemployment. Using the Burgess model of concentric circles (Park, Burgess and McKenzie, 1925), Shaw and McKay used a zonal model explanation and showed the rate of delinquent residency was highest in areas adjacent to the central business district and neighborhoods that were in transition. Delinquency rates declined as distance increased outward away from the central business district and towards neighborhoods with greater stability. This phenomenon was explained by the theory of social disorganization and argued that delinquency rates were related to growth processes within the city.

Juvenile arrest rates throughout the city of Chicago were examined during three periods: 1900-06, 1917-23, and 1927-33. By comparing the rates of arrests during these different time periods, Shaw and McKay attempted to show whether delinquency was caused by new immigrant groups or by the environment in which the immigrants lived. If high delinquency rates for specific immigrants remained high in future generations as they migrated through different ecological environments, then delinquency could be associated to the environment. If delinquency rates decreased as immigrants moved through different ecological environments, then delinquency could not be associated with particular immigrants, but had to be connected to the environment. In comparing maps of average arrest rates throughout the city during these separate time periods, Shaw and McKay found that certain areas of the city had high crime rates no matter what immigrant group lived there. They concluded that patterns of delinquency remained constant over time in the same geographic areas and corresponded to the concentric zonal model.

Along with being responsible for the emergence of ecological studies in sociological research, the Chicago School represented a paradigm that encouraged a synthesis of qualitative and quantitative methodologies. As levels of analysis become more place specific, qualitative analysis often becomes useful for tying together quantitative social attributes. The social ecological foundation presented by Shaw and McKay also led to later developments in criminological theory such as Sutherland's differential association and Thrasher's (1927) mapping of locations where street gangs formed. Thrasher attempted to distinguish areas where gangs formed from nongang areas. Through these projects, researchers began to look more closely at social disorganization variables such as poverty levels, race, immigrant concentration, socioeconomic status, and overall residential stability.

Theories that evolved were based on these social variables and provided an outline for researching crime generating environments.

Several criticisms or points of differentiation should be noted with the work of Shaw and McKay that are relevant for the given research endeavor.

1. Their research still dealt with the criminal rather than crime sites. This allowed their research to maintain a positivistic doctrine of studying individual offenders in determining why people commit crimes. (Brantingham and Brantingham, 1981, p. 227).
2. The level of analysis in proceeding studies have moved from national to state to regional to city and intracity levels. The closer the analysis comes to the actual crime site the better conclusions a researcher can draw in terms of predicting which variables are influential to crime. Brantingham and Brantingham (1991) refer to this as the "cone of resolution" moving the research project to a more narrowed focus of analysis.
3. These early sociological works from the University of Chicago committed an ecological fallacy when explaining individual behaviors through aggregate level data. (Brantingham and Brantingham, 1981, p. 17; Davidson, 1981).

Ecological fallacies continue to plague spatial research today and often are a source of criticism. For example, Rengert & Wasilchick (2000) studied distance patterns of suburban burglary incidents for the offender's place of residency. Their data was collected ethnographically from individual offenders and their results were reported as aggregates of the suburban areas from which the offenses occurred. In another analysis, Capone and Nichols (1976) used aggregated robbery rates in Miami police data as a basis for drawing conclusions on individual behaviors. By making conclusions about an offender's rational decision making process based on aggregated data researchers commit an ecological fallacy. This occurs because aggregated data is used in attempting to explain individual-level behavior and statistical findings may vary if individual data is collected.

Another criticism made towards the Chicago School research is directed at their emphasis on the criminal (i.e., juvenile delinquency)

rather than on the crime site or on the social rather than on the physical environment. Research for this book attempts to divert these criticisms by analyzing the physical environments that surround crime while still allowing for attention on latent informal social control mechanisms that are hypothesized to mediate the effects of the ecological variables.

1950s (Extending Shaw and McKay: Social Area Analysis)

Sociologists of the 1950s began to focus on aggregate data, mainly through census tract variables that were readily accessible. Increased computer technology allowed for data such as income, housing, and racial composition to be more quickly analyzed statistically. Landers (1954) was one of the first to look at variables such as education, rental property, number of persons per room, vacant buildings, and percentage of minorities in census tracts. Several of these variables were combined through factor analysis leading to one variable labeled "anomie" from Durkheim's early research (Durkheim, 1893). The concept of anomie defined a lack of social integration and cohesiveness as the main explanatory variable of higher crime. Landers also reported that crime was not related to the socioeconomic status of the census tract. Bordua (1958) and Chilton (1964) contradicted Landers study and found that socioeconomic variables were highly significantly correlated to crime rates.

In another study, Shevsky and Bell (1955) used social control, urbanization, and ethnic segregation factors to explain crime in specific social areas. Although their research showed correlations between the predicting factored variables and crime, they did not provide causal meaning or directionality. For example, it is not known whether ethnic segregation affects social control and also crime or if all three are related to another variable. Because of these flaws, the Shevsky and Bell research was highly criticized by Brantingham and Brantingham (1984, p. 315). Specifically, criticism was directed at social area analysis that ignored space and location as variables in ecological research and the lack of theoretical development that flowed from this early research.

Baldwin (1979, p. 53) was even more critical towards these early attempts at social area analysis:

> "to return to the discussion of criminological applications of social area analysis and factorial analysis, we must, it seems,

> stress the sterility of each approach. This research has yielded many new insights, and despite the immense effort extended, our knowledge of delinquency areas has been scarcely advanced."

Baldwin (1979) also criticized these early studies for not being theoretically or empirically valid and falling into the trap of inferring individual behavior patterns from census tract data or the ecological fallacy. Also, Brantingham and Brantingham (1981, p. 17) point out the early confusion of criminal residence and crime locations. Most researchers used these terms interchangeably. Research questions about criminal motivation are assumed when analyzing offender's residency, which cannot directly be answered with ecological data. However, research that is concerned with the effectiveness of crime prevention policies and are directed towards analysis of crime sites can be addressed via ecological data.

Criticism of research during the early attempts at social area analysis led to the development of environmental criminology, mainly through the work of C. Ray Jeffery and Oscar Newman. Independent research by Jeffery and Newman attracted a multidisciplinary approach from criminologists, urban planners, geographers, environmental psychologists and architects to the study of criminal environments (Brantingham and Brantingham, 1981). Their work was appealing since it offered a way to design out crime and save enormous costs and time for the police, courts, and prisons. Jane Jacobs (1961) was first to introduce this argument for the necessity to conduct better city planning and architectural designs that create an environment for residents to more freely interact.

1960s (Jacobs' American City Structural Design)

Research in the 1960s-1970s focused on the structural layouts, architectural designs, and street patterns that surround concentrated crime patterns. Jacobs (1961) focused on the physical characteristics of where crime takes place in her pivotal publication, "The death and life of great American cities." Although anecdotal in nature, Jacobs was one of the first to point out that new forms of urban design broke down many of the traditional controls on criminal behavior and the ability of residents to watch the street day and night. Jacobs' work was:

> "an indictment of post-war urban planning policies that gave precedence to the needs of the automobile at the expense of conditions fostering local community life" (Clarke, 1980, p. 2).

She argued that streets are unsafe when they lack adequate surveillance, and properly built structures can increase surveillance and foster residential interaction, which will in turn prevent crime. Jacobs' contended that crime flourished in areas where people did not know and meaningfully interact with their neighbors. Within these areas, residents are less likely to notice an outsider who may actually be a criminal who is scanning the environment for potential targets or victims. Through this argument, Jacobs believed that more people would equate to more control and less crime. However, later research showed that taverns (Block and Block, 1995), night clubs (Ramsey, 1982), or even crowded bus stop locations (Sideris, 1999) can become hot spots for crime. This is especially true for socially disorganized areas that may encourage crime by providing more "coverage" for strangers to circulate (Angel, 1968; Brantingham and Brantingham, 1978). Jacobs' "planning" approach for increasing residential surveillance opportunities over-estimated the influence of natural surveillance and the physical environment on offending. More importantly, social cohesiveness and the willingness to intervene are critical in researching crime specific locations.

It has been further pointed out that creating better physical structures may not be enough and informal social control occurs only when residents make use of the opportunities to intervene in criminal or disorderly situations (Taylor and Harrell, 1996). In addition, potential offenders have to perceive that both surveillance and social control is active and that they cannot easily escape intervention if they behave disorderly or victimize a space user. These concepts are especially challenging in terms of mapping and researching public spaces. It is not enough to test for negative physical attributes. There must also be a holistic understanding of the social ecology that surrounds these locations.

1970s (Newman's Defensible Space Theory)

Criticisms of Jacobs' theories led into Newman's architectural research and 1973 publication of *Defensible Space Through Environmental Design.* Newman's work is perhaps the most well-known link from the built environment to the individual offender's behavior (Brantingham and Brantingham, 1991). Newman claimed that the physical or built features surrounding specific places could contribute to decreases in social control capacities of crime suppressors. Roncek and Francik (1981) backed up Newman's findings when their research showed that elevated crime levels were present in and near public housing facilities, even after controls were implemented for residential population and other social variables. Their study provided support for the facility itself serving as a criminogenic role independent of the space users.

Newman (1973) argued that crime would be high when public housing designs prevent residents from exercising proper surveillance and informal social control over their environment. Informal control mechanisms evolve from natural surveillance, image and feelings of territoriality among the space users. Newman defined surveillance as the ability of inhabitants to observe the territories they use in their daily activities. Image is the stigma (positive or negative) attached to the physical space. Areas with vandalism or broken windows have a low image leading to increased crime (Wilson and Kelling, 1982). Territoriality arises from feelings of possessiveness or belonging that space users maintain. Newman recommended that housing should be designed in a way that gives residents better surveillance of vulnerable areas (e.g., stairways, outside courtyards, etc.) and increases a sense of territoriality.

Newman (1975) attempted to prove his theory in two ways. First, he analyzed 70,000 criminal incidents in 133 public housing complexes in New York. He found that most crime occurring in the housing complexes were in elevators, stairways, or hallways. Important to Newman's findings were those crimes occurring away from public view. Second, Newman compared two housing complexes and found low crime in the one that had more defensible space mechanisms in place. Newman assumed that areas where natural surveillance was high informal social control would also be higher. Despite the interesting findings supporting defensible space, Newman was criticized for not considering the origins of informal social control or the true origins of crime (Taylor and Gottfredson, 1986).

Other criticisms were directed towards the generalizability of Newman's work outside of the United States. Newman's social control/defensible space model was found to be inaccurate through replicated studies comparing London's high-rises with low-rise housing. According to Newman (1975), high-rise housing projects should have lower rates of surveillance and territoriality than low-rise housing equating to higher crime. However, Mayhew (1979) found that the principles underlying defensible space did not hold up in London and high-rises experienced lower crime than low-rise housing.

Others have argued that defensible space is based on several untested and erroneous assumptions such as Newman's assertion that people will naturally exercise a policing function and make use of surveillance (Taylor and Gottfredson, 1986). Mayhew (1979) points out that there is a lack of territoriality among the average citizen despite the level of natural surveillance. Only people employed to exercise surveillance and social control (i.e., police, private security, or employees) will actively intervene and report crimes to the police (Taylor, 1997). Oc and Tiesdell (1997) argue that:

> "by prematurely dismissing social factors it may nullify attempts to make use of the theory to control crime" (Oc and Tiesdell, 1997; p. 55).

In this context, it is necessary to take into account different levels of territoriality. Murray (1983, p. 107-122) defends Newman's revised crime control model by extending the caveat that defensible space is least effective in places with the worst crime problems, whereas defensible space is effective in neighborhoods where people are already allied.

Newman's reformulated defensible space theory (Newman, 1975; Newman and Franck, 1980) became less physically deterministic and directed more towards territoriality. Newman (1975) found that social characteristics of residential populations were stronger predictors of crime rates than the physical characteristics of design. This finding came from 1967 New York City Housing Authority Police Data within 87 public housing units. Through a multivariate regression analysis, the social variables were found to be more prominent in predicting crime rates with percentage of residential population receiving welfare being the highest predictor of crime. In analyzing the physical factors, Newman looked at the height of housing developments, number of

entries to each building, and the total number of dwelling units in each building. Each of these physical aspects was found to correlate significantly to crime, although at lower rates than the social attributes.

These findings were significant in terms of social and physical theoretical integration and extending defensible space theory. Newman argued that physical characteristics can either reinforce or counteract levels of social control by residential inhabitants. Thus, the larger the low-income housing projects are with fewer entry points and the more low-income residents surround the housing projects, the higher crime is expected. Although socioeconomic characteristics were independently the strongest predictors of crime as found through multivariate regression analysis, the physical characteristics of the buildings were also found to mediate these effects. The size and form of the residential environment occupied by low-income families could either mitigate or aggravate the problems the residents faced (Newman, 1975). The highest crime housing projects were found to consist of the worst mixture of social and physical attributes.

Although not tested for directly, a primary mediating effect discussed by Newman (1975) was neighborhood cohesiveness or life-styles of residential inhabitants. According to his argument, a high degree of recognition among neighbors has been shown to produce low crime. This recognition is the product of residential similarity defined by shared ages and lifestyles, the number of years of continued residency in the same building, and the degree of interaction among the residents resulting from shared life-styles. Increased recognition of one's neighbors leads to higher levels of territoriality or sense of ownership that residents have in ensuring their own safety and residential well-being.

Newman's arguments are especially challenging for researching public spaces such as bus stop locations. It is not enough to test for negative physical attributes. There must also be a holistic understanding of the social characteristics that surround bus stop locations, especially in terms of mediating the effects of social cohesion on traditional disorganization variables and crime. Within this type of framework, it is predicted that social disorganization variables will affect both crime and informal social control levels.

The absence and need for testing the mediating effects of territorial social control on disorganization was summarized in a report by the National Institute of Justice (NIJ) (Rubenstein, 1980) in which the researchers argued that concepts such as territoriality, image, and social

cohesiveness were not being effectively defined or operationalized. The research report pointed out that models being presented were flawed and lacking the use of potential intervening variables between the environment and crime. Encouragement was directed towards better defining concepts such as territoriality and social cohesiveness as intervening variables in order to make links from both the social and physical environment to crime.

1970s (Jeffery's Crime Prevention Through Environmental Design-CPTED)

Newman's work in developing defensible space concepts for urban space users led to several national funding programs to implement crime prevention through environmental design (CPTED). C. Ray Jeffrey coined the term CPTED in his 1971 publication. The concept is rooted in psychological learning theory of B.F. Skinner and the role of that the physical environment plays in the development of pleasurable and painful experiences for the offender. This approach to crime prevention involves taking proactive action against crime before it occurs, which stands in stark contrast to criminal justice model that waits for crime to occur. Jeffrey separates CPTED from defensible space by arguing that crime prevention is either 1) physical design affecting the physical environment, or 2) social control affecting social surveillance (Jeffrey, 1990). According to Jeffrey, his CPTED model is based on an ecological model of the physical environment and its interaction with the physical organisms. The human-made environment is critical to his model as are the characteristics of individual crime sites, such as the type of building, location of streets, parking lots, bus stops, etc. Jeffrey argues that the physical environment can be used to control behavior by removing the reinforcements for crime and unlike defensible space projects, CPTED strategies have been more successful (Jeffrey, 1990).

However, the similarities between defensible space and CPTED strategies are more apparent than the contradictions. Others have pointed out that the physical design of place structures can increase territoriality, which has been defined as a sphere of influence that arises in space users who develop a sense of proprietorship over the space they occupy (Crowe, 2000, p. 23). Jeffrey also argues that the physical environment affects levels of social control and the nonrandom nature

of criminal events and the CPTED model offers a multidisciplinary analysis of urban environments and crime.

> "Crime rates are highly correlated with the physical features of the environment, such as streets, parks, buildings, highways, and public transit. Most areas of the urban environment are crime-free; crime is very selective where it occurs. Some blocks have many murders and robberies, others have none. Crime prevention involves the design of physical space. This is a joining of urban design, environmental psychology and social ecology into a meaningful relationship" (Jeffery, 1978, p. 160).

This type of interdisciplinary approach is useful for studying both the physical and social attributes that affect crime in and around bus stop locations.

Recent NIJ research suggests several ways in which CPTED and community policing initiatives should be coordinated to move towards a comprehensive approach for improving community security (Fleissner and Heinzelmann, 1996). Basic principles outlined include using traffic diversion to control and promote neighborhood cohesion and reducing criminal opportunities through territoriality reinforcement. This would give residents a sense of security in the settings where they live and work. Community policing programs that encourage informal control of the environment are believed to contribute to reduced crime and enhanced quality of life (Greenberg, 1985). Strategies to enhance defensible space can be initiated by both the police and residents through a combination of CPTED and community policing philosophies.

1980s (Brantingham and Brantingham: The Spatial School)

Through a focus on designing environments to impede crime, came new research and theoretical development that analyzed where and when crime occurred. In the 1980s, researchers began to look at the behavioral settings in which crime occurred with a focus on the environmental choices made by offenders. Paul and Patricia Brantingham (1981; 1984) studied the spatial patterning of burglary rates and formulated a spatial choice or crime pattern theory. Within their theory, they argued that offender behavior is normal and rational

and they will operate most often near their home residency or within their normal daily activities. As offenders travel, they begin to develop mental maps or 'awareness space' of their surroundings. Certain places within these surroundings become crime generators due to some recognizable physical and/or social negative attribute(s). The more negative attributes that are present the greater the opportunity to commit crime.

Further arguments are made that crime occurs not as the direct result of motivation, but is mediated by perceived opportunity. In this manner, Brantingham's foundation fits assumptions of rational-choice theory and situational crime prevention (Clarke, 1980; Cornish and Clarke, 1986). The perceived opportunity is influenced by the distribution of opportunities, which can include various disorganization variables and signs of residential transience. Since criminals are not seen to strike targets or victims randomly, urban structures can be analyzed to discover how people interact. These findings can then lead to predictions that are more coherent on the spatial distribution of crime as well as explaining some of the variation in the volume of crime between urban areas and between neighborhoods.

Central to crime pattern theory are notions of 'nodes' 'paths' and 'edges'. Nodes represent departure and arrival points in the journey. The Brantinghams used a bus stop location as an example of a node. Other examples include home, work, school, or leisure activity locations. Paths represent the journey between the nodes. Offenders find targets of accessibility while conducting their personal activity in and around the nodes and paths. Most often people will offend or be victimized within their daily paths. However, other crimes are likely to occur at the edges or boundaries of the paths. In these instances, offenders make a concerted effort not to be recognized. These crimes are more likely to include face-to-face violent encounters such as armed robberies.

In addition to crime type, the timing of offenses is an important area that has been analyzed through temporal spatial analysis. Much like the nonrandom spatial nature of crime the timing of these events has also been found to be nonrandom (Ratcliffe and McCullagh, 1998). Temporal mapping is able to show crime disproportionably occurs at select hours of the day, days of the week, or months out of the year with links made to pedestrian path flows. Areas of interest can include bars closing, children being let out of school, people boarding buses or

any other processes that would influence the crime patterns and path flows from different nodes.

In an expanded theoretical development of crime pattern theory, Brantingham and Brantingham (1996) theorized that certain places become 'crime attractors' or 'crime generators' due to their locations and site structure that draw people together who, if it were not for the location, would not be together. The 'crime generator' theory has implications for research on bus stop locations since many bus stops often become areas of high activity as a side product of its actual purpose. People will often socialize and congregate at bus stop locations even when they have no intention of actually using the bus. Due to the level of accessibility to the public, certain bus stop locations can become crime attractors. However, according to Brantingham's school of thought, bus stop locations can also become crime detractors. This refers to something in the physical and/or social structure that may be discouraging offenders, such as the presence of natural surveillance or neighborhood watch signage that is supposed to signify an attempt to increase territoriality among legitimate space users.

The Brantinghams argued that transportation systems, especially major intersections, represent major-crime areas. Human activity flows along major transportation routes, such as public transportation. Urban development is present in areas where major transportation routes intersect. Therefore, bus stop locations that are used more frequently should also experience more frequent crime. The design of streets and public transportation also affects crime through the level of accessibility that is present to potential offenders. For example, it has been argued that dead-end streets, cul-de-sacs, and one-way streets should project a private atmosphere that will cut down on stranger access and increase the presence of legitimate space users (Enger, 1997). Newman and Wayne (1974) looked specifically at this issue in comparing public and private streets adjacent to one another in St. Louis. They found that streets maintained by residents through landscaping, gates, or other features had less crime and more interaction between the residents as compared to other public streets. Although these findings are encouraging, comparability did not actually exist in this study between experimental and control groups.

Other studies have found that more accessible streets with higher pedestrian traffic will experience higher rates of crime (Beavon, Brantingham, and Brantingham, 1994; Buck, Hakim, and Rengert, 1993; Jeffery, Hunter, and Griswold, 1987; White, 1990). Duffala

(1976) looked at pedestrian traffic over a 24-hour period in two urban cities. Findings showed that establishments in high-traffic areas were more vulnerable to crime than those that were in low-traffic areas. The interest of the current research is to determine if similar findings will result when systematically analyzing high crime bus stops and to determine if high pedestrian traffic results in high crime.

Brantingham and Brantingham (1981) made note of the concentration of certain crimes in identifiable places adding to the obvious value of place-based analyses of crime. Sherman (1995) defined hot spots as:

> "small places in which the occurrence of crime is so frequent that it is highly predictable" (p. 35).

The concentration of crime among repeat places is more predictable than repeat offenders (Spelman and Eck, 1989). By knowing when and where crimes are likely to happen allows for the police or other guardians to be present to prevent it. Knowing the distribution of crime allows crime analyzers to explore further the surrounding factors that may be causing the crime to occur. Sherman et al. (1989) conducted one of the first research studies to quantify concentrations of crime in relatively few places. Their study found that 3.3 percent of addresses in Minneapolis created 50.4 percent of all calls for police service. Replicated studies have shown similar patterns (Pierce, Spaar, and Briggs, 1988; Sherman, 1992; Weisburd and Green, 1994).

Research that examines the spatial distribution of crime has demonstrated that specific uses of space and population characteristics are associated with being part of crime hot spots. For example, Roncek and Maier (1991) found a positive relationship between crime and the number of bars located in city blocks of Cleveland. Crime was even greater when bars were located in areas rated as having low guardianship. Interestingly, half of the top ten hot spots identified in Sherman, et al.(1989) included the presence of bars. Cohen, Gorr, and Olligschlaeger, (1993) found that drug hot spots tended to be in areas with condemned residencies/buildings, or areas with high poverty and family disruption as measured by percentage of female-headed households. The goal of this present study is to conduct a similar analysis of hot spot bus stop locations.

When determining if hot spot locations contribute to crime in any type of causal way, it is important to determine if the observations are

systematic (meaning regular and predictable) or just random occurrences. If hot spots are random and occur nonsystematically, then crime does not depend on the distinctive features of the place specific locations. In addition, crime reduction efforts that target those features are likely to fail based on flawed scientific evidence. Researchers are warned about the critical nature of carefully identifying hot spot locations with methodologically sound analyses that utilize extensive data over long time periods before linking crime to space (Anselin, et al.2000).

1980s-1990s (Felson and Clarke: Routine Activities and Situational Crime Prevention)

Around the same time as the spatial school was being formulated under the direction of Brantingham and Brantingham, a renewed interest in the ecological and social disorganization perspective took place though various victimization studies. The analysis of the spatial school (Brantingham and Brantingham, 1981) coincides with much of the research and foundation supported by routine activities theory (Cohen and Felson, 1979) and situational crime prevention (Clarke, 1983) in terms of reviving research on the location of crime. Routine activities theorists sought to extend the ideas of Shaw and McKay (Bursik, 1988) with the exception of focusing on crime incidents rather than offenders and discovering why certain places maintain ecological stability over time.

Routine activities theory was introduced by Cohen and Felson (1979), and refined by Felson (1987, 1994). It became especially relevant to crime pattern theory (Brantingham and Brantingham, 1993), with place-based crime research becoming the central focus. The routine activities approach incorporated previously underutilized contextual variables including community organization and crime location as predictors of potential victimization (Cohen and Felson, 1979).

The foundation introduced by routine activities calls for naturally occurring crime prevention alternatives to limit offender opportunity. Criminal opportunity and criminal victimization theories stress the convergence of motivated offenders, suitable targets, and the absence of guardianship in time and space (Cochran, 2000). Routine activities theory predicts that specific place locations will become crime generators through the normal occurring social activities of the space

users and the best strategies for reducing crime should be directed towards those routine pathways. The theory further argues that a large percentage of criminal offenses and general disorder is related to everyday patterns of social interaction and as patterns of social interaction change so will the number of offenses (Cohen and Felson, 1979). The term *routine activity* refers to any commonly occurring social activity that provides for basic needs, such as the use of public transportation.

Routine activities theory is concerned with the reasons why certain groups of people are at a disproportionate risk for victimization. Proponents of the theory argue that patterned lifestyles and daily activities lead to skewed victimization rates, and that opportunity is the cornerstone for all criminal behavior (Felson and Clarke, 1998). Reducing these opportunities leads to a reduction in overall levels of crime with little displacement effects (Felson and Cohen, 1980). The opportunities arise through the normal everyday movements and activities of both potential offenders and victims, making the likelihood of crime highly situational.

Situational crime prevention research encourages integrating several theories that are traditionally neglected in prior work through an examination of crime prevention techniques (Clarke, 1988). Routine activities theory has direct links to situational crime prevention strategies (Felson and Clarke, 1998) and environmental criminology. As is the case with routine activities, situational crime prevention also draws on rational choice and lifestyle theories. Since rationality of offenders is an assumption, policy implications are directed at reducing opportunities to commit crime by increasing the effort and risks while also reducing the potential rewards from crime (Clarke, 1992). Situational crime prevention can be easily incorporated to an analysis of bus stop locations since the focus is placed on those locations rather than on the offender. Additionally, crime mapping allows researchers to determine what locations have the highest amount of crime.

By definition, crime mapping is the "process of using a geographic information system to conduct spatial analysis of crime problems and other police-related issues" (Boba, 2005, p. 27). Crime maps are useful for understanding and locating areas where opportunities are highest and developing methods for blocking these opportunities (Matthews, 1992). Situational crime prevention focuses on changing the physical surroundings that can affect crime (Clarke, 1992). From an administrative perspective, an interesting argument within the

situational and routine activities crime prevention perspective holds that the analysis of physical space:

> "is promising because, once understood, available technologies can be used to modify patterns and abate crime without doing significant damage to basic human rights" (Brantingham and Brantingham, 1981: 18).

Both situational crime prevention and routine activities theory utilizes an ecological assumption that criminal events occur when motivated individuals and unguarded targets come together in space and time. Like situational crime prevention, routine activities theory is part of what has been referred to as the integrative "criminologies of everyday life" (Garland, 1999). These related criminological theories include rational choice, routine activities, and lifestyle theory. Rational choice is a critical assumption of routine activities (Clarke, 1995), which argues that crime is committed by rational individuals who balance opportunities hedonistically through a cost-benefit analysis (Cornish and Clarke, 1986). Routine activities theory argues that researchers should:

> "focus on crime incidents rather than on offenders themselves, examining how these incidents originate in the routine of everyday life" (Felson, 1994: p. xii).

Lifestyle theories argue that victims' lifestyles, including work and leisure activities, contribute to differential risks for victimization (Hindelang et al.1978). For example, use of public transportation during weekend evenings may put users at more risk than during a weekday morning commute. Temporal crime mapping allows for a more thorough analysis of when and where victimization may be highest and these findings can be linked directly to lifestyles of the space users.

Through this type of foundation, crime can be explained through the convergence of motivated offenders, suitable targets (e.g., a vulnerable person at a bus stop location) and the absence of capable guardians against crime (e.g., lack of surveillance of the bus stop from surrounding residencies or an unwillingness to intervene in situations of victimization/disorder). These three elements make up routine activities theory and argue that crime prevention strategies should be

directed at preventing one or more of these three factors. For example, city planners may consider routine activities when deciding where to place bus stop locations. Surveillance may be increased and guardianship better promoted among bus stop locations that are placed in areas of low visibility or weak territorial social control. Thus, a thorough analysis of the crime location is an important component for utilizing routine activities theory and situational crime prevention.

Increasing guardianship and limiting the vulnerability of targets is the basis for situational crime prevention. This includes reducing crime through environmental design that utilizes defensible space concepts. Situational crime prevention is particularly relevant to urban bus stop locations in terms of qualitatively analyzing the overall environment of bus stops. This type of approach argues that changing offenders' lifestyles so they do not commit crime is a very costly and time-consuming venture. In addition, Felson and Clarke point out that:

> "statistical analyses used to unravel individual causes of crime are highly complicated and seem to go in circles. We see no immediate prospect of success in resolving the many controversies about what causes individual crime propensities" (1998, p. 2).

Situational crime prevention is unique in this matter since most criminological theories focus attention on the individual offender's behavior rather than on why individuals are or are not criminally inclined in different environmental circumstances. Situational crime prevention focuses on the criminal event and the location of the crime rather than the offender (Clarke, 1980). Since every crime needs a physical opportunity to occur, target hardening the environment may be one solution to preventing crime. Based on this theory, empirical observations of high crime bus stop locations were predicted to yield evidence that defensible space mechanisms are lacking, and are present within low crime bus stop locations that are otherwise similar.

Through this type of analysis of bus stop locations, it becomes critical that early ecological roots from the Chicago School are taken into account. As is the case with routine activities, the Chicago School perceived human behavior as being social and at least partially a product of the social environment in which their routine activities take place. These environments provide the cultural values and definitions for appropriate behavior and disorganization within these environments

is measurable through family disruption, low socio-economic status, high concentration of immigrants, or high levels of residential transition. When social disorganization begins to occur, routine activities are also disrupted. Therefore, when theoretically analyzing crime through routine activities, it is also important to recognize that changes in routine paths can be affected by social disorganization and these social variances must be accounted for within any type of spatial analytic research.

Bursik and Grasmick (1993) presented a systematic model of neighborhood victimization that integrated a revised version of social disorganization with routine activities theory. Their main thesis was that routine activities mediate the effects of structural organization in terms of victimization patterns and different levels of guardianship. Patterns of routine activities are linked to neighborhood social order. In testing their hypotheses, the researchers used data from the Chicago Neighborhood Study (Taub, Taylor, and Dunham, 1984). Their main hypothesis stated that the effects of routine activities on victimization would be invariant among neighborhoods with similar social orders and the effects of routine activities would vary across neighborhoods with different social order characteristics. They used burglary and vandalism as their criterion (dependent) variables. Tests for variance across different neighborhood structures uniformly supported their framework showing that routine activities are affected by social disorganization variables.

Within research directed towards crime surrounding bus stop locations, it is necessary to account for the routine activities of transit users but also the surrounding social attributes that affect their pathways. Sampson and colleagues (1997) proposed that both crime and social disorder stem from structural characteristics present within certain neighborhoods, most notably poverty concentration and residential instability. These social constraints promote increased crime and disorder, but also inhibit informal social control mechanisms that can mediate disadvantage, or lessen its impact on crime within specific neighborhoods or built environments, such as bus stop locations.

1990s (Sampson: Social Ecology)

Technological advances in computer capabilities have provided the catalyst for recent analytical advances in the methodologies available

for analyzing place-based crime data. Computer mapping applications and geographic information systems (GIS) are the fundamental application for measuring and displaying spatial relationships in ecological data analysis. Advances in representing computerized police records within neighborhood relationships have created a revival in contemporary ecological studies of crime. Contemporary social ecology research has evolved into a more specific focus on spatial theories of crime with references made to defensible space concepts, crime pattern theory, routine activities theory and situational crime prevention (e.g., Sampson et al.1997).

Specific focus has been placed on the need to more efficiently define and operationalize social cohesiveness as part of an extension from earlier Chicago School research (LaFree et al.2000; Sampson et al.1997; Sampson & Groves, 1989). Sampson (2001, 1995) and colleagues (Sampson and Morenoff, 2003; Sampson, Squires, and Zhou, 2001; Sampson & Groves, 1989; Sampson, et al.1997) have utilized a community social organization model by building on Kasarda and Janowitz (1974) and extended the ecological model by analyzing how community members become empowered to take action against crime and outsiders despite their socio-demographic makeup. Indicators of social disorganization tested under this model include population density/heterogeneity, impoverished areas, non-native residents, family disruption (as typically measured through female-headed households), and residential mobility (Baldwin and Bottoms, 1976; Bottoms and Wiles, 1986; Bursik and Grasmick, 1993; Sampson et al.1997; Shaw & McKay, 1969). These variables are seen as impediments to how well space users know their neighbors and would intervene or recognize an outsider. All of these variables are hypothesized to ultimately affect cohesiveness, which mediates victimization risk. The inclusion of multiple disorganization indicators is meaningful and has precedent from early ecological research.

Shaw and McKay found that the most significant indicator for predicting crime was levels of concentrated poverty (1942, p. 320). A main part of the social disorganization variation encompasses economic status, which is found throughout ecological studies that transcended the earlier Chicago School model (Bordua, 1958; Chilton, 1964; Lander, 1954). However, the findings of these prominent studies are mixed. Lander (1954) and Bordua (1958) argued that if home ownership is controlled within a multivariate analysis, the effects of poverty on crime are weak. Gordon (1967), however, is highly critical

of Lander and argues that poverty is a very strong predictor of delinquency. Sampson and Groves (1989) found that neighborhoods with poor socioeconomic conditions had higher burglary rates and lower rates of informal social control than did wealthy neighborhoods. In addition, Kornhauser reviewed multiple studies on ecological crime research and concluded that correlations between poverty and crime is secure (1978, p. 100). While most ecological studies have demonstrated a positive bivariate relationship between poverty and crime, there is ambiguity once variables are controlled through multivariate analyses (Byrne and Sampson, 1986), and more advanced structural modeling techniques are necessary. A disentanglement of variables such as racial composition, family disruption and economic levels within the social ecology of crime was a major focus for the first part of my research project.

Studies that look only at economic distress may be inadequate at measuring the ecological effects on crime in their totality. For example, family disruption has been shown to be an important component affecting informal social control throughout neighborhoods (Samspon, 1986) by reducing effective guardianship (Cohen and Felson, 1979), especially in the case of increased juvenile delinquency. Sampson (1986) argues that ecological studies testing race and socioeconomic status (SES) are misspecified when they fail to account for a community's family structure. Both race and SES status have been found to be positively related to rates of divorce and female-headed households, so there is a possibility that causal inferences made towards race and poverty are actually due to family disruption. Thus, ecological analyses of crime-specific place locations should take into account race, SES, and family disruption variables. In addition, Sampson and Laub (1993) indicate that variables of family disruption and residential stability tend to have stronger effects on crime than racial composition or income inequality. From these findings, Sampson (1993) argues that studies emphasizing only economic and racial factors (e.g., subcultural and strain theorists) are also misguided.

Neighborhood-level research generally analyzes the following ecological predictor variables influence on crime: percent minority, poverty, public assistance, unemployment, social transition, proportion of youth, and concentration of immigrants. As is the case with analyzing various economic variables, the levels of multivariate correlation between these predictor variables and crime is often blurred due to collinearity problems, but still follow the tradition of the early

Chicago School sociologists. Byrne and Sampson (1986, p. 4) point out that the importance of ecological research is relative and can be misleading since there is great variation in:

1. Dependent variable data sources (e.g., UCR, victimization surveys)
2. Statistical analyses (e.g., bivariate, multivariate)
3. Different levels and units of analysis (e.g., intercity, intracity)
4. Sample sizes and cities used vary considerably (e.g., populations 4,000 to over 100,000)
5. Different research designs utilized (e.g., cross-sectional, longitudinal)
6. Different measures and types of predictor and criterion variables used between studies (e.g., only economic distress or racial minority percentage).

The need for ecological research reform led to a large multilevel study under the Project on Human Development in Chicago Neighborhoods (PHDCN). Research used to write this book attempted to mimic the PHDCN Chicago Sampson study, although some alterations were made due to differences in a factor analysis and financial inability to survey individual households. While there are some differences from the well-funded PHDCN Chicago study, comparisons were attempted to retest collective efficacy hypotheses and determine control neighborhoods for testing the crime impact of concentrated bus stops.

Therefore, the primary reference for utilizing a comparison ecological model in my study is the Sampson and colleagues (1997) study of Chicago neighborhoods and is often referred to throughout this book as the comparison model. In their ecological study, Sampson and colleagues (1997) tested the hypothesis that collective efficacy is linked to reduced violent crime. Unlike guardianship (Cohen and Felson, 1979), collective efficacy (Sampson et al.1997) argues that surveillance is not enough and space users must be willing to intervene when they witness disorder or criminal incidents. Collective efficacy was defined as a working trust and shared willingness to intervene in informal social control. This follows the definition of self-efficacy, which can be defined as one's belief in their ability to influence outcomes or events

(Bandura, 2000). Sampson and colleagues (1997) argued that collective efficacy may increase with community member's ties to their neighborhoods and decrease when these ties are weak.

The collective efficacy hypothesis predicts that residents can overcome the sociological effects of disorganization if there is a mediating effect of community stability. This type of foundation is useful from a spatial analysis perspective because it allows for the potential of layering social data into maps and making predictions on where hot spots may be located based on demographic data and how levels of neighborhood cohesion may mediate the effects of these demographics. However, a major conceptual limitation of past ecological research is the lack of attention directed towards operationally mediating the effects of community characteristics on crime (Byrne and Sampson, 1986). While most ecological studies will analyze the effects of census variables on crime in order to infer support for a specific theory, often there is a lack of empirical evidence shown in model specification for testing any mediating effects. Both the Sampson and colleagues (1997) Chicago research and the my comparison model tested collective efficacy mediating effects on crime.

Sampson and colleagues (1997) retrieved their independent variable data from multiple sources in 343 Chicago neighborhoods and their dependent variable data from police records showing officially recorded crime in these neighborhoods throughout 1993. The Chicago research also included systematic observations (SSO) of both physical and social disorder. Qualitative signs of physical disorder observed and documented through video taped observations of neighborhoods included graffiti, condoms, illicit drug needles, trash, etc. Documented social disorder included adults openly drinking alcohol on the street, drug dealing, prostitution, and loitering. The research was multilevel since it included surveys from 3,864 randomly selected households and 8,782 residents in 196 census tracts in addition to utilizing neighborhood level census demographics. The census data accounted for aggregate-level data used to measure concentrated disadvantage that consisted of factoring poverty, public assistance, unemployment, female headed households, and concentrated immigration. The surveys accounted for individual-level data on neighborhood perception of collective efficacy. When individual-level characteristics were taken into account from the survey data and aggregate-level census data were also used, collective cohesion was shown to have a negative effect on violence after controlling for measurement error and prior violence.

Levels of concentrated disadvantage and immigrant concentration were mediated by certain levels of cohesion, meaning that indirect effects on crime could be shown after accounting for the collective cohesion of the group. Whereas individual-level research explores the effects of individual survey respondent's willingness to exercise informal social control, the aggregate-level research explored neighborhood-level stability as measured through census data that provided spatial concentration for those who own a home as opposed to those who rent or have lived at their residency for more than five years. These residential stability variables have been used as indicators for cohesiveness in several other studies (Bursik, 1988; Bursik and Grasmick, 1993; Sampson and Groves, 1989; Sampson and Lauristen, 1994).

The essence of social disorganization theory is at the aggregate-level and measuring the effects of informal social control in terms of a community's ability to manage the behavior of its residents. The percentage of people in the same area with the same characteristics over a number of years represents a measurement of neighborhood stability. More stable neighborhoods have less acceptance for crime, disorder or non-conformity (Rank and Hirschi, 1988). Lack of stability increases the effects of social disorganization variables such as poverty, unemployment, family disruption, or high concentration of immigrants. According to this premise, areas with low mobility and/or higher owner-occupied housing would be expected to have lower reported crime incidents than areas where mobility high. These variables can be measured spatially at the aggregate-level through a variety of different predefined governmental boundaries.

Within the aggregate-level analysis, Sampson and colleagues (1997) utilized census tract demographic data with the assumption that collective efficacy can be measured uniformly across large geographic areas, such as census tracts in the city of Chicago. However, within ecological research different levels of spatial analysis exist. For example, macro-level research involves studies at the highest level of spatial aggregation involving research on the distribution of crime between countries, states, or cities. Meso-level analysis is directed at areas of comparison within the city. These units can include police beats, census tracts, block groups, or face blocks. Micro-level spatial analysis involves the study of specific crime sites. Spatial patterns of crime will differ depending on which of analysis is selected.

Unlike the Sampson and colleagues (1997) multilevel research, the comparison model from Lansing, Michigan only utilized aggregate-level data at the block group level as the primary unit of analysis. Typically, census tracts are broken into several different block groups allowing for a more micro-scale neighborhood analysis and better justification for homogeneously measuring collective efficacy ties across neighborhoods. In addition, the final analysis of the research includes systematic observations of micro-level bus stop locations to qualitatively test defensible space and crime pattern theory. The justification for using aggregate-level data over individual-level surveys was determined by both cost and time constraints.

In addition, it is an interesting to challenge the research of Sampson and colleagues (1997) to determine if aggregate-level data that is available free of cost through the US Census can equate to the same information as retrieved through multi-million dollar sampling of Chicago residents. It can also be argued that by utilizing this aggregate-data at a lower level (i.e., block group) as opposed to the census tract the main unit of analysis will serve as a better proxy for neighborhoods as opposed to utilizing the larger census tract units of analysis.

Both census tracts and block groups provide a convenient geographic unit on which to base neighborhood variation and measurement because of the large amount of data available through each decennial census. In addition, administrative governmental data, such as crime incidents, can be aggregated into both of these same units of census boundary geography. Since block groups are sections within census tracts, they may provide a better area of analysis for determining differences in the given data as well as being an improved measure of the geographic space in which residents actually perceive as their neighborhood (Coulton, et al.1997). In terms of research ethics, aggregating crime incident data to the block group level also allows for the data to be sanitized so direct links cannot be made to specific address locations and block group comparison could be made through the use of the census data.

Block groups may provide the best proxy representation of neighborhoods when utilizing aggregate-level data. One study found resident perceptions of their neighborhoods come close to producing the same values of many indicators in an area that official boundaries produce, such as block groups. This pilot study was completed in response to uncertainty in the field about how accurate official

boundary files were to residential perceptions of what encompassed their neighborhood (Coulton, et al.1997). Residents were asked to draw boundary lines around what they defined as their neighborhood and these results closely matched official government boundary lines of the census block groups.

Perkins, Abraham, and Taylor (1993) argued that both residents and potential criminals take a variety of environmental cues from several blocks as opposed to a single block in terms of territorial markers. Taylor (1997) notes that multiple blocks represent ongoing, ecological settings in which environmental features facilitate specific behaviors for both residents and outsiders, but census tracts may represent more heterogeneous demographic characteristics. Therefore, researchers have often used block group locations as an indicator of neighborhood representation (Harries and Kovandzic, 1999; Lowenberg and Bandurraga, 1982; Novak, James, and Smith, 2002; Paschall and Hubbard, 1998). A more accurate picture of social disorganization and its impact on potential offenders and victims can be drawn from an analysis of multiple blocks. A block group unit of analysis will allow for data over multiple blocks to be accounted, given that these areas can better define neighborhoods and measure the impact of residential census survey variables on surrounding commercial property and bus stop locations. After accounting for the general social make-up surrounding bus stop locations, the microenvironment of the bus stops was more thoroughly analyzed allowing for a mixed methodological focus to the research.

SUMMARY OF THEORETICAL CONTRIBUTIONS TO ENVIORNMENTAL CRIMINOLOGY

- Guerry (1833) and Quetelet (1842) found patterns of crime varied spatially but were stable over time. Their findings opened the debate for the relative importance of offender motivation and opportunity that would become the foundation of future environmental spatial research.
- Shaw and McKay (1942) questioned the correlation of crime rate increase and levels of economic stress. Lead future researchers to focus on specific crime sites rather than offenders and develop more sophisticated models to avoid ecological fallacies.

- Landers (1954); Bordua (1958); Shevsky and Bell (1955); Chilton (1964) attempted to extend Chicago School sociological research by focusing on crime sites rather than offenders. Findings indicated that socioeconomic correlations to crime were complex and lack of reliability existed in many studies.
- Jacobs (1961) was instrumental in challenging previous assumptions about modern city planning and architecture. Introduced the need to measure and test the impact of physical attributes on crime and disorder.
- Jeffery (1971) introduced the concept of CPTED and focused specifically on the impact of the physical environment on crime.
- Newman (1972, 1975) developed defensible space theory and analyzed how both social and physical attribute data may interact and contribute to crime surrounding public housing.
- Brantingham and Brantingham (1981, 1991) theorized about the impact of place locations in terms of crime patterning and available opportunities. Their research linked routine activities and social disorganization theory at the micro-level.
- Cohen and Felson (1979) introduced routine activities theory at the macro-level and analyzed the role of victims.
- Sampson, Raudenbusch, and Earls (1997) research extended social disorganization theory by spatially mapping and systematically observing correlates of crime. Their research avoided ecological fallacies through multilevel variable selection. Mediating effects were found on social disorganization from informal social control mechanisms referred to as collective efficacy.

CHAPTER 3

Drilling Down the Data

Within recent extensions of social disorganization theory, various methodologies have been used to tap into how informal social control mediates social disorder variables as represented by socioeconomic status (SES). The research conducted by Sampson, Raudenbush, and Earls (1997) through the Project on Human Development in Chicago Neighborhoods (PHDCN) appears to be one of the most promising and comprehensive approaches at measuring the mediating impact of informal social control or what they have labeled collective efficacy (Bower, 1997). Findings drawn from this well funded research became the primary reference for analyzing theoretical concepts of social disorganization within the city used for research to write this book.

The theoretical evolution presented in Chapter II utilizes an ecological analysis of crime that looks towards analyzing criminal activities as part of the overall neighborhood ecosystem. Gradually, ecosystem research has been directed toward either an environmental perspective or a social disorganization perspective. Discussions of the research that serves as the premise of this book attempts to bring the two fields together in the spirit of Newman's reformulated defensible space theory that concentrated attention on territoriality and Sampson and colleagues (1997) focus on mediating the effects of social disorganization variables through collective efficacy. By including an analysis which accounts for both physical and social attributes of crime this study attempted to systematically test social disorganization and defensible space concepts. Within this type of ecological analysis, criminal incidents were believed to be highly opportunities and focus was placed on spatial crime concentration rather than offenders.

Defensible space concepts draw together social and physical structure contributions to crime through surveillance and territoriality. Territoriality is dependent on levels of residential stability, which provide an indication of the likelihood of social control being exercised in public spaces that are within the neighborhood. The impacts of these controls were measured through an SEM model test in Part I of the research methodology.

PART I
SEM Model Test of Social Attributes

Quantitative links from the social environment that surround bus stop locations were made through a structural equation model (SEM) test to determine which social attributes have the greatest effect on official crime incidents. Demographic social disorganization data were factor analyzed to make up latent indicating variables in the research model.

In an effort to test some of the same concepts as Sampson and colleagues (1997) research, the first part of this book was directed at analyzing the extent that residential stability mediates neighborhood disorganization through structural equation modeling (SEM). The SEM model allows for the measurement of informal social control to act as proxies for both a dependent variable of social disorganization and a mediating independent variable predictor of crime at the same time.

According to the Sampson and colleagues (1997) research, the single latent variable of concentrated disadvantage should include factor loadings from indicator variables that show the concentrations of neighborhood poverty, public assistance, unemployment, female-headed households, African-Americans, and youth (ages 17 and under). These variables were all seen as measuring the same construct of concentrated disadvantage. Taken as a whole, disadvantage is a direct causation of increased crime and a direct causation of lowering informal social controls or collective efficacy. However, Sampson and colleagues (1997) findings showed that high levels of collective efficacy can also mediate the effects of disadvantage and negatively effect crime.

Based upon these same findings, low collective efficacy was predicted in spatial areas that have a high concentration of immigrants or foreign-born residents. Much like concentrated disadvantage, immigrant concentration was found to have a direct positive effect on

crime, a direct negative effect on residential stability, and an indirect mediating effect on crime through residential stability. Indicators of immigrant concentration included percentage of foreign-born and Latinos (Sampson et al., 1997). A similar model with repetitive predictions was used for the given research project.

The main mediating effect of social disorganization was labeled by Sampson and colleagues (1997) as "collective efficacy" or informal social control and was defined as cohesion among space users who share similar expectations for informal social control of public space. These types of constraints on disorder are not necessarily economic but can be measured through levels of home ownership and low levels of transience. Higher levels of home ownership and lower levels of transiency equate to higher levels of collective efficacy. This finding mimics Newman's (1973) theory of territoriality that argues residents will increasingly exercise informal social control based upon the length of time they live at a residency or if they own their property rather than rent it from someone else. Based upon the Sampson and colleagues (1997) findings, it was hypothesized that in areas where stability/collective efficacy mediation is high, rates of crime would be low, regardless of the socio-demographic composition. Thus, residents in stable areas are seen to have higher levels of informal social control mechanisms to intervene in preventing disorder and crime in public places such as bus stop locations. In terms of urban planning, it may be useful to locate bus stop locations in areas with low levels of transiency if it is found that bus stop locations may facilitate crime.

PART II
Quasi-Experimental Design

After completing the SEM test, an identification of bus stop locations that serve as crime facilitators/attractors/generators was determined through the use of ArcView software[1]. Block group comparisons were

[1] ArcView, the world's most popular desktop GIS and mapping software, provides data visualization, query, analysis, and integration capabilities along with the ability to create and edit geographic data. ESRI is located in Redlands, California and produces yearly updated additions of ArcView software. ArcView version 8.1 was utilized for data analysis throughout the research study for this book.

made by comparing bus stop presence with non-bus stop presence. Social disorganization data were controlled for within logistic regression models and block group locations were compared in an effort to determine if bus stop locations statistically contribute to high crime rates compared to non-bus stop locations. The part II methodological strategy allows for a comparison of crime statistics that coincide with bus stop locations to areas without bus stop locations while controlling for previously tested socio-demographic characteristics. Comparisons are also made between neighborhoods that have concentrated bus stops versus those that have bus stops that are more dispersed. The methodology mimics a quasi "case-control study" (see Loftin and McDowall, 1988) through a odds ratio analysis providing some of the first scientific evidence in determining if bus stop locations can be attributed to increased crime.

PART III
Mixed Methodological Spatial Analysis

Neither practitioners nor academics take full advantage of all the potential sources of information that could be useful for inferring patterns of crime (Maltz, 1990). Part of the reason for this discrepancy is lack of data in areas such as crime specific locations. In addition, as the level of analysis becomes more specific to geographic locations the less standard statistical techniques can be employed (Maltz, 1990). It has been advocated that mixed methodological approaches be used to combine different types of data into a place specific crime analysis (Sampson and Raudenbush, 1999). Sampson (1993) referred to this type of mixed methodological approach as "dynamic contextualism" or "narrative positivism" with the goal of better understanding the effects of deteriorating informal and formal controls. Maltz (1994) advocates the use of graphical techniques to present different types of data in ways that permit researchers to infer patterns. This argument is consistent with the prediction that in the future "the primary language for promoting the human understanding of data will be sophisticated computer graphics rather than mathematics" (Wild, 1994, p. 168).

There is a qualitative nature to measuring and interchangeably mapping place specific activities. Sampson and Raudenbush (1999) reported on the necessity of conducting systematic social observations of disorder within urban neighborhoods. These types of mixed methodology designs combine quantitative and qualitative approaches

within different phases of the research process (Creswell, 1995; Nau, 1995; Patton, 1987).

With this mixed methodology spirit in mind, bus stop locations with the highest amount of crime were analyzed more thoroughly through a qualitative observational analysis of the built bus stop environment. The environments were analyzed through systematic observations from a predefined checklist adding to future reliability of the findings. Crime pattern theory and defensible space concepts will be tested through these observations to see if similar empirical findings can be found within high crime bus stop locations compared to low crime bus stop locations. These observations allowed for a more thorough analysis of census level social attributes and documenting signs of traffic flow, routine activities, social control mechanisms, and possible deterioration within select areas based on mapped data. In addition, signs of defensible space theory were documented such as natural surveillance and general images of the areas that surround bus stop locations.

MIXED METHODOLOGY

Other studies have used a similar mixed methodological process. For example, Cohen (1980) conducted a mixed methodological study of prostitutes in New York City by first conducting a quantitative spatial measure of social disorganization and then following with qualitative observational research. Findings indicated that prostitution spans all levels of income across different census tracts, however, qualitative observations noted remarkable similarities within the face blocks and street corners where prostitutes worked and johns solicited services. Cohen (1980) also noted features of the built environment within areas with high incidences of prostitution such as wide streets (provided an inconspicuous traffic flow through the area), business establishments (indirectly used to attract prostitute clientele), and spatial proximity of unlit alley ways, parks, or parking lots (providing locations for sex and other illegal activities). Cohen's (1980) work provided an empirical study that qualitatively and quantitatively analyzed crime-facilitating spaces that included "motivated" offenders as proposed by routine activities theory (Cohen and Felson, 1979).

Cohen's work was instrumental in highlighting the importance for specifying the correct unit of analysis in ecological research studies. In

researching public spaces within block groups, such as bus stop locations, it is necessary to take into account influences from the surrounding area, but then also to look at the specific environment of the unit of analysis. For Cohen, this became the street corners that the prostitutes used to solicit their services. Cohen (1980) found that when examining the presence of the socioeconomic structure, there were actually few differences between areas with prostitutes and areas without. However, when Cohen examined variation within the census tracts, important differences emerged, thus, showing the importance of qualitative analytical techniques for creating a more accurate picture of ecological studies.

New GIS computer crime mapping technology makes this process easier since point data of locations from specific criminal incidents can be obtained. It is now more routine to map out crime variables to smaller place level locations, allowing for greater variation to be detected. However, in researching areas as small as bus stop locations, it is still necessary to actually go to the site of these locations and conduct a qualitative analytical comparison of the physical features that incorporate the location.

Within mapping micro-environments researchers have discovered that the presence of special-purpose places such as taverns, 24-hour convenience stores, or bus stop locations have links to increased crime within their immediate vicinity (Block and Block, 1995; Roncek and Meier, 1991; Roncek and Pravatiner, 1989; Sideris, 1999; Spelman, 1993). These research initiatives are founded on theories and assumptions of routine activities, (Cohen and Felson, 1979; Felson, 1986, 1987) rational choice theory (Clarke and Cornish, 1983; Cornish and Clarke, 1986), social disorganization (Sampson and Groves, 1989), crime pattern theory (Brantingham and Brantinham, 1991) and situational crime prevention (Clarke, 1992) that argues increased opportunity produces increased crime. These opportunities arise through spatial target attractiveness based on the social and physical attributes of the surrounding area.

RESEARCH QUESTIONS

The first objective of my research was directed towards testing the impact of informal social control on block groups (i.e., neighborhoods) throughout a medium sized Midwestern city. Block groups were

compared in terms of traditional social disorganization variables such as levels of poverty, unemployment, minority concentration, youth, immigrants, and residential stability. Long standing social disorganization theories argue that areas with higher disorder will have higher rates of crime than areas with less disorganization. Therefore, the first set of research questions stems from social disorganization and more specifically, collective efficacy theory:

1. Do block groups / neighborhoods with higher levels of concentrated disadvantage and immigrant concentration have higher crime rates? Do block groups with higher levels of residential stability mediate the effects of disadvantage and immigrant concentration on crime? Which variables have the largest impact on crime?

The second objective of my research was to determine if neighborhoods with bus stops have higher crime rates than neighborhoods without bus stop locations. Theories such as routine activities and crime pattern theory argue that as daily pathways are brought together in a given place location with low levels of guardianship, crime will be higher. A quasi-experiment methodology included crime statistics and social disorganization variables within the city's block group locations to compare areas based on matched social disorganization scores to determine the adverse impact of bus stop locations. From this perspective a second set of research questions for my project included:

2. Do bus stop locations have a detrimental secondary affect on crime within block group locations after all social disorganization variables are controlled for within comparison block groups?

The final objective of my research project was to conduct a systematic qualitative analysis of the physical attributes and social movements that surround the built environment of high crime bus stop locations. These locations were analyzed in terms of defensible space and crime pattern theory. According to these theories, areas with low natural surveillance and poor image should have higher crime rates. In addition, crime pattern theory predicts areas with lower crime will have

higher defensible space, less pedestrian traffic and less empirical physical and social disorder.

3. Do high crime bus stop locations also exhibit signs of physical disorder, social movements conducive to crime, and low natural surveillance from surrounding businesses and/or residential housing?

The proceeding three chapters (4-6) explores the three part methodology for determining the environmental impact of hotspot bus stop locations. Chapter four examines a test of collective efficacy within 114 blockgroup neighborhoods through Lansing, Michigan. Chapter five compares neighborhoods with bus stops and neighborhoods without bus stops and neighborhoods with concentrated bus stops with those that have less condensed b us stops. Neighborhoods are matched by other sociological indicators before making comparisons. Chapter six discusses a qualitative observational analysis of hotspots bus stop locations and examines reports completed by a variety of research raters in addition to photographs that were taken of these locations.

CHAPTER 4

Preparing to Test Collective Efficacy

PART I

This study analyzed the effects of social disorganization and residential stability on official crime statistics over two years (1999-2000) at the block group level. The use of these dependent variables is contemporaneous to the timing for the 2000 census allowing for a relatively close proximity of causal order. Since the census count actually took place in 1999 with results being publicly available in 2000, the contemporaneous crime data actually occurred during the time of the census data collection and one year later. This allows testing the causal prediction of census demographic data with the given crime data. The data were spatially geocoded and aggregated to the 114 block group locations throughout Lansing, Michigan. Selected crime incidents were mapped using ArcView 8.1 software according to individual addresses or street intersections of each incident recorded by the local police department.

The underlying theories presented earlier provide the necessary foundation for conducting spatial analysis at the neighborhood level. Construct validity was determined by how well the study remains focused under the confines of its purpose and theory. Since spatial crime analysis deals with the specific geographic areas in which the crime takes place, emphasis was placed on the locations of the crime incident data and social ecological variables present within the block group units of analysis.

Differences from Sampson and colleague's (1997) Chicago study

This study made use of the most recent census data to analyze covariances within two years of crime incident data. Since both crime and ecological factors have been found to be nonrandom, concentrated and stable (Spelman, 1995) census data from the year 2000 (taken from Lansing, Michigan households in 1999) were seen to be close enough in time to predict 1999 and 2000 crime data. One difference between the Sampson and colleagues (1997) study and my comparison study was the use of 1990 Chicago census data and 2000 Lansing, Michigan census data. The comparison city (Lansing, Michigan) had a 2000 census total population of just over 114,000 compared to Chicago's 1990 population of 2,783,726. The comparison city allows for some form of external validity by testing the collective efficacy theory within a smaller urban setting. However, it should be noted that major differences in data collection exist between the very well funded Chicago study that included a multilevel analysis of census and individual household survey data Subtle changes in variable comparisons were due to the different demographics between these cities, and every attempt was made to ensure constructs determined through a factor analysis remained conceptually the same.

The conceptual model I used for my research project allowed for minor adjustments in terms of selecting disorganization indicator variables from the original Sampson and colleagues (1997) study. Differences in two variables reflect differences in the given unit of analysis and the results of the primary component analysis. For example, all minorities are accounted for within the my data rather than separating African-Americans as was done by Sampson and colleagues (1997). Considerations for limitations of producing a summary component for all minorities were evident. Part of this limitation results in the possibility of ignoring the effect that one minority group has over another minority group. However, in accounting for the latent construct for concentrated disadvantage, my research attempted to include predictor variables of all ethnic isolation in determining spatial areas where these levels were most concentrated. Areas with the highest risk families, greatest ethnic isolation, highest unemployment and public assistance, and largest proportion of youth were defined conceptually as "concentrated disadvantage."

The other difference from the Sampson and colleagues (1997) Chicago study and my study in Lansing, Michigan consisted of

indicators for immigrant concentration. The Chicago study achieved factored indicators from Latino and foreign-born residents. The Latino population in Lansing, Michigan was too low to account for its own factor score. In addition, Sampson and colleagues (1997) use of Latino as a census-variable indicator for foreign-born may be misleading since many Latinos are second or third-generation citizens and not necessarily under the same constraints as new immigrants. Indeed, later research findings discovered that first-generation immigrants were 45 percent less likely to commit violence than third-generation immigrants and second-generation immigrants were 22 percent less likely to commit violence than third-generation immigrants (Sampson, Morenoff, and Raudenbush, 2005). Based on past research, it has been found that immigrants exercise less collective efficacy (Butcher and Piel, 1998) but this latest research by Sampson and colleagues (2005) challenges the notion that first-generation immigrants equate to higher crime. Because of these unresolved issues, separate loadings for "foreign-born" and "speaks little to no English" were deemed better predictors for immigrant concentration within my research model.

This model still reflects a test for the effects of disorganization variables on crime and the hypothesized mediating impact of collective efficacy. Unlike Sampson and colleagues (1997) this mediating effect was only tested at the aggregate block group level through census residential stability variables and not through individual surveys of residents. Following the tradition of the Chicago School, indicating variables selected for this my study represented block groups that can be defined as disorganized based on their given demographics. Shaw and McKay (1942) focused their research on indicators of social decay, such as poverty and high unemployment rates. These rates were used to demonstrate why crime is a normal response to specific social, structural, and cultural characteristics of the neighborhood ecosystem. Within their model, their independent variables represented the economic conditions by square-miles as well as heterogeneity and population turnover. Variables used for my study followed this example.

VARIBLES DEFINED

Dependent (endogenous) variables: Officially Recorded Crime Incidents

Crime incidents include offenses reported to the police that they record which may or may not end in an arrest. A selected mix of disorder and violent crimes were included in a SEM model test, unlike other tests of social disorganization that look solely at violent crime. In this manner, my study attempted to extend the work of Sampson and colleagues (1997) by testing their theory against multiple crime incidents, which are believed to most frequently affect users of public transit. A two-year total of 7,914 incidents were used for analysis and included armed/unarmed robberies, alcohol/narcotic violations, assault, disorderly conduct, domestic abuse, obstruction, truancy, and weapons violations.

Any incidents that were coded by Lansing, Michigan police officers as occurring indoors (e.g. inside an apartment or family dwelling) were excluded from the analysis. This allowed for only an analysis of 'outdoor' incidents since it is theorized that collective efficacy, and especially guardianship, discourages crime through naturally occurring surveillance within outdoor geographic spaces. The exclusion of 'indoor' crimes is also unique from the Sampson and colleagues (1997) research. In addition, if a researcher or crime analyzer is focusing solely on official data, it may make more sense to isolate outdoor related crime when focusing on knowledge about what is causing public disorder or the most visible criminal/deviant problems. Eck and Clarke (2003) argue for classifying problems into two criteria-*environments* in which problems arise and the *behaviors* of the participants. In the case of my research project, this approach calls for a thorough analysis of neighborhood and bus stop environments researching how available targets are regulated, what types of outdoor activities people engage in, and who controls or does not control the locations. Once the environmental behaviors are empirically specified comparisons can be made between those with high crime incidents and low crime incidents.

Within an initial factor analysis, crime incidents loaded separately from the indicator census variables. Attempts were made to separate incidents into two factors (i.e. nonviolent and violent crime), but this was not successful. For purposes of hybrid model testing, all incidents

became part of a summary scale used as a total crime main effect exogenous variable. As expected, criminal incidents per block group varied substantially ranging from 1 to 594 per block group, with an overall mean of 68 incidents per block group and standard deviation of 87 incidents throughout the block groups. This finding supported past research that has shown a clustering of incidents in place specific neighborhood-level locations (Sherman, 1995) and the nonrandom nature of criminal incidents (Felson, 2006). Therefore, a log transformation of the incident data was used to normalize the variables (Keene, 1995) as is commonly done with crime data before beginning the structural equation model test.

Independent (exogenous) Variables: Concentrated Disadvantage

The following indicator variables represent the aggregate-level ecological replication of the Sampson and colleagues (1997) Chicago study. These exogenous variables were all hypothesized to be indicators for social disorganization that would be positively related to crime and negatively related to collective efficacy. The indicating variables were factor analyzed into two categories representing concentrated disadvantage and immigrant concentration as directed by Sampson and colleagues (1997). The following include variable definitions as specified by the US Census Bureau.

1) Poverty- Following the Office of Management and Budget's (OMB) instruction, the Census Bureau sets income thresholds that vary by family size in determining poverty levels. If a family's total income is below the threshold, they are determined to be below poverty
2) Public assistance- Includes any households that receive government public assistance income
3) Female-headed household- Families headed by a woman with no husband present.
4) Unemployed- Community members ages 16 and over who are part of the civilian labor force and classified as unemployed
5) Youth- Individuals who are below the age of 18
6) Minorities- Summary scale of all non-white respondents

In terms of minority percentage, Sampson and colleagues (1997) used African-Americans as an indication of concentrated disadvantage and Latinos as an indication of immigrant concentration. This study differed by combining all minorities into one group as an indication of concentrated disadvantage. This type of summary scale of non-white residents is limited in terms of not justifying the potential impact of racial differences that could have a varying effect on how disorganization is spatially defined or correlations to crime are determined. Because of the low percentages of Latinos residing in Lansing, Michigan, the factor scores would not load Latino or African-Americans into a separate construct. Combining all minorities within one category is not necessarily a good indicator of racial clustering since racial groups will naturally vary in terms of attitudes, customs, and residential housing location. However, when combined, the minority variable did load heavily on the concentrated disadvantage construct.

Despite these limitations, the minority variable indicator appears to measure racial isolation and can serve as an indicating variable for disadvantage. As an indicator, the minority variable loaded highly on the same construct as poverty, unemployment, public assistance, female-headed household, and youth variables. This finding indicated that the percentage of minority clustering within a block group, when combined with poverty, unemployment, public assistance, female-headed households and youth, serves as an indicator of ethnic isolation, which is attributed to social disorganization (Sampson, 1998).

Other researchers have argued finding rates by using the percentage of total population of an area divided by the percentage of divorce and female-headed households to reflect disruption of family life as an indicator of attenuated community social control (Felson and Cohen, 1980; Cohen and Felson, 1979). These disruption factors were hypothesized to increase the number of criminal incidents in areas that report high disadvantage with the percentage of reported female-headed households being one indication of disadvantage. Along with labeling these households as part of the disadvantage concept, Felson and Cohen (1980) also argued that these situations signify a lack of guardianship and potential increase for victimization. Therefore, block groups that have a high proportion of single-parent households and are otherwise disadvantaged, present a more attractive crime target than areas with strong families. Felson and Cohen (1980) provide further empirical support for their arguments by showing that changes in households had

a significant and positive effect on crime trends in the United States from 1950 through 1972.

Independent (exogenous) Variables: Immigrant Concentration

The concept immigrant concentration included a combination of indicators for the "percentage of individuals who do not speak English very well or at all" in place of Latinos. Again, since the data from Lansing, Michigan did not have as large of a population to draw from or ethnic diversity as the Chicago study, not enough Latinos were present for a separate factor. Individuals who do not speak English very well or at all may represent the same construct, immigrant concentration, which Latinos measured in the Chicago study. In addition, foreign-born citizens were also found to be an indication of immigrant concentration. Using this variable selection strategy, there is the possibility of double counting individuals who classified themselves as both minority and foreign-born. It is impossible to separate these two indicators from the given census data. It can further be argued that the given theoretical foundation of social disorganization and spatial crime analysis calls for measuring the impact of both foreign-born immigrants and minority concentration, even if these individuals are double counted.

When dealing with factoring independent crime predictors, the principle guide should be directed by the theoretical foundation. In addition, factor scores utilized were not forced for the given analysis, meaning that scores were free to vary. The research model used for my project was based on the factor analysis and serves as a best attempt for completing a modified version of Sampson and colleagues (1997) collective efficacy hypothesis within a different unit of analysis.

Independent (endogenous/mediating) variables: Residential Stability

Residential stability included the percentage of owner-occupied housing and percentage of housing (rental or owner-occupied) that have had the same residents for at least five years. Selection of these indicators for residential stability represent collective efficacy and also follows Coleman's (1988) social capital theory, which argues that shared territory and responsibility over one's space promotes social

capital. In addition, higher levels of social capital equate to more commitment to residential stability and deterring disorder and crime. Previous research has shown that higher levels of social capital relate to lower levels of resident-reported crime and physical disorder (Rosenbaum, 1994; Skogan, 1990). Based on these findings, it was hypothesized that a different residency during the past five years lowered overall territoriality for place specific locations and was not expected to correlate with other residential stability factors. However, there is no indication of how long collective efficacy takes and it is quite possible that residents who have moved into an already existing cohesive block group would be able to exhibit territoriality within a five-year period. Despite the potential for this problem, these variables are the best census-level indicators for neighborhood stability.

CHAPTER 5

Preparing to Compare Neighborhood Locations

PART II

The second part of my research design compared block group locations in terms of crime incidents and bus stop presence. During this stage, the chosen quasi-experimental research design attempted to address the second research question and answer if bus stop locations predict higher spatial crime. This part of my study moved from an entire city social disorganization model test to a more specific block group (i.e., neighborhood) comparison between bus stop locations and non-bus stop locations. Brantingham and Brantingham (1981) referred to this process as the cone of resolution in terms of a spatial research project moving towards a more narrowed focus.

Potential internal validity threats are a possibility in quasi-experimental designs since randomized assignment has not been achieved (Cook and Campbell, 1979). In order to ensure procedural validity and evidentiary reliability of these findings, the research accounted for error rates. The error rate refers to a probability statistic (i.e., significance test) for accepting the results as true, when it may actually be false (Bachman and Paternoster, 1997). The erroneous rejection of the null hypothesis is referred to as a Type I error. It is important to acknowledge the error structure of this study as this serves as an indication of the reliability. Studies that fail to acknowledge and confront issues of error rate risk losing credibility. The error rate is determined by calculating an estimation of a population characteristic

that summarizes the data that were collected. Next, that statistic is compared to the degree of chance allowed. It is convention in social science research to see the error rate at 5 percent or less (Cohen and Cohen, 1983).

Specific assumptions are typically made in order for certain statistical tests to be applied to the data in addition to calculating error rates. The most critical assumption is that the units of analysis (e.g., survey respondents) are randomly selected from the population or randomly assigned to experimental and control groups (Babbie, 1998) to limit potential spurious effects. The results of these random assignments are as reliable as the set error rate. However, in place-based crime research, it is not always practical to randomly assign the units of analysis. For example, it is not feasible to randomly assign bus stops to specific experimental locations in the city and assign other bus stops to control areas in order to determine if crime increases or decreases around bus stops relative to the control areas. Bus stop locations are built for transit user convenience rather than research practicality.

In these particular instances, adherence to professional scientific standards is necessary to insure methodological integrity and validity of the study. This part my research attempted to match block groups according to similar social disorganization attributes in the geographical areas surrounding the bus stop locations and compare those with a bus stop and those block groups without a bus stop location. Instead of utilizing a randomization technique, the matching strategy approximated a control function for determining potential differences in crime rates surrounding locations with or without bus stops present. This quasi-experimental approach looked at whether certain public space structures (i.e., bus stop locations) caused adverse secondary effects on crime, meaning the bus stops could facilitate crime problems by increasing available targets (i.e., opportunities) in areas that may contain motivated potential offenders.

Scientific criteria for matched comparisons

In this second part of my study, the impact of bus stop locations on crime was considered. Under this type of contextual analysis, various criteria were met in order to insure proper implementation of the study. First, in order to make accurate comparisons, control areas were statistically selected that were equivalent to spatial areas with bus stop

locations. Variables used for matching comparisons were tested and analyzed through the first part of my research project. Since crime rate comparisons are the main research purpose, variables related to crime were again utilized, such as similar concentrated disadvantage constructs, immigrant concentration, total population, and residential stability. Second, an adequate amount of crime data over an extended period was necessary to ensure that the research study was not detecting some erratic pattern of activities that only lasted for short periods of time. The use of two years of crime data from Lansing, Michigan police statistics provided some stability for the estimates of the potential effects of bus stop locations. Third, the crime rate should have been measured according to the same valid sources for all areas considered. The same dependent crime variables used in the model testing of collective efficacy were used for the quasi-experimental comparison research. Cook and Campbell (1979) point out the importance of matching the variables so that the same information sources for the control and experimental sites are used throughout the study. It would not be accurate to measure dependent variable calls for service or arrests in non-bus stop locations and criminal incidents in the bus stop locations. Therefore, only dependent variables that included officially recorded criminal incidents were compared between the control block groups (i.e., no/few bus stops) and the experimental block groups (i.e., many/some bus stops). Likewise, independent variable indicators based on Sampson and colleagues (1997) research was used to match experimental and control areas before conducting a comparison of crime data.

Summary of strengths from the quasi-experimental research design

Specific criteria were used to ensure this quasi-experimental design of secondary crime effects was conducted on the bus stop presence. First, in an effort to make a valid comparison, locations without bus stops were selected that was equally comparable to areas with bus stop locations. Second, an adequate amount of time (i.e., two years of crime data) was utilized in an effort to adjust for any eradicate or temporary patterns in offender activity or police presence. Third, criminal incidents were used as the main dependent variable for all areas of comparison as factually compiled and supplied by the local police department. Calculated error rates were used to determine if there are

any differences between areas with bus stop locations and comparison areas and if these differences are due to chance or true dissimilarities.

Matching bus stop locations and comparison areas on social disorganization variables

In an effort to add credibility to the results, it was critical that areas surrounding bus stop locations and the comparison areas were matched in terms of social disorganization variables addressed in Part I of the research model test. Past research has shown links between crime hot spots and high levels of poverty (Cohen, 1993) and disadvantage (Sampson, et al., 1997). Also family disruption variables should be controlled for since hot spot locations have also been shown to be associated with low family cohesion (Cohen, 1993; Sampson, et al., 1997; Sherman, 1995). Since higher population densities are expected to effect crime, total population was also equalized (i.e., matched) in bus stop and concentrated bus stop locations and the comparison locations. All of these matching strategies were critical for adding to the credibility of the results that were obtained in order to determine if bus stop locations effected crime within block groups.

Independent t-tests for the equality of means for controlling the independent social disorganization variables were used to compare the bus stop locations against comparison locations. If these statistical tests do not reach statistical significance according to the preset alpha level ($p<.05$), then this indicates that the comparison and bus stop location areas did not statistically differ from one another and can be considered well matched. These statistics also help to ensure that any differences in crime incidents found were actually the result of the presence or absence of bus stop locations and the not the result of a contaminating outside variable. This also added to the internal validity of the quasi-experimental comparison or what has been defined as "the extent to which differences observed in the study can be unambiguously attributed to the experimental treatment itself, rather than to other factors" (Campbell and Stanley, 1966, p. 15). In the quasi-experiment analyzed for my research, the presence of the bus stop is seen as the 'treatment' with the prediction that a positive correlation will exist in terms of increased bus stop concentration and increased recorded crime.

Spatial Autocorrelation

In comparing bus stop and non-bus stop locations it is quite possible that variable data from bordering block groups contributes to crime incidents in other neighborhoods. Spatial autocorrelation allows a test to determine the effect of these issues before generalizing specific findings. Spatial autocorrelation deals with the values of one location being dependent on the values observed at a neighboring block group location. As part of the first law of geography, everything is related to everything else, but near things are more related than distant things. Spatial autocorrelation is valued when an understanding of the relationship between place and crime also requires the knowledge of the dynamics of hot spot development over time (Anselin, et al., 2000).

The spatial autocorrelation coefficient is determined by modeling the spatial covariance between pairs of observations as it changes with distance (Baller et al., 2002). There are a variety of techniques for testing spatial autocorrelation including time series analysis (vector autoregression), quadrant count, kernel estimation, moran scatterplots, or other distance-based statistics. These techniques represent a specialized method for conducting spatial regression analysis (i.e., spatial econometrics) in order to avoid the potential of receiving biased results and faulty inferences due to the presence of spatial dependence (Anselin et al., 2000). Findings of minimal spatial autocorrelation would mean that the values within an observed location are not dependent on the values observed at a neighboring location. This also means that the spatial pattern of values is just as likely as any other spatial pattern. This can be determined by simulating randomized crime clustering and then comparing actual rates.

Spatial autocorrelation is found to exist in areas where similar values cluster in space and neighborhoods (i.e., block groups) are judged compatible or otherwise similar. Studies that utilize several years of crime data should test for the impact of spatial autocorrelation in better determining the impact of bordering units of analysis. Positive spatial autocorrelation is common in finding crime patterns in which neighboring areas are alike and crime is statistically clustered into hot spots. Spatial autocorrelation can be a problem similar to multicollinearity, meaning the variable data may not be independent of one another. In other words, the occurrence of a criminal event in one block group may increase, or constrain, the probability of the occurrence of an additional crime in a neighboring block group.

This page intentionally left blank

CHAPTER 6

Systematically Observing Hot Spot Bus Stops

PART III

In reference to Brantingham and Brantingham's (1981) recommendation of conducting research through a cone of resolution, the final step for this spatial analysis project was directed towards qualitatively inspecting the surrounding locations in the top hot spot bus stop locations. A total of 638 bus stop locations were mapped to the 114 block groups in Lansing, Michigan. The locations of each bus stop location came from a database given to the researcher from the city's bus company. These locations were recorded by the bus company in 1999, so links closely matched both the criminal incident data and the census variables. From the mapping software, those bus stop locations that contain the highest amount of criminal incidents over a two-year period were highlighted and analyzed qualitatively through systematic observation.

Sampson and Raudenbush (1999) note that direct observation is fundamental to the advancement of knowledge and Reiss (1971) advocates systematic observations as a key measurement strategy within natural social phenomena. By systematic, Reiss calls for observations and recording devices that are completed according to explicit rules that can be later replicated. Therefore, a checklist for defensible space and crime pattern concepts was developed allowing for future replication. Physical disorder attributes that surround these bus stop locations were through systematic nonparticipatory

observational research. In order to reach uniformity within each bus stop observed, the coding sheets filled out for each bus stop location chosen will be rated on the presence or absence of the same physical attributes.

Empirical measurements of physical disorder are referenced by deterioration of urban landscapes. According to Sampson and Raudenbush (1999), this can include graffiti (i.e., in or near the bus stop location), abandoned cars, broken windows, and/or garbage on the streets. Hunter (1985) referred to the visible evidence of disorder as "incivilities" which has also been labeled as central to a neighborhood's public presentation (Goffman, 1963). These incivilities have been connected to both crime and fear of crime (Kelling and Coles, 1996; Skogan, 1990; Wilson and Kelling, 1982) as well as presenting a signal that space users are unwilling to confront loiters, intervene in criminal situations, or call the police when necessary. Because disorder is seen to trigger predictions about crime from both insiders and outsiders, it was also predicted to have measurable effects on bus stop use or disuse and serve as a catalyst to crime that is more serious.

Observation of "soft crimes," such as those represented by graffiti or prostitution, has been shown to be a reliable measurement for more serious crime (Wilson and Kelling, 1982). A combined quantitative and qualitative study of two Canadian cities also looked at the effects of minor crime on more serious crime (Hagan and McCarthy, 1997). Findings demonstrated a close connection between predatory youth crime and the social/physical settings of public disorder (e.g., open prostitution, vagrancy, vandalism, trash, drug selling). For this reason observation and acknowledgement over the control of social/physical disorder was seen as an important component of both research and crime prevention.

By this stage of the research, it was predicted that visual cues surrounding bus stop locations do matter and systematic observations of these locations should be conducted to see if social and physical disorder surrounding the area is equated with the given crime incidents. In this manner, the association of independent measures of officially recorded data from both the census bureau and the local police department were tested against the systematic observations of high crime and low crime bus stop locations.

Since the research methodology at this stage was nonparticipatory observation, special attention was placed on the physical image

surrounding the bus stop locations and specific social movements rather than strictly on social interaction. Although specified as an ecological construct, neighborhood disorder has been researched mainly through individual perceptions and individual-level research methodologies (Sampson and Raudenbush, 1999). Other examples of observational research conducted on units independent of persons or social units can be found in the research of Taylor and colleagues (Covington and Taylor, 1991; Gottfredson, and Brower, 1984; Perkins et al., 1992; Perkins and Taylor, 1996; Taylor, Shumaker, and Gottfredson, 1985). Taylor and Harrel (1996) observed the environment of 20% of all occupied face blocks in 66 Baltimore neighborhoods and linked physical incivilities with nonresidential land use. Their findings matched correlations between perceived disorder and fear of crime that were found among neighborhood individual-level survey data.

Very few studies have employed observational ratings across multiple ecological contexts (Sampson and Raudenbush, 1999). Based on the potential benefits that come from direct observation, my project integrated observational research with record-based methodologies at the neighborhood level. Within this type of approach, a more reliable picture is believed to have been drawn in determining the predicted causes of neighborhood criminality and the impact of bus stops within those neighborhoods. This type of approach is supported through a theoretical framework that accounts for the impact of defensible space concepts, social disorganization and informal social control mechanisms and assumptions that underline routine activities and crime pattern theory.

This segment of the research fell against the backdrop of the higher-level model testing that analyzed residential stability effects and other structural constraints that impede neighborhoods from self-policing. Because illegal activities are seen to feed off the spatial and temporal structure of routine activities, especially within public transit, differential land use of bus stops were taken as a key for comprehending neighborhood crime and patterns of disorder. Thus, the effect of concentrated disadvantage, immigrant concentration, and residential stability were considered in reference with other structural characteristics such as the built environment surrounding bus stops, transit density, and street activity.

This page intentionally left blank

CHAPTER 7

Mapping Crime Incidents

A fundamental component of descriptive spatial crime analysis is attempting to answer the "where" question before attempting to answer the question "why." In problem-oriented policing SARA model this step may be analogous with scanning or early stages of analysis (see Eck and Spelman, 1987). The where question is directed towards hot spot identification, which has become one of the most critical issues facing spatial researchers and administrators since resource allocation can more effectively be utilized based on concentrated crime incidents. Limited resources and increasing demands for policing services require better allocation based on improved spatial analysis and hot spot identification (Block, 1993). Unusual clustering of events may at times call for a recommendation of saturated patrol or research into the underlying social/physical conditions that may be affecting the proportion of crime incidents in specific locations. Levels of sophistication used to identify hot spot locations vary.

ANALYTICAL CRIME MAPPING

There are basically four types of analysis used to identify hot spot locations: visual inspection, descriptive mapping, basic analytical mapping, and advanced analytical mapping (Canter, 1998).

1. Visual inspection calls for identifying hot spots based on "pin mapping" and officers "knowledge" of an area. However, this method of analysis is limited since many officers do not consistently work within the same areas so

their knowledge may be limited or biased. In addition, studies have found that officer's cognitive maps of hot spot areas often differ from where the actual hot spots are located according to the given data (Block and Block, 1995).

2. Descriptive mapping of hot spot locations is the easiest method for identifying areas with concentrated crime and is used by more police than any other method (Weisburd and McEwen, 1998). Within these maps, polygons (or in the case of the research used for this book; block group boundaries) are used to represent a number of events over time and hot spots are created for areas with the highest number of crimes. However, this type of mapping fails to control for other information that can potentially influence crime such as socio-demographic data, land use or population density. These maps are also influenced or limited by boundary issues rather than being able to find hot spots across predefined boundary lines. Thus, how the data is aggregated could influence the map interpretation and different levels of aggregation could mean changes in the location of hot spots. The current chapter 7 presents descriptive mapping utilizing two years of crime data throughout Lansing, Michigan.

3. Analytical mapping allows for more sophisticated hot spot recognition showing crime concentration that crosses otherwise predefined boundary lines. For example, hot spots can be identified by determining any cluster of crimes that have a value of two standard deviations above the mean regardless of latent boundary lines.

4. Advanced analytical mapping methodology is based on inferential statistics that analyzes clusters of incidents that cannot be viewed as occurring by chance alone. This type of methodology allows for testing models that account for a number of layered variables within a map and begins to tap into the why question while visual and descriptive mapping answer the where question.

In terms of descriptive mapping, a common practice for both researchers and departmental crime analyzers has been to aggregate point data to a larger unit of analysis such as a census tract, block group, or face block. Within the spatial analysis conducted for this book, crime and census demographic data have been aggregated to the block group level. Before attempting advanced analytical spatial analysis, a fundamental element of any research should be directed towards providing summary statistics of the pertinent variables within these block group locations. Within this process, descriptive statistics accompanied with descriptive maps are presented to numerically and graphically show the breakdown and spatial location of all the pertinent variables used for my research.

Lansing, Michigan Crime Incidents (1999-2000)

The dependent crime variables utilized in this project represent official incidents recorded by the Lansing police department. Only incidents that were recorded as occurring outdoors were included for this analysis since these were seen as having the greatest impact on bus stop locations and offered the greatest potential for limiting the opportunities to commit these crimes due to the potential influence of social/physical attributes and collective efficacy.

The dependent variable data used for this research included incidents coded by police officers as occurring in the following outdoor locations: alley, parking lot/parking ramp, park/playground, yard/field, street, or an undeveloped area. Specific crime locations included intersecting street names and/or specific addresses allowing for this data to be layered into street level data within Lansing, Michigan. The breakdown of all the criminal incidents (or the main dependent variables) used for this research project is listed in Table 7.1. Both rates and raw numbers for each criminal incident are broken down in the following tables.

Table 7.1. Descriptive Crime Statistics

Year	Alcohol	Armed Robbery	Assault
1999 (rates)	4.49	.49	1.81
1999 (raw)	647 (16%)	71 (2%)	261 (7%)
2000 (rates)	4.42	.36	1.68
2000 (raw)	637 (16%)	52 (1%)	242 (6%)
Total (rates)	----	----	----
Total (raw)	1284 (16%)	123 (2%)	503 (6%)

Year	Disorderly Conduct	Domestic Abuse	Narcotics
1999 (rates)	5.92	1.52	4.93
1999 (raw)	852 (21%)	219 (5%)	710 (18%)
2000 (rates)	5.45	1.31	4.64
2000 (raw)	785 (20%)	189 (5%)	668 (17%)
Total (rates)	----	----	----
Total (raw)	1637 (21%)	408 (5%)	1378 (17%)

Year	Obstruction	Truancy	Unarmed Robbery
1999 (rates)	5.99	1.09	.63
1999 (raw)	863 (22%)	157 (4%)	92 (2%)
2000 (rates)	6.09	2.15	.36
2000 (raw)	877 (22%)	310 (8%)	52 (1%)
Total (rates)	----	----	----
Total (raw)	1740 (22%)	467 (6%)	144 (2%)

Year	Weapons	Total
1999 (rates)	.73	27.62
1999 (raw)	105 (3%)	3977
2000 (rates)	.87	27.34
2000 (raw)	125 (3%)	3937
Total (rates)	----	----
Total (raw)	230 (3%)	7914

NOTE: Total crime rate was standardized per 1,000 residents in each block group location. Raw crime statistics are followed by percentage of total crime in parentheses.

Table 7.1 represents a descriptive breakdown of all 7,914 criminal incidents used for this analysis over the two-year period. In both years, obstruction constituted the most incidents recorded with 22 percent of the total. Next was disorderly conduct with 21 percent of the total incidents recorded. Both these incidents also had a rate of 5.9 per 1,000 people. These incidents offer the police a great deal of discretion in terms of exercising their authority. According to the city ordinance, obstruction is defined broadly as any action that makes it more difficult for the police to carry out their duties. Disorderly conduct is also defined broadly as any act that endangers self, others, or otherwise deprives inhabitants of the peace they are entitled. Not surprisingly, violent offenses of armed and unarmed robbery appeared least in comparison with the other incidents used for analysis making up a little more than three percent of the total crime incidents recorded in 1999-2000.

Since youth is a variable measured in Sampson and colleague's (1997) factor analysis, truancy was also included within the dependent variables. Both Sampson and colleagues (1997) Chicago study and the comparison Lansing, Michigan research project measured the youth variable by the percentage of the population under 18 years of age. While conducting field interviews during my research, I learned truancy and loitering youths at the main city bus terminal was an on-going problem that many transit users had brought to the attention of both the police and private security officers that worked at the terminal. In an effort to alleviate this problem, additional police officers and volunteer senior citizens were worked collaboratively to patrol the terminal during school hours and arrest and/or report truants. This strategy greatly increased police presence within the main bus terminal[2]. However, no research was conducted to measure potential displacement effects or the potential for crime to move away from the terminal after an increase in police presence. The year 2000 accounted for 43 percent of all truancy incident data over a six-year period beginning in 1995. Most of the truancy incidents reported by the Lansing, Michigan police (87%) were mapped to the bus terminal.

---

[2] In an unrelated research project, it was found that public police and private security officers rated their relationships more highly as increased non-dispatched contact was made during these truancy (or "community policing") sweeps at the main bus terminal (Kooi, 2001).

In addition to total crime numbers, crime rates per 1,000 residents within each block group were also calculated to standardize incident data according to total population within each block group. The calculation of the crime rate allows more meaningful comparisons to be made spatially between different block groups. However, there is also an assumption being made that the rate calculated for each block group means that areas with a low population are more at risk. This assumption may not be warranted since movement between block groups are more fluid and risky block groups may be more attributed to land use (e.g., presence of taverns, bus stops, liquor stores, etc.) rather than total population. For this reason, both crime rates and raw crime figures are displayed where appropriate. Rates were calculated per year in Table 7.1 but it was not intuitive to give these rates over the combined two-year period.

Answering the 'where' question and addressing problems with point-analysis

Geocoding official crime statistics is a method of specifying the location of a crime incident, emergency call for service, or arrest within official statistics. Each of these three official crime recordings offers benefits and limitations and hot spot locations can vary depending on which data source is utilized within the map. In addition to using different data sources of official statistics, single data source hot spot identification can also vary by different methodologies including simple visual interpretation of point data to calculating the standard deviational ellipses of raster map images (Jefferis, 1998).

Most police departments have remained simplistic in plotting incident locations on a base map (Eck, Gersch and Taylor, 1997) and then visually interpreting the distribution of crime (Mamalian and LaVigne, 1999). About 25 percent of large departments[3] use a variety of software packages for hotspot identification purposes, but very few use any type of statistical spatial analysis. Several problems exist in regards to interpreting point maps without the use of some type of statistical software. Repeated incidents may be represented by overlapping points making the map uninterruptible in terms of actually knowing where crime is clustering. In addition, research among map-

[3] Large departments have been defined as 100 police officers or more (Mamalian and LaVigne, 1999).

readers found visual interpretation differences regarding cluster perceptions (Sadahiro, 1997). Therefore, bias results are probable when blindly interpreting simplistic point maps.

It is often difficult to interpret point maps in terms of face validity since many points (i.e., incidents) may fall on the border of block groups. In these cases, it becomes difficult to interpret if an incident actually falls within a specific "neighborhood" or not.

As a whole, the field of spatial crime analysis lacks a systematic methodology for comparing and utilizing appropriate techniques within either visual or statistically computer aided hot spot identification. However, there have been suggestions made for creating more statistically robust crime maps (Chainey and Reid, 1999; Williamson et al., 1999) and moving to more advanced analytical mapping methodologies.

One technological effort is a software package developed by the Illinois Criminal Justice Information Authority called Spatial and Temporal Analysis of Crime (STAC). The STAC software was created in response to requests by local law enforcement administrators who wanted to improve their crime spatial analysis capabilities. The STAC software is able to locate clusters of criminal activities by automating various analytical functions such as the time of day, month, season, etc. In addition, the program calculates statistical summaries of hot spot areas without being restricted by jurisdictional boundary lines or temporal issues. The STAC software overlooks artificial boundaries and summarizes point data through complex algorithms (Block, 1993) taking into account space and time. This type of software and robust statistical analysis serves as an improvement over aggregating crime data to census tracts and block groups and then determining those predefined boundary areas that have the highest amount of crime. Often times hot spot areas cross-jurisdictional boundaries and software that is more advanced is necessary for locating those hot spot locations.

In addition to aggregation issues involving borders and locating hot spot locations, there is also the issue of hot spotting by year, month, day, or time. It is possible that hot spot locations will change when comparing specific temporal issues. Place level theory testing must account for these temporal issues when attempting to answer the 'where' question while arguing that crime is not a randomized event but takes place due to increased opportunities in particular locations and at particular times.

Findings showing that crime often tends to concentrate in relatively small places or hot spots (Sherman and Weisburd, 1995; Maltz, Gordon and Friedman, 1990; Pierce, Spaar, and Briggs, 1988; Weisburd, Maher, and Sherman, 1992) has been accepted throughout the criminological field. In addition, temporal elements invariably affect crime rates. For example, early and current research has found similar patterns for city level data showing that property crimes are highest in the fall and winter and crimes of aggression peak in mid-summer and are lowest in January (Cohen , 1941; Block, 1983; Anderson, 1987). Table 7.2 shows that data used in the research project shows temporal indicators of crime. These temporal issues persisted over a five-year period and during the main two years (1999-2000) that were critically analyzed throughout the research project.

Within Table 7.2, the warmer months appear to be a clear indication that the given crime incidents remain higher than in colder months. The months of July and August both have double-digit percentages for crime concentration in all six years of data in comparison to other months. Clearly, Table 7.2 shows a seasonal temporal pattern for the given incident level crime data.

Table 7.2. Monthly Crime Incidents (1996-2000).

Month	1996	1997	1998	1999	2000	TOTAL
Jan	205	195	246	219	219	1276 (6)
Feb	188	262	257	260	337	1483 (7)
Mar	221	235	258	258	315	1588 (7)
Apr	235	239	252	365	322	1692 (8)
May	247	267	308	382	396	1879 (9)
June	280	310	342	397	395	2086 (10)
July	324	342	363	397	385	2217 (10)
Aug	367	318	331	406	410	2219 (10)
Sep	307	351	341	401	351	2074 (10)
Oct	293	308	344	370	334	1966 (9)
Nov	261	233	294	291	266	1311 (6)
Dec	192	226	250	228	203	1279 (6)
TOTAL	**3120**	**3286**	**3588**	**3977**	**3937**	**21,290**

NOTE: Incidents are totals from armed/unarmed robberies, assaults, domestic abuse, disorderly conduct, weapons, alcohol/narcotics violations, obstruction, and truancy. Monthly percentages of total crime appear in ( ).

Contemporary 'opportunity' theories used as a framework through this research project, such as routine activities, crime pattern theory, and rational choice [4] provide the foundation for analyzing these seasonality temporal crime issues. For example, routine activities theory (Cohen and Felson, 1979) reports that opportunities to commit crime are concentrated in time and place with temporal differences having an effect on the convergence of 1) motivated offenders, 2) worthy targets, and 3) the absence of capable guardians. Seasonality can affect one or all three of these components within routine activities theory in a number of ways. Hylleberg (1995) produced a structural model that grouped several exogenous variables of crime causation into classes of seasonality such as school vacation days, weekends, and weather issues. The argument made was that time of the year and specific days affect opportunities to commit crime since offender and victim routine activities will vary according to the day of the week, time of the day, and climate. Cohen and Felson (1979) and Felson (1987) had similar findings in determining levels of risk were highest during the evening weekend hours since potential offenders and victim paths are more likely to cross without the presence of adequate guardianship.

Within the mapping analysis over the critical two-year data period, it was apparent that concentrations of crime incidents were disproportional within specific areas of the city. Spelman (1995), along with Shaw and McKay (1942), found that spatial patterns in crime persisted and were generally spatially and temporally stable. These findings were backed by the data mapped in the research project. This means that hot spot block groups did not change year to year. Hot spot block groups were determined by dividing crime up equally for each year into quartiles. Block groups with the largest (i.e., most extreme) quartile of crime were shaded and labeled as the hot spot block group for that year. Also, both 1999 and 2000 data were combined to calculate hot spot locations over a 24-month time period.

There are several different techniques designed to identify hot spot locations (Sherman, et al., 1989). Since criminals and incidents of crime do not respect governmental boundaries, it becomes necessary to measure crime clusters without the restriction of predefined boundary lines. In addition to aggregating all crime data to block group locations

---

[4] Felson and Clarke (1998) provide an overview of opportunity theories.

for hot spot analysis, the more advanced analytical version of hot spot identification was conducted through a similar software to STAC called CrimeStat (Levine, 1999). This software utilizes a partitioning technique or what has been frequently referred to as the K-means technique. Within this process, crime incidents are partitioned into a specific number of groups according to how closely they occur to one another spatially. This process operates as a technique for hierarchically clustering criminal incidents together according to their spatial proximity. The clustering is repeated until all points appear in a cluster. The software displays the highest clustering in ellipses on the map. For demonstration purposes, a single ellipse appears in the map figures presented throughout this book representing clustering of criminal incidents across block groups within the city used for this analysis. The hot spot ellipse closely matches the hot spot block groups for each year of data and for each incident of crime showing overall stability in hot spot locations year to year.

As findings from past spatial studies have indicated, crime incidents do cluster in terms of space once mapped according to the location that police officers or dispatchers recorded they occurred. Within the data, not only did yearly incidents not vary much in terms of clustering, different crime types also did not vary substantially in terms of concentration. For example, during the two-year period hot spot crime rates for incidents of alcohol violations, armed robberies, assault, disorderly conduct, domestic abuse, narcotic violations, obstruction, and unarmed robbery all appear at the same single block group location. Only truancy and weapons violations appeared slightly different with an expanded multiple hot spot block group. Each individual crime type was mapped to block group locations and is presented in Figures 7.1-7.3. In addition, Figure 7.4 shows total raw crime hot spot block group locations and the areas with the largest number of clustered bus stop locations. Following the pattern of identification in the first three figures, the number of incidents occurring in each block group location was split into five quartile classifications. Block groups that contained the highest number of criminal incidents are shaded representing hot spot block groups. The ellipse indicated by the CrimeStat software for hot spot identification of all crime incidents is used for comparison purposes.

Figure 7.1. Two years crime rate for alcohol, armed/unarmed robbery, assault, disorderly conduct, domestic abuse, narcotics, obstruction, and total crime hot spot block group and ellipse.

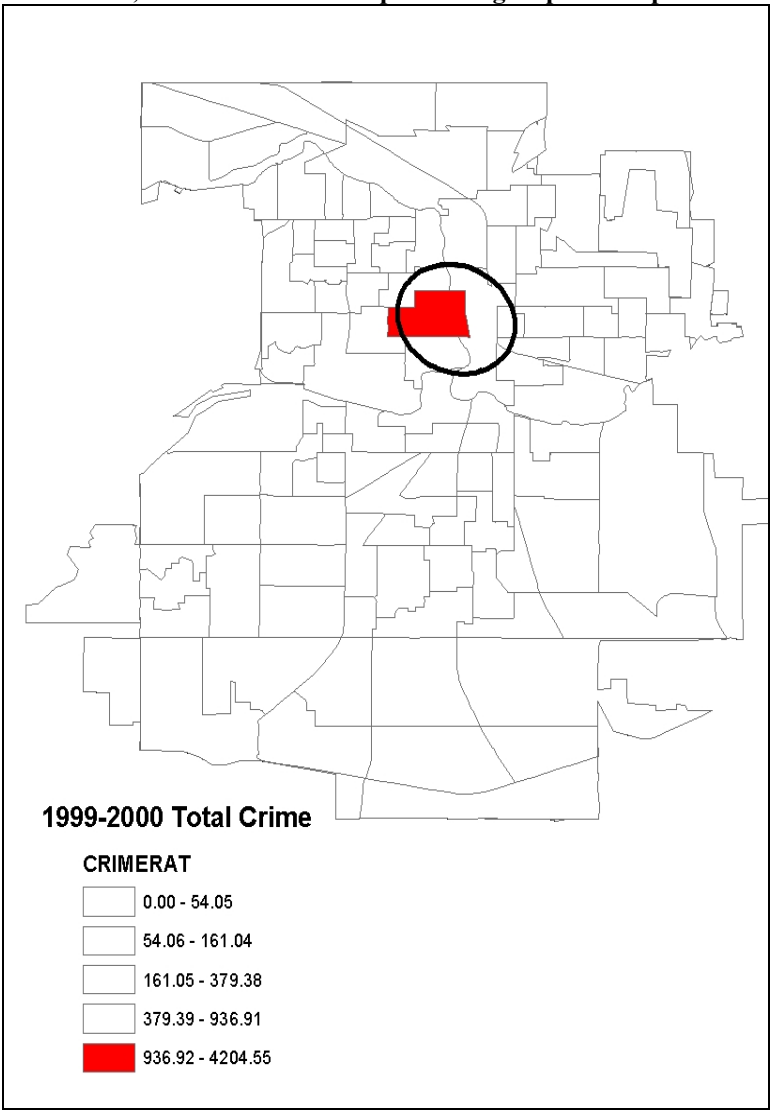


Figure 7.1 presents the most concentrated hot spot block group for total crime and multiple other categorized offenses. The legend presents only total crime rate over the two-year period, however the same single block group represents the same hot spot location for each of the given offenses. In other words, when categorizing total crime into the specific offenses utilized for the book, each of these offenses also concentrates at this same block group location. This spatial finding is important for a couple reasons. One, it shows that the spatial data used for this research is fairly concentrated rather than random. Second, it also points out a problem with standardizing the crime incident data through rates. The block group that is highlighted in figure 7.1 also happens to have the lowest population concentration.

Part of the problem with standardizing crime rates by population throughout areas as small as block group locations is that some block groups do have a very low populous but high crime. In the given hot spot block group shown in figure V.1, the total population is 44 but there were 185 crime incidents over the two-year time period, meaning the actual high crime rate is 4,204.54 per 1,000 at that block group. Obviously, the 44 people living in the block group are not being victimized at this rate and residents living in other block groups have frequent activities in this block group. Because of this complication with standardizing data into crime rates discussion and presentation of hot spot block group raw crime data precedes the rate calculations and are presented with other hot spot block group incidents.

The raw statistics for calculating the hot spot block group was calculated through the ArcView software dividing up the 114 block group crime statistics into five quartiles. In Figure 7.2 this meant that the hot spot block groups contained a minimum of 37 truancy violations in order to fall in the last or most extreme quartile. Again, this is a raw statistic, but the same finding can be shown through the rate calculation as the main hot spot block group also contains the lowest numbers for block group residential population.

The finding that crime has the highest concentration in low populated areas as per the census calculations is not surprising. Further qualitative analysis of this block group location reveals that this area is mainly commercial and lacks residential areas. A challenging research question evolving looks at how concentrated bus stop locations within these non-residential areas may serve as facilitators for increased crime in areas that contain a high number of motivated offenders and lack of

territoriality (Newman, 1973; 1975) or collective efficacy (Sampson et al., 1997).

In figure 7.2 the same block group as total crime is highlighted as having the highest concentration of truancy rates. However, a second block group just to the south also makes up the highest concentration of truancy rates. This second block group contains the main bus terminal, which became a target for a community initiative to cut truancy during the years of the data used for my research. Because of this community policing tactic, it was no surprise to find the large increase of truancy rates at the bus terminal. However, when looking a total crime, even over a six year time period (1995-2000) the bus terminal remained the number one crime hot spot within Lansing. This finding will be explored in more detail throughout this book, but leads directly into the given research questions exploring why routine pathways of transit users accompanied by motivated offenders would produce spatially and statistical crime hot spots at these locations. In addition, when analyzing the mapped data presented in these figures over a two-year time period, what type of response is most appropriate for the community and the police when acknowledging potential causes of crime concentrating in these specific areas. These issues will be addressed more uniformly throughout the book.

Figure 7.2. Two years truancy hot spot block groups and statistical ellipse.

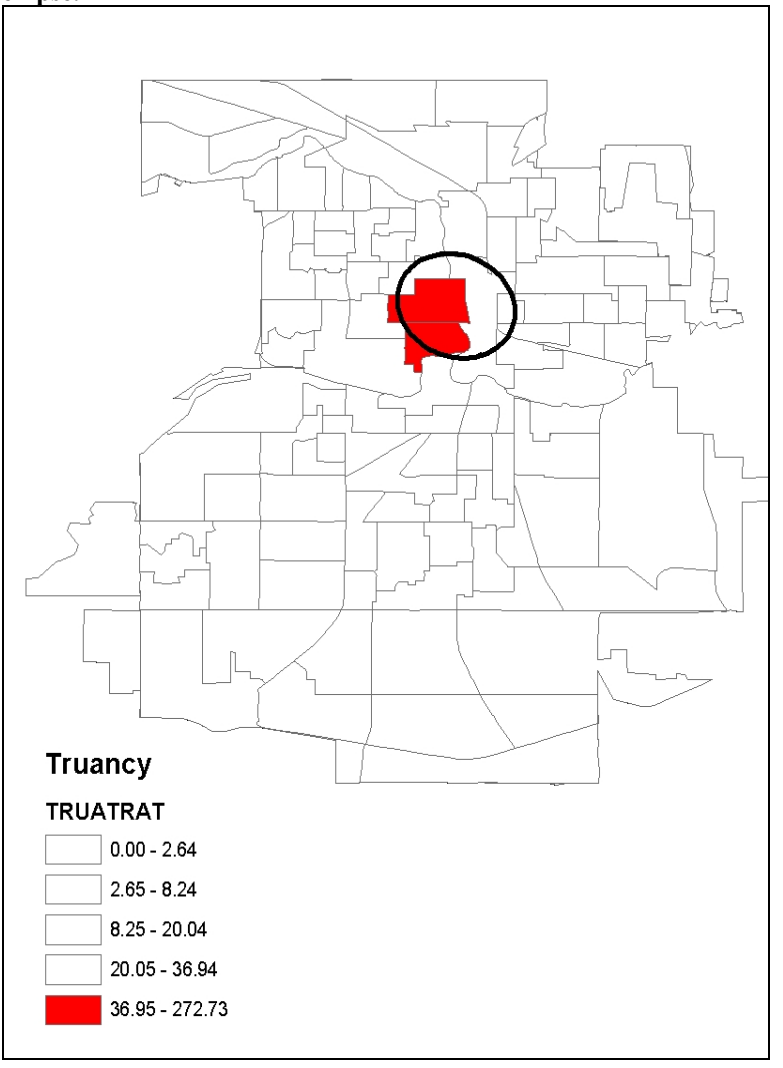


Figure 7.3 shows weapon violations and a high concentration of incidents in both block groups highlighted under the truancy data and also a third block group. Interestingly, all three of these block group

locations cluster very close together and are stable throughout several years of data (i.e., 1995-2000). There are several possibilities for why weapon violations may concentrate in multiple block group locations unlike other offenses selected for analysis. However, an exploration of these possibilities is beyond the scope of the current research project.

Figure 7.3. Two years weapon violations hot spot block groups and ellipse.

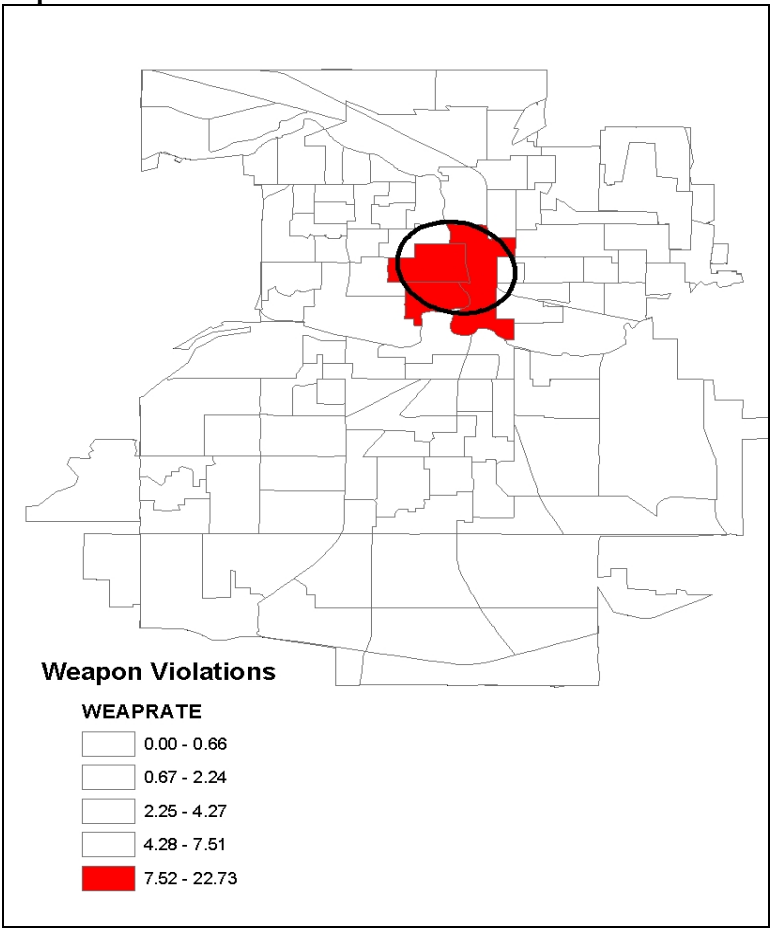
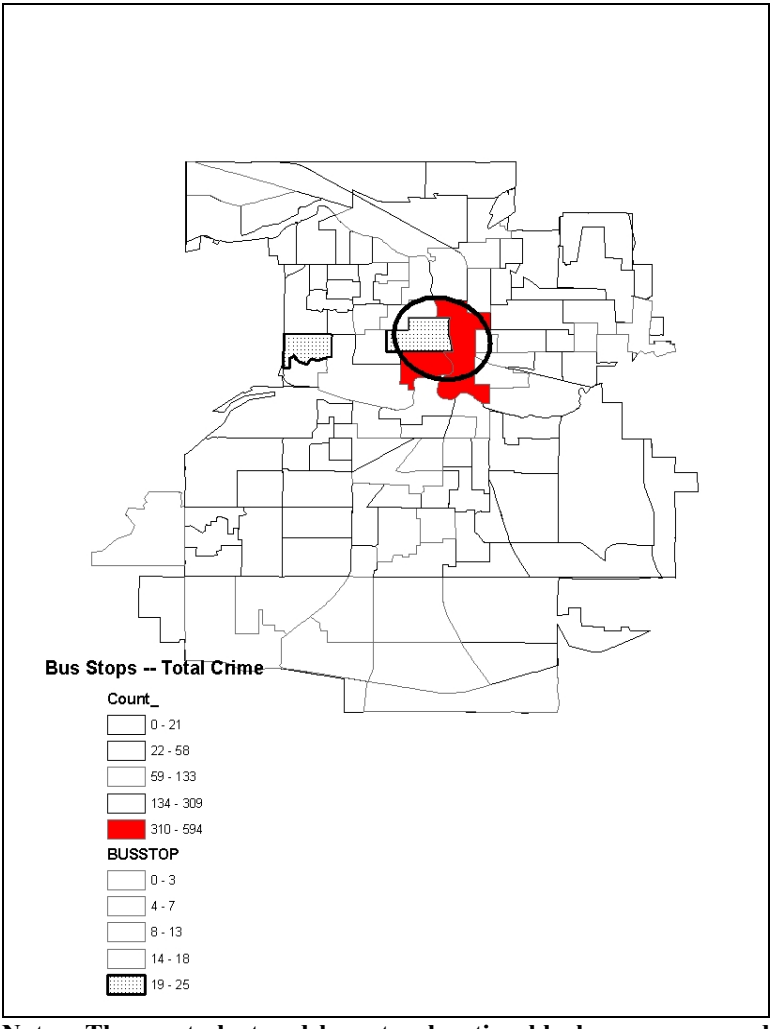


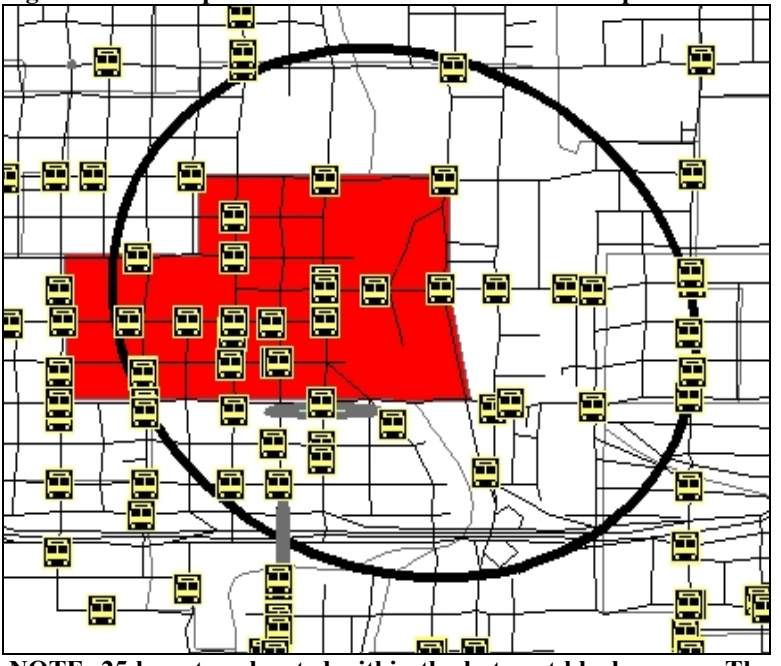
Figure 7.4. Total Raw Crime Hot Spots and clustered Bus Stop locations.



Note: The most clustered bus stop location block groups ranged from 19-26 bus stops and hot spot raw crime incident block groups ranged from two-year total of 310-594 incidents. Total raw crime incidents per 114 block groups varied substantially ranging from 1 to 594 per block group, with an overall mean of 68.28 (SD=87).

Figure 7.4 demonstrated that clustered bus stop locations appear in the block group adjacent to the hot spot total raw crime block group. In addition, clustered bus stop locations appear in the same hot spot block group as hot spot crime rates. An argument can be made that areas with high bus stop concentration may be correlated with high crime. Although this correlation is only visual at this point, it was further tested in more advanced analytical models. The next figure takes a closer look at the hot spot block group and the clustering of bus stop locations that are within that block group. This map appears in Figure 7.5.

Figure 7.5. Hot Spot Block for crime rates and bus stop locations.



NOTE: 25 bus stops located within the hot spot block group. The large ellipses accounts for statistical crime clustering across block group boundaries identifying the main crime hot spot in the city. Smaller ellipse circles just south of the hot spot block group include the tightest clustering of crime events in the city, which occurs at the main bus terminal.

Interestingly, one of the block groups that has the largest number of bus stop locations (18-26) borders the main hot spot block group for total raw crime and is within the same block group for the main hot spot crime block group when using crime rates. Figure 7.5 gives visual support for Brantingham and Brantingham's (1981; 1991) crime pattern theory. Research within crime pattern theory finds that offenders pick their targets in close proximity to areas within their routine pathways and within areas they are most familiar. From this assertion, it is assumed that offenders within the block groups containing the highest number of bus stop locations are familiar with these areas and these same offenders are more likely to be within these block groups because of the concentration of bus stop locations.

Of interest in Figure 7.5 is also the hot spot crime ellipses that appears just south of the hot spot block group. These ellipses represent a tighter clustering of crime incidents than the larger ellipse to the north. In fact, these ellipses represent the tightest clustering of all outdoor crime incidents throughout the city. Empirically, the smallest ellipse circle closest to the hot spot block group is the location of the main bus terminal. Routine activities theory and crime pattern theory both argue that transportation systems may provide the catalyst for increased crime since stranger pathways are brought together in one centralized location where opportunity is high and collective efficacy is potentially low. The main city bus terminal offers several reasons why it attracts the highest amount of crime. According to unstructured interviews conducted with administrators of the private security firm that patrols the main bus terminal, security officers patrol the terminal during all opened hours and report several incidents of crime and disorder to the local police. Although formal guardianship is high within the terminal, the external area surrounding the bus terminal is not customarily patrolled by security. In addition, local police officers will often patrol the terminal and find probation violators or truants. It may be of no surprise that given the crime data utilized for this research project had demonstrated the tightest clustering of crime at the bus terminal. However, analysis of all crime incidents recorded by the police (indoors and outdoors) still shows the bus terminal as being the main isolated single location hot spot for the given city in the same years utilized for my research.

Both hot spot ellipses appearing in Figure 7.5 were created through the CrimeStat software nearest neighbor index (Nna) which provides an approximation about whether points are more clustered or dispersed

than would be expected on the basis of chance (Levine, 1999). The ellipses are determined by comparing the average distance of the nearest crime incident (i.e. nearest neighbor) with a spatially random expected distance. This statistic is achieved by dividing the expected average nearest incident distance by the expected random distance. From this iterative process, clustering of crimes can be determined and adjusted as displayed by the small and large ellipse hot spots in Figure 7.5. Further advanced analytical techniques will be utilized to test the correlation of bus stop locations on crime rates.

Knowing where crime has occurred descriptively is the first part of processing and analyzing spatial data. Beyond knowing that crime is spatially and temporally stable (the where?), it then becomes critical to analyze the "why" question. Within this process, my analysis moves beyond visual and descriptive inspection and towards a more advanced spatially based three part analytical methodology in chapters 8-10. Chapter 8 represents Part I factor analysis of data to determine mediating effects of collective efficacy. Chapter 9 represents Part II logistical regression comparing bus stop and non-bus stop locations. Chapter 10 represents Part III qualitative analysis of the hot spot bus stop locations.

This page intentionally left blank

CHAPTER 8

Testing Informal Social Control

Census demographic data chosen for this study attempted to replicate those variables used by Sampson and colleagues (1997), with a few changes that were noted in the beginning of Chapter 4. One hundred-fourteen block group locations made up the main unit of analysis for this spatial research. The initial factor analysis included all independent and dependent variables. The dependent variables (i.e., crime incidents) loaded separately from the indicator census variables. Attempts were made to separate crime incidents into two factors (e.g., nonviolent and violent crime, officer initiated incidents and victim initiated), but neither of these were successful. For purposes of hybrid model testing, all incidents became part of a summary scale used as a total crime rate main effect exogenous variable. As noted in various figures and Table 8.1 criminal incidents per block group varied substantially ranging from 1 to 594 per block group, with an overall mean of 68.28 (SD=87). This finding supported past research that has shown a clustering of incidents in place specific neighborhood-level locations (Sherman, 1995). Therefore, a log transformation of the incident data was used to normalize the variable (Keene, 1995) as is commonly done with crime data.

In addition to crime, residential stability and owner-occupied housing also represent endogenous dependent variables and are indicators of informal social control or collective efficacy. The main independent demographic variables, along with a dependent summary scale of all criminal incidents, are presented in a bivariate correlation matrix in Table 8.1. Nonsignificant correlations appear in italics.

Table 8.1 represents the results of the correlations along with descriptive mean percentages and standard deviations for the main unit of analysis. Mean scores indicate percentage representation of the variables for the entire unit of analysis. For example, the 2000 unemployment rate was 4.4% and 6.1% of residents were on public assistance.

High correlations between independent variables were noticeable indicating the potential of multicollinearity problems. Multicollinearity problems may exist when independent variables are more strongly related to other independent variables than with dependent variables (Weidner et al., 2002). An examination of the bivariate correlation table revealed that several indicator variables correlated more highly with each other than with the dependent variables showing that multicollinearity could be an issue in regards to the use of these variables. The highest bivariate correlation (.76) existed between foreign-born and speaks little to no English. In addition, owner-occupied housing and residential stability had the second highest correlation (.75). In the proceeding SEM model tests, it was determined that these variables were redundant and the model was respecified to drop variables that were most highly contributive to multicollinearity problems.

In this study, the goal was to make substantive as well as methodological contributions to collective efficacy neighborhood-level research. The research analyzes how neighborhoods mediate crime through guardianship (Cohen and Felson, 1979), territoriality (Newman, 1972; 1975) or collective efficacy (Sampson *et al*., 1997). Through this type of foundation, crime is ecologically concentrated through the presence or absence of collective efficacy. The main research question analyzes whether cohesion, as measured through residential stability, mediates the effects of both concentrated disadvantage and immigrant isolation on total crime incidents. Since ecological factors and crime concentration is seen as being relatively stable (Spelman, 1995), incident rates over a six year time period can be explored in relation to census variables that define concepts from earlier social disorganization studies.

Several studies have made use of factoring ecological variables (Elliott et al., 1996; Sampson, et al., 1999; Sampson et al., 1997; Taylor and Covington, 1988). A factor analytic approach is useful in ecological research since many aspects of neighborhoods are related (e.g., poverty rates related to minority populations and to female-

headed households). One of the goals of collapsing several correlated variables into a single factor is to limit multicollinearity and yield more stable coefficients with greater statistical power. Data used for this research project was factor analyzed and found to closely match data from the Chicago study conducted by Sampson and colleagues (1997). However, it should be noted that my model is not an 'exact' replication of Sampson and colleagues (1997) Chicago neighborhood analysis and some differences between choices in variables do exist due to obvious differences between Chicago, Illinois and Lansing, Michigan.

Building a model to test the collective efficacy hypothesis occurred in three stages. In the first stage, a principle components analysis was completed to compare the results with the Sampson and colleagues (1997) factor analysis. In the second stage, a preliminary path model was set up based on the given structure of the confirmatory measurement model. A test of the full model involved estimating a hybrid structural equation model through SAS software. The third stage presents a final model based on diagnostic analysis, the bivariate correlation matrix, suggested modification indices and deleting insignificant paths. Changes made provided an acceptable and parsimonious fit of the data that were relevant to the integrity of the theoretical foundation.

Table 8.1. Descriptive Percentages, Standard Deviations, and Bivariate Correlations.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Poverty	13.62	10.95	88									
2 Public Assistance	6.07	5.36	.73**									
3 Female Household	26.39	12.93	.66**	.65**								
4 Unemployment	4.41	3.40	.38**	.39**	.27**							
5 Youth	25.73	8.21	.37**	.54**	.47**	.17						
6 Minority	31.46	17.06	.57**	.56**	.60**	.39**	.42**					
7 No English	2.01	2.47	.44**	.33**	.34**	.33**	.27**	.33**				
8 Foreign-born	5.33	5.10	.39**	.27**	.30**	.29**	*.18*	.35**	.76**			
9 Stability	48.26	13.38	-.37**	*-.18*	*-.16*	-.40**	.20*	-.21*	-.32**	-.39**		
10 Owner-occupied	61.43	24.47	-.47**	-.26**	-.36**	-.49**	.19*	-.30*	-.41**	-.47**	.75**	
11 Total Crime (raw)	185.79	213.21	.39**	.31**	.30**	.33**	*.16*	.39**	.51**	.51**	-.38**	-.59**

NOTE: N = 114, **p < .01, *p < .05

Principle Component Analysis (PCA)

Measures of the key ecological constructs are consistent with much of the early literature on social disorganization theory and specifically to Sampson and colleagues (1997). These indicator variables represented three broad constructs- concentrated disadvantage, immigrant concentration, and residential stability. The results of the given principle component analysis provide support for defensible space concepts as indicated by (Newman, 1975) and incivilities or lack of stability as indicated by (Sampson et al., 1997; Shaw and McKay, 1942). The three factors extracted from the data included characteristics that identify instability and social disorganization follow research from early Chicago School sociology and include indicators for poverty, family disruption (as measured through single-female headed households), ethnic heterogeneity, and residential mobility (Shaw and McKay, 1942).

Loadings for the given census variables were comparable to the Chicago study. Factor scores retained included those with eigenvalues greater than 1.00. The eigenvalue measures explained variance as the sum of squares of the factor loadings. Variables with eigenvalues of less than 1.00 did not become part of the analysis since they did not significantly contribute to the construct. Along with the minimum eigenvalue score, a scree test and proportion of variance accounted for selecting the number of factors. The scree test showed a natural break indicating three factors existed for the Lansing, Michigan data, showing a close comparison to what was found by Sampson and colleagues (1997) Chicago study. Factor score comparison follows in Table 8.2.

Table 8.2. Comparison Factor Scores.

Variable	**Factor Loading** (Sampson et al., 1997)	**Factor Loading** (Lansing, Michigan)
Concentrated Disadvantage		
Below Poverty	.93	.84
Public Assistance	.94	.88
Female-headed household	.93	.85
Unemployed	.86	.86
Less than 18	.94	.66
Black[a] / Minority	.60	.78

Variable	Factor Loading (Sampson et al., 1997)	Factor Loading (Lansing, Michigan)
Immigrant		
Latino[b] / Speaks no English	.88	.94
Foreign-born	.70	.93
Residential Stability		
Same house as in 1985[c] / 1995	.77	.89
Owner-occupied housing	.86	.91

[a]Sampson et al., (1997) used percentage black concentration while the Lansing, Michigan study used a summary scale for percentage of all minority concentration.

[b]Sampson et al., (1997) found percentage of Latino loaded separately from disadvantage Data used for comparison found *Speaks no English* loaded separately from disadvantage.

[c] Sampson et al., (1997) used census data from 1990. Residents reporting that they have lived at the same residency since 1985 were coded as being stable. Research for this book used the most current census data from 2000. Residents reporting that the have lived at the same residency since 1995 were coded as being stable.

Sampson and colleagues (1997) and the Lansing, Michigan factor analysis utilized an oblique rotated component matrix. Significant loadings on the given components occurred when the absolute value of the factor loading was greater than .50 and less than .50 for all other factors, although the lowest significant loading for these studies was .66 (youth) and .60 (blacks) for Sampson and colleagues (1997). Interestingly, youth was one of the highest loading variables for Sampson and colleagues (1997) study and the lowest within my comparison data.

The minimal loading extraction of .50 is reasonable within criminology in order to reduce otherwise spurious inclusions. The choice to use an oblique rotation to determine these loadings is also not without merit. Oblique rotation has increased in popularity in the social sciences, not only because it often results in simpler factor structure matrices, but also because even if census data are not correlated in a given population it is quite possible that the data will be

correlated in the sample (Norusis, 1985). This type of linear transformation creates a better solution by lowering low to moderate loadings and raising high loadings to be more recognizable. An oblique rotation allowed the extracted components to freely correlate since it was predicted that the given census factors that measure disadvantage and immigrant concentration are correlated. An empirical comparison of the results of orthogonal varimax and oblique promax rotation in SAS demonstrated that oblique rotations did tend to result in simpler, less ambiguous solutions.

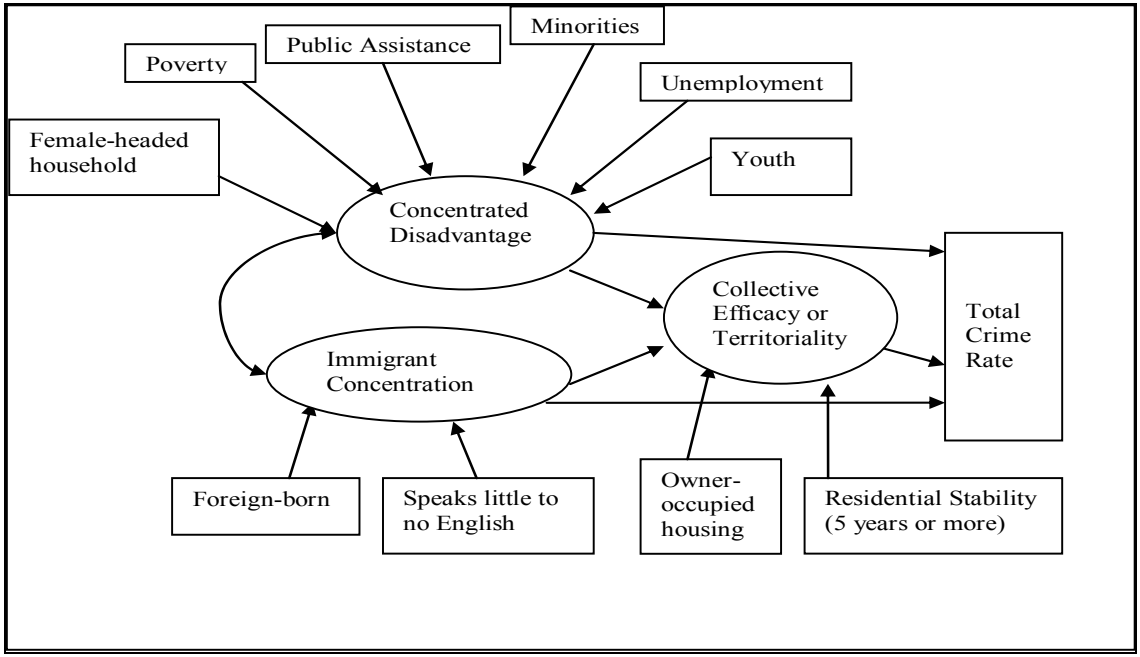
Conceptual Model

Within the initial recursive model, the latent concept of concentrated disadvantage showed high convergent validity with factor loadings from indicator variables poverty, public assistance, unemployment, female-headed households, minorities, and youth. Taken as a whole, concentrated disadvantage is a direct causation of increased crime and an indirect causation of lowering informal social controls or collective efficacy, which then directly affects crime rates. These variables all measured the same construct of disadvantage in the initial factor analysis that appears in Table 8.2.

The latent concept of immigrant concentration, based on the results by Sampson and colleagues (1997), and more specifically on Butcher and Piehl (1998), was predicted to have a direct effect on crime and an indirect effect on lowering collectively efficacy, which leads to increased crime and disorder. This hypothesis follows the argument that immigrants often have a more difficult time initially becoming a collective part of neighborhoods and are less likely to exercise informal social control by intervening in situations where they do not yet understand the culture. They are also less likely to reach out to formal social control mechanisms when victimized or witnessing victimization (Butcher and Piehl, 1998). Indicators of immigrant concentration included the block group percentage of foreign-born residents and the percentage of residents who spoke little to no English.

The mediating latent variable labeled collective efficacy also showed high convergent validity between two manifest variables. These indicating variables included the percentage of owner-occupied housing and those who lived in the same housing (owner or rental) for 5 years or more. A completed hybrid model from the given factor analysis appears in Figure 8.1.

Figure 8.1. Complete hybrid model of concentrated disadvantage and immigrant concentration mediated by residential stability.



The strategy of factor analyzing the given variables is also beneficial for mapping purposes since it may be easier to visually interpret a latent construct of concentrated disadvantage as opposed to mapping several manifest indicator variables that account for this concept. In addition, overall territoriality or collective efficacy can be easily displayed in terms of residential turnover and owner-occupied housing. It was hypothesized that those block groups with a high degree of measurable residential stability and a low degree of concentrated disadvantage will have lower incident rates. In this manner, residential stability serves as a mediating variable for social composition. According to Sampson and colleagues (1997) and Newman (1975) stable housing results in an increased sense of ownership and social cohesion. It was predicted that within these types of neighborhoods residents are more likely to look after one another and intervene in disorderly or criminal situations. Thus, despite the level of disorganization, crime is mediated by the extent of residential stability or collective efficacy.

A spatial presentation of the factored constructs appears in Figures 8.2-8.4. Again, the ellipse crime incident hot spot calculated from CrimeStat appears in each map to help better determine spatial identification of concentrated crime compared to the disorganization latent constructs. Block groups that are shaded represent the neighborhoods that have the highest concentration of disadvantage, immigrants, or lack of stability. From this analysis, it was hypothesized that areas of high disadvantage and immigrant concentration would also appear within the crime hot spot ellipse. It was also predicted that areas with the lowest amount of stability (i.e. high rental areas and high transition in housing) would also appear within these crime hot spot ellipse. For presentation purposes, Figure 8.4 identifies the block groups with the lowest stability factor. However, Figures 8.2 and 8.3 identify the block groups with the highest levels of concentrated disadvantage and immigrant concentration.

Figure 8.2. Concentrated Disadvantage

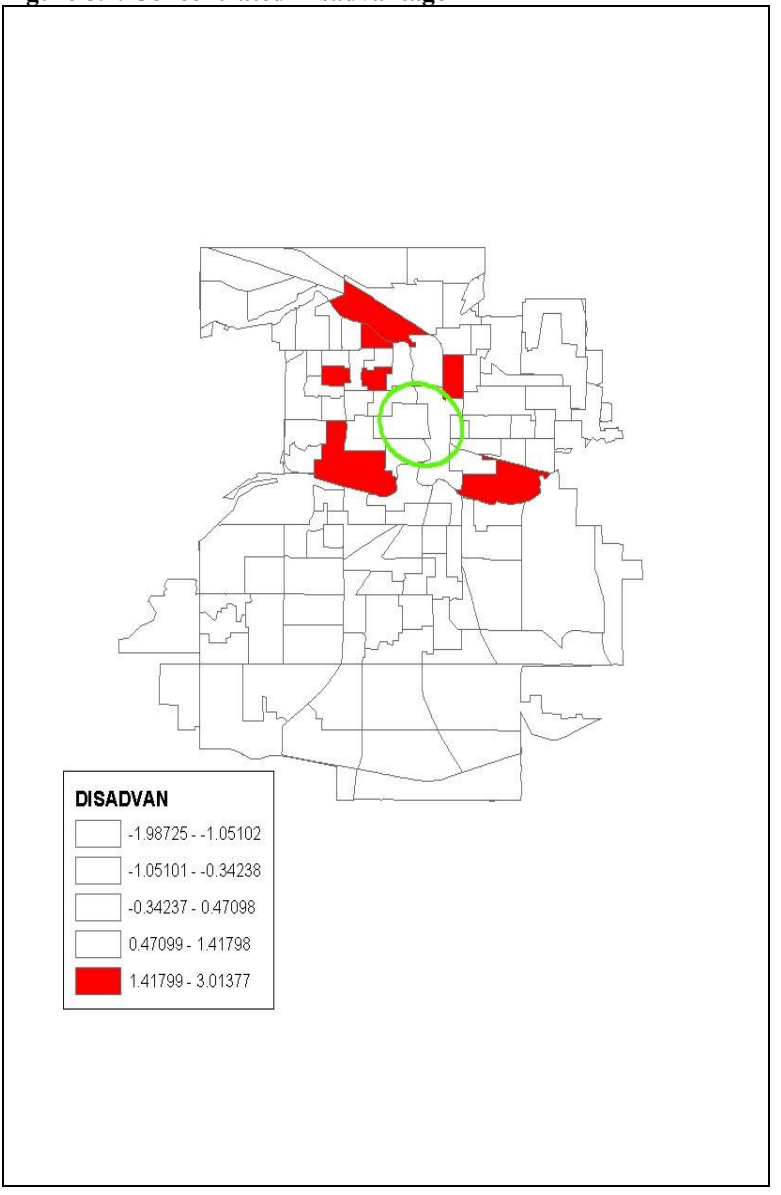


Figure 8.3. Immigrant Concentration

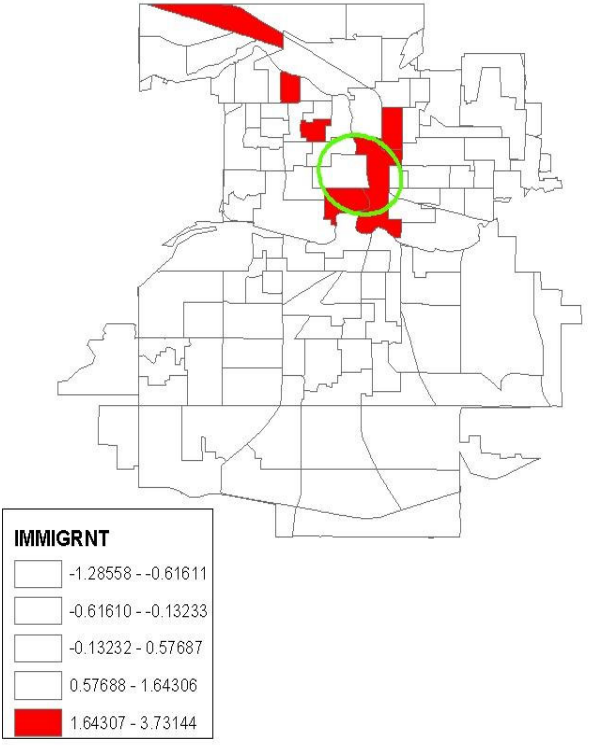


Figure 8.4. Residential Stability / Collective Efficacy

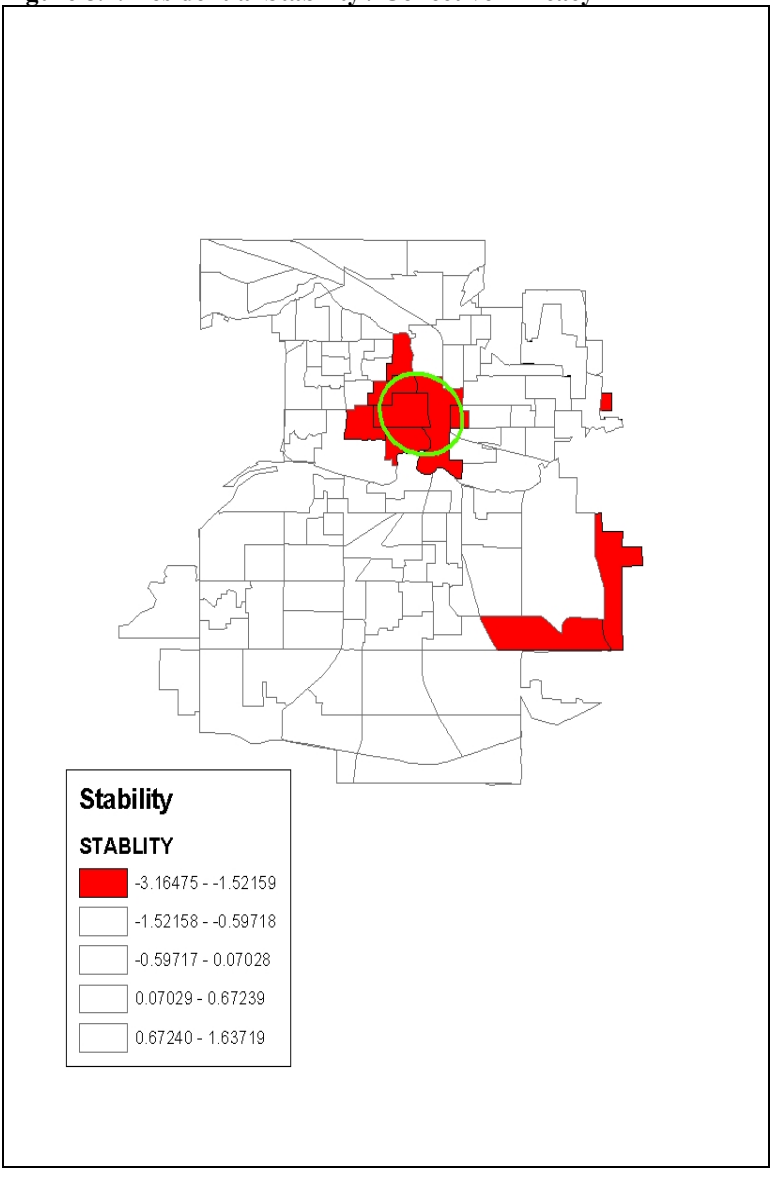
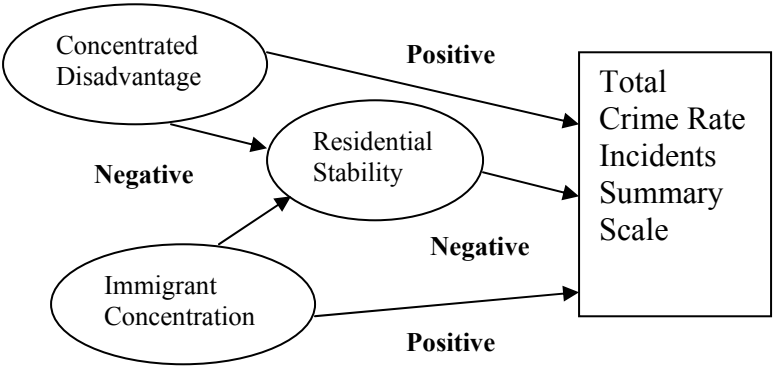


Figure 8.2 indicates that the areas with the highest concentration of disadvantage may not be spatially related to the given crime incident data. In comparison, Figure 8.3 shows high levels of immigrant concentration that appear within the hot spot crime incident ellipse, but also block group neighborhoods high in immigrant concentration that are in low official crime data neighborhoods, indicating that some new immigrant neighborhoods may be low in crime (Sampson et al., 2005) while others remain high in crime. Figure 8.4 shows low levels of residential stability being concentrated within the hot spot crime ellipse except for one section on the east side of the map. However, this is due to the fact that the high crime area also consists of a high concentration of commercial property as opposed to owner-occupied housing. After completing the visual descriptive mapping of the disorganization latent constructs it is important to also analytically process this data within a model test that will better determine the impact of the disorganization data on crime. This analytical process will take place through an SEM test utilizing the given factored constructs.

Hypothesized model testing

The initial hypothesized hybrid structural model came from the results of the factor scores appearing in Table 8.2. Pathways that show the directional hypotheses indicate the regression coefficients that were tested within the SEM analysis. Pathways that show the directional hypotheses indicate the regression coefficients that were tested. All directional pathways are based on findings from past research. Problems with this initial model included only using two manifest indicators for a latent construct. Findings from other structural models have indicated that the inclusion of only two indicator variables per factor have been shown to exhibit problems in terms of identification and convergence (Anderson and Gerbing, 1988; Bentler & Chou, 1987; Kline, 1998). Other additional concerns included finding out which indicators may be redundant and taking away from the power of the overall model. The preliminary factored model showing only latent constructs appears in Figure 8.5.

Figure 8.5. Factored SEM model of demographic predictors mediated by collective efficacy/territoriality functions.



The latent construct concentrated disadvantage is hypothesized to positively influence crime incidents and negatively influence the amount of stability within each block group. This pathway shows that as disadvantage increases, residential stability will decrease in terms of increased residential turnover and reduced owner-occupied housing. Reciprocally, these events directly and indirectly increase crime within the block group. Immigrant isolation also reduces residential stability, leading to increased crime. In addition, the covariance (unanalyzed association) between the exogenous latent constructs concentrated disadvantage and immigrant concentration will be computed.

RESULTS

Results from the initial confirmatory factor analysis were processed through a full structural equation model test and produced a number of problems. The initial hypothesized model did not show a very good fit for the given data: (GFI =.84, NFI[5] = .81, CFI =.86, and RMSEA[6]

[5] The normed-fit index (NFI) was proposed as an alternative to the chi-square test. NFI values over .90 indicate an acceptable fit of the data to the model (Bentler and Bonett, 1980).

=.15). The chi-square was highly significant ($\chi 2$ =134, *df* =39), and the $\chi 2/df$ ratio was unacceptable at 3.44. The null hypothesis indicating model fit was rejected since the chi-square statistic was significant and the ratio to degrees of freedom was high. However, all hypothesized paths from the initial model were in the predicted direction and significant except for the direct effect of immigrant isolation on crime. These findings coincide with the model found in Sampson et al., (1997), since they also found that immigrant isolation did not directly affect crime but did so indirectly through collective efficacy.

Modifying the Model

Several steps focused on finding a more parsimonious model. In terms of the total crime scale, no single block group consumed a disproportionate amount of influence on the coefficients after the log transformation was completed. Regression analyses were examined for influential outliers using a variety of diagnostic tests such as Cook's D and leverage scores. Outliers observed in scatterplots caused a high multivariate kurtosis of 36.67. However, there was concern with deleting entire block groups from the analysis since the sample size only consisted of 114 block group locations. This was a limitation of the research in comparison to multilevel analyses [i.e., Sampson et al., (1997)] that could more justifiably delete highly skewed individual surveys. In addition, deletion of block groups from diagnostic tests did little to lower multivariate kurtosis problems and was not chosen as a strategy for creating a better-fit model.

After rerunning the model, kurtosis problems still plagued the analysis. Redundant variables removed one at a time tested the model fit. Although all factor indicators of concentrated disadvantage were significantly correlated ($p<.01$), poverty, public assistance, and unemployment were seen to be a redundant representation of low income. Public assistance loaded the highest in the initial factor analysis, so the revised model dropped poverty and unemployment. All indicators significantly correlated with the total crime scale except youth (.16). Therefore, the youth indicator does not appear in the final

---

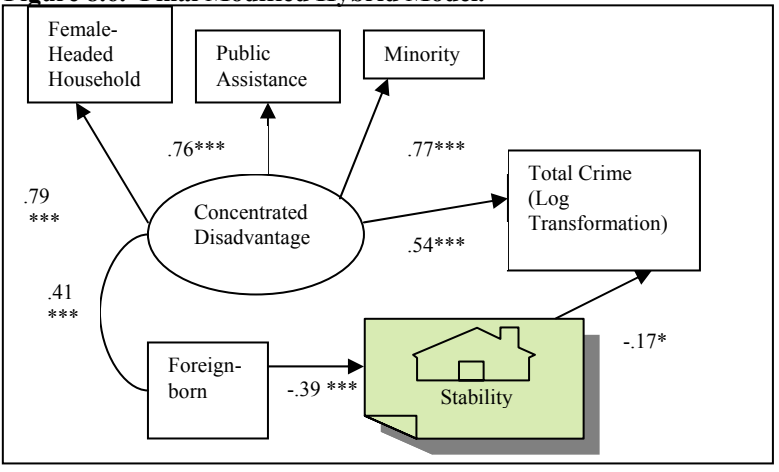
[6] Root mean square error of approximation (RMSEA) compares the observed and predicted covariance matrices. Confidence intervals suggest there is a good model fit if RMSEA is less than or equal to .05. By this criterion, the model is rejected since RMSEA is equal to .15.

model. This left the latent construct concentrated disadvantage with three indicators- public assistance, female-headed households, and minorities. Thus, single indicators representing low income, family instability, and ethnic isolation may be all that is necessary for measuring the concept of concentrated disadvantage and including other variables in a structural model test are unnecessarily redundant.

Final Full Model with Significant Path Coefficients

The final hybrid modified model appears in Figure 8.6. The measurement model for the single latent variable concentrated disadvantage included three indicators. Since public assistance loaded the highest in the initial confirmatory factor analysis, its path was fixed at 1 to avoid a scale indeterminacy problem so no error rate is reported. All path directions remained as predicted by previous hypotheses.

Figure 8.6. Final Modified Hybrid Model.



Path coefficients for concentrated disadvantage remained significant and were positively related to total crime (β = .54; t = 5.49; p<.001) and its coefficient was larger than in the original model (β = .38; t = 3.83; p<.001). However, the negative effect from the mediating manifest variable on total crime was smaller in the final hybrid model going from (β = -.29; t = -3.00; p<.01) to (β = -.17; t = -2.15; p<.05), but remained significant. The prediction that immigrant concentration

will reduce residential stability was supported by the significant ($p<.001$) path coefficient ($\beta = -.39$).

Significant path coefficients

Path coefficients were reassessed after deleting redundant indictors from the measurement model. The direct paths between the manifest variable foreign-born and total crime was spurious, but the indirect path through the mediating variable was significant. Therefore, the path coefficient of foreign-born directed at crime was fixed at zero in the final model. In addition, after deleting redundant indicators from the single remaining latent variable, the direct path from concentrated disadvantage to the mediating variable also became insignificant. In the initial model, this path coefficient was ($\beta = -.22$) and significant ($p<.05$) but became insignificant after limiting the concept of disadvantage to three indicators.

These findings were again similar to the Chicago study conducted by Sampson and colleagues (1997). Their research also found statistically direct effects of concentrated disadvantage on crime but insignificant effects of percent foreign-born on crime. However, they did find significant indirect effects with both concentrated disadvantage and ethnic isolation mediated by collective efficacy. This finding may be due to their larger sample size within the city of Chicago and the greater number of indicators for defining the mediating variable.

After removing insignificant paths, an analysis of modification indices was conducted that suggested model improvement by fixing and freeing certain causal paths. Due to the small sample size (N=114) and utilizing only two years of crime incidents, data-driven modifications were seen as risky (MacCallum, et al., 1992). Suggestions from LaGrange multipliers called for directly linking measurement model indicators to each other or to the total crime scale. The suggested modification involved a series of cause and effect issues and challenges to discriminant validity that went beyond the scope of testing collective efficacy as hypothesized by Sampson and colleagues (1997). Therefore, modification indices were not used for the final model presentation.

Percentage of Variance in Endogenous Variables

Determinations for R^2 appear on the top right corner of each variable within the final model Figure V.20. A relatively high proportion of explained variance in total crime was indicated with an R^2 of .36. Although residential stability also had a relatively high R^2 of .15, there was 85% unexplained variance and a .92 residual path coefficient or estimated correlation between residential stability and its disturbance. This also means that 85% of the variance in the residential stability variable is shared with its disturbance. With this proportion of shared disturbance, and since concentrated disadvantage was seen to insignificantly effect residential stability, it may be argued that a single measure is inadequate for capturing the full conceptual meaning of collectively efficacy as defined by Sampson and colleagues (1997).

Indirect and Total Effects

Calculations of indirect and total effect path coefficients were completed and the only indirect effect came from residential stability mediating the exogenous manifest variable foreign-born residents. Standardized results appear in Table V.5. The indirect effect was a multiplicative product of the direct negative effect of foreign-born on residential stability and the direct positive effect of residential stability on total crime. The indirect effect was insignificant[7] ($\beta = .07$; $p=.07$) with a total effect of ($\beta = .02$). Concentrated disadvantage had the highest significant direct and total effect ($\beta = .54$; $p<.001$) and the mediating variable had a significant direct and total effect ($\beta = -.17$; $p<.05$).

[7] Significance of the indirect mediator path coefficient could not be determined through SAS. I ran a Sobel test (Sobel, 1982) through an interactive webpage set up by the Ohio University. Unstandardized regression coefficients between foreign-born and the mediating variable and the standard error was inputted in addition to the raw coefficient for the association between the mediating variable and crime along with its standard error. The results from the Sobel test and Goodman (I&II) tests all indicated that the indirect effects from the mediating variable were insignificant with p-values=.07, .08, and .07, respectively.

Table 8.3. Standardized Structural Model Effects

	Direct	Indirect	Total
Concentrated Disadvantage	.54***	----	.54***
Foreign-born	-.39***	.07	.02
5 years in residency or more	-.17*	----	-.17*

NOTE: N=114, *** p < .001, ** p < .01, * p < .05

Standard Error Issues

Differences that are more serious existed between the Sampson et al., (1997) study and Lansing, Michigan units of analysis. In their study, they found indirect effects for each aspect of the social composition variables (Raudenbush and Sampson, 1999) and each indirect effect was far larger than its standard errors, which provided additional evidence of a statistically mediating effect of collective efficacy. Within my comparison data, the mediating effect was significant, but only for foreign-born residents and not for concentrated disadvantage. In addition, there were small standard errors within the path coefficients leading to the total crime scale (concentrated disadvantage=.03, residential stability=.01). These small standard errors indicate an estimation problem and linear dependence issue between the parameters that could invalidate the test scores. It is possible that the low sample size of 114 block group locations is problematic. Despite these problems, the final model did show an excellent fit in comparison to the initial hypothesized model.

Model Fit Summary

The initial model and the final model fit summary comparisons appear in Table 8.2. The chi-square of the final model is again significant but the χ^2/df ratio of 1.00 is well within general acceptance. Removal of redundant indicators in the measurement model and fixing insignificant path coefficients greatly improved the final model fit and overall multivariate kurtosis issues from the original hypothesized model.

Table 8.4. Model Fit Summary Comparison

	Initial Model	Final Model
Goodness of Fit Index (GFI)	.84	.97
Non-normed Index (Bentler & Bonnet, 1980)	.80	1.00
NFI (Bentler & Bonnet, 1980)	.81	.96
Comparative Fit Index (CFI)	.86	1.00
X^2 / df Ratio	3.44	1.00
RMSEA Estimate	.15	.00
Multivariate Kurtosis	36.67	7.36
R^2 Collective Efficacy	.24	.15
R^2 Total Crime	.40	.36

Multivariate kurtosis was reduced 29.31 after eliminating redundant indicators. The major fit indexes were all seen to exceed .9 with some being rounded to 1.00; GFI =.97, NFI = .96, CFI =1.00, and RMSEA =.00. The goodness of fit index (GFI) indicates the proportion of observed covariances explained by the model and serves as an alternative fit indicator to the chi-square statistic (Jöreskog and Sörbom, 1996). The normed fit index (NFI) indicates the proportion of improvement of fit in the model relative to a just-identified model (Bentler and Bonett, 1980; Kline, 1998). The NFI of .96 indicates that the final model is 96% better than the null hypothesized model. The comparative fit index (CFI) was designed as a modification to the NFI without being restricted to sample size (Bentler and Bonett, 1990). The CFI score of .999 rounded to 1.00, again indicating a nearly perfect model fit.

The collective efficacy hypothesis from Sampson and colleagues (1997) was supported within the SEM model test with the data used for the comparison. The latent construct concentrated disadvantage had the largest impact on increasing the total crime scale but indicators for collective efficacy still had a significant direct positive impact on crime incidents. There was also a mediating effect for immigrant concentration, meaning that although immigrant concentration does not directly effect crime within the given city, it does indirectly effect crime by reducing residential stability, which in turn increases crime. This model is not as strong as Sampson and colleagues (1997) since disadvantage is not mediated by stability.

CHAPTER 9

Comparing Bus Stop and Non-Bus Stop Locations

In moving from a macro-level to a more meso-level analysis, this second part of the methodology tests if bus stop locations significantly influence crime compared to non-bus stop locations. Before conducting this type of comparison analysis, it is useful to have a full understanding of the impact of social disorganization and stability factors on crime. Since these variables have been found to significantly affect crime, either directly or indirectly, it is necessary to control for their effect when comparing bus stop and non-bus stop block group locations on crime. Within a quasi-experimental design it is critical that experimental and control areas are matched for the same characteristics before testing the experimental effect. Since bus stop locations cannot feasibly be randomly allocated, quasi-experimental designs seek alternative strategies for matching group characteristics. In the units of analysis, these match scores will include the factored scores that resulted in the latent constructs of concentrated disadvantage, immigrant concentration, and residential stability.

This second part of the analysis proceeds in three sections. First, a dichotomous variable for bus stop locations and non-bus stop locations was created. Within these locations, descriptive statistics are reported for the presence of each independent and dependent variable within the bus stop and non-bus stop block groups. Second, independent-sample t-tests are conducted to match the latent constructs that were originally used in the SEM test. These tests are conducted in an effort to statistically match bus stop and non-bus stop block groups. Lastly, a binary logistic regression analysis was conducted to test the predictability of bus stop locations on each individual crime incident

while controlling for independent variables that were not otherwise statistically matched within the independent-sample t-tests.

CODING BUS STOP AND NON-BUS STOP LOCATIONS

In order to test the impact of bus stop locations versus non-bus stop locations dummy codes were created for block groups containing bus stop locations (i.e., quasi-experimental treatment neighborhoods) against those that did not contain bus stop locations (i.e., control neighborhoods). This allowed for a dichotomous variable of bus stops versus no bus stops. Frequency quartiles were conducted for the number of bus stop locations within each block group. Those bus stops falling within the 25 percent quartile (i.e., representing the fewest number of bus stop locations) were coded as (0) or block groups without a bus stop location. Thus, any block group location that contained fewer than three bus stop locations was coded (0). Any location that contained three or more bus stop locations was coded (1). This logic was used to test the hypothesis that more bus stop locations in a block group/neighborhood location would be correlated with higher levels of crime. The dummy variable created denotes group membership. In the case of this quasi-experiment, bus stop locations are coded as the "experimental" group with a value of (1) and non-bus stop locations become the "control" group with a value of (0).

In order to test if concentrated bus stop locations are truly attributed to crime, bus stop locations were also dichotomously dummy coded into concentrated (8 or more bus stops) and not concentrated (less than 8 bus stops). A total of eight or more bus stops within a block group made up the most concentrated quartile after dividing up the 114 block groups.

After block groups were classified as either bus stop or non-bus stop locations, general descriptive data could be obtained for these locations. Table V.7 represents this descriptive information for bus stop and non-bus stop locations. These descriptive statistics include mean (μ) scores for each crime incident type, total crime, and mean percentages for each independent disorganization variable that indicated the latent constructs for disadvantage, immigrant concentration, and stability. Raw crime incident scores are used for presentation and comparison purposes since two years of combined data may be more intuitive than the average rate.

Table 9.1. Descriptive statistics on bus stop and non-bus stop block groups

	Bus stops Raw # (μ)	**No bus stops Raw # (μ)**	**8 or more bus stops Raw # (μ)**	**Less than 8 bus stops Raw # (μ)**
Total Block Groups	97	17	35	79
Dependent Variables[a]				
Alcohol	1182 (13.43)	85 (6.54)	704 (20.71)	563 (8.40)
Armed Robbery	114 (2.33)	4 (1.00)	73 (2.81)	45 (1.67)
Assault	450 (5.42)	47 (4.70)	240 (6.86	257 (4.43)
Disorderly Conduct	1482 (16.65)	117 (7.80)	851 (25.03)	748 (10.69)
Domestic Abuse	360 (4.14)	39 (3.55)	181 (5.66)	218 (3.30)
Narcotics	1239 (13.92)	114 (7.60)	597 (17.56)	756 (10.80)
Obstruction	1563 (16.63)	146 (10.43)	860 (24.57)	849 (11.63)
Truancy	433 (7.10)	30 (3.75)	283 (10.88)	180 (4.19)
Unarmed Robbery	132 (2.64)	12 (1.71)	75 (3.13)	69 (2.09)
Weapons	203 (3.17)	22 (2.44)	112 (3.73)	113 (2.63)
Total Crime	7263 (73.90)	651 (36.24)	4049 (113.83)	3865 (48.10)

[a] Dependent crime incidents contain raw numbers followed by mean scores in parentheses.

Table 9.1. Descriptive statistics on bus stop and non-bus stop block groups (continued)

	Bus stops Raw # (μ)	No bus stops Raw # (μ)	8 or more bus stops Raw # (μ)	Less than 8 bus stops Raw # (μ)
Independent Variables[b]				
Poverty	13.70	13.26	15.92	12.61
Public Assistance	5.86	7.13	6.80	5.75
Unemployed	4.63	3.34	4.62	4.32
Female-headed	26.68	24.95	30.24	24.68
Under 18	25.48	26.98	26.18	25.53
Minority	32.88	24.37	39.52	27.89
No English	2.08	1.69	2.64	1.74
Foreign-born	5.66	3.64	6.35	4.87
Owner-occupied	59.60	70.57	54.50	64.50
No address change past 5 years	48.05	49.30	48.57	48.12

[b] **Independent variables contain mean score percentages for the given block groups.**

In comparing block groups containing three or more bus stop locations and those that had less than three bus stop locations, there is a difference with the bus stop block groups having more crime than non-bus stop locations. This is evident with a difference of 6,612 more incidents in block group locations coded as having at least three bus stop locations compared to those block groups that had less than three bus stop locations. However, these findings are far from being scientific since there have been no controls adjusted for potential differences in total population, income levels, disadvantage, immigrant concentration, or overall stability. Without these types of controls it is

not possible to determine what is actually causing the increased crime within these block groups that contain three or more bus stop locations. In addition, there are 44 fewer block group locations for non-bus stops represented within the given comparison than there are bus stop locations. Therefore, controls that are more sophisticated are necessary for conducting the quasi-experimental comparison between bus stop and non-bus stop locations.

Matching Block Groups through independent-sample t-tests

Independent sample t-tests were conducted to see if block groups that had bus stop locations statistically matched those that did not have bus stop locations. This match was created according to the factored scores for concentrated disadvantage, immigrant concentration, and residential stability. Significant results from the t-test scores would indicate that a match had not been made and that differences existed between the bus stop and non-bus stop block groups. The results from this test appear in Table 9.2.

Table 9.2. Matched bus and non-bus stop block group attributes. Independent sample t-tests.

	Mean (No Bus Stop)	Mean (Bus Stop)	F	t-test	Sig.
Latent Constructs					
Disadvantage	.271	-.047	.346	-.04	.965[a]
Immigrant	-.003	.001	.136	-1.2	.245[a]
Stability	.152	-.027	6.974	1.3	.063[b]
Manifest Indicators ***Disadvantage***					
Poverty	14.44	13.52	1.018	-.16	.876[a]
Public Assistance	7.85	5.80	2.449	.94	.347[a]
Unemployment	3.42	4.63	4.500	-2.2	**.033**[b]*
Female-headed households	26.69	26.68	1.530	-.531	.596[a]
Under 18 (Youth)	27.85	25.35	2.128	.727	.469[a]
Minority	26.63	32.55	.878	-2.01	**.047**[a]*

Manifest Indicators *Immigrant*					
No English	1.87	2.06	.239	-.63	.532[a]
Foreign-born	3.83	5.65	5.256	-2.06	**.046[b]***
Manifest Indicators *Stability*					
Stable Address	51.92	49.18	4.603	.448	.657[b]
Owner-occupied	69.49	59.77	2.561	1.803	.074[a]
Other match variable					
Total Population	1057.88	1299.22	2.244	-.943	.348[a]

[a] Equal variances assumed.
[b] Equal variances not assumed.

Table 9.2 establishes the match between bus stop block groups and non-bus stop block groups. Accordingly, the three latent constructs established through the principle components analysis for the SEM model test are insignificantly dissimilar. Although there were only 17 non-bus stop block groups to compare against 97 bus stop block groups, the t-test comparisons provide the best alternative for first establishing matched block groups within a quasi-experimental design, and then comparing the crime rates between these block groups. Another limitation can be seen with significant differences in unemployment, minority concentration and foreign-born residents. However, comparisons of the latent constructs that represent all of the given independent variables show that there are no significant differences between these block groups. Therefore, it was determined that bus stop block groups and non-bus stop block groups are well matched and comparisons can further be made between t-tests. Crime rates and raw incidents numbers (i.e., dependent variables) are then compared between bus stop and non-bus stop block groups through independent sample t-tests in Table 9.3.

Table 9.3. T-test crime rate comparisons between bus stop and non-bus stop block groups (Rates are incidents per 1,000 total block group population)

Crime Rates/ Crime Raw	Mean (No bus stop)	Mean (Bus stop)	F	t-test	Sig.
Alcohol Rate	5.50	23.40	.920	-.652	.516
Alcohol Raw	6.54	13.43	2.049	-1.177	.242
Armed Robbery Rate	.84	4.35	.390	-.432	.667
Armed Robbery Raw	1.00	2.33	4.255	-4.563	.009
Assault Rate	5.08	6.45	.306	-.288	.774
Assault Raw	4.70	5.42	.304	-.494	.622
Disorderly Rate	8.32	29.42	.855	-.627	.532
Disorderly Raw	7.80	16.65	2.459	-1.441	.153
Domestic Rate	4.04	5.52	.459	-.333	.740
Domestic Raw	3.55	4.14	1.758	-.546	.587
Narcotics Rate	9.43	18.76	1.006	-.720	.473
Narcotics Raw	7.60	13.92	3.082	-1.420	.159

Table 9.3. T-test crime rate comparisons between bus stop and non-bus stop block groups (Rates are incidents per 1,000 total block group population) (continued)

Crime Rates/ Crime Raw	Mean (No bus stop)	Mean (Bus stop)	F	t-test	Sig.
Obstruction Rate	11.41	23.27	.572	-.569	.571
Obstruction Raw	10.43	16.63	1.741	-1.231	.221
Truancy Rate	3.36	12.30	1.024	-.616	.540
Truancy Raw	3.75	7.10	.554	-.620	.538
Unarmed Robbery Rate	1.56	3.05	1.928	-1.043	.301
Unarmed Robbery Raw	1.71	2.64	1.754	-1.110	.272
Weapons Rate	2.73	3.39	1.889	-.558	.579
Weapons Raw	2.44	3.17	1.698	-.803	.424
Total Crime Rate (1999-2000)	40.02	114.43	.843	-.704	.483
Total Crime Raw (1999-2000)	36.24	73.90	2.604	-1.658	1.00

In comparing incidents of crime between bus stop and non-bus stop block groups there appears to be no significant differences. All individual incidents were tested as well as total crime and total crime rate combined over the two years of data. The two main mean scores being compared for total raw crime statistics had a difference of 37.66 with bus stop locations having a higher mean of crime. However, the t-test comparison of the means was non-significant (.10). In a comparison of six years of crime data (1995-2000) bus stop block groups contained a mean difference of 147.34 crimes, which was very significant ($p<.000$). However, since independent variables utilized for this research were collected in 1999 through the decennial census, internal validity issues exist in terms of predicting past dependent variable incident data. However, the stability factors of crime presented in Figure 7.1 suggest that future crime within the given units

of analysis may show that bus stop location crime does significantly differ from non-bus stop block group locations over a period of years. This finding would also indicate that crime does occur non-randomly and certain place characteristics attract crime while other place locations detract crime. Despite the insignificant differences between bus stop and non-bus stop block groups, correlations between bus stops and crime can be determined through logistic regression analysis, which also allows for other predictor variables to be controlled for within model specification.

Binary Logistic Regression Analysis

Unlike path models, logistic regression is part of statistical models called generalized linear models. Logistic regression allows one to predict a discrete outcome, from a set of variables that may be dichotomous and/or continuous. This means that logistic regression does not make any assumptions about the distribution of the independent variables in terms of being normally distributed, linearly related or of equal variance within each group. The main predictor variable is dichotomous meaning that bus stop locations have a value of 1 (i.e., bus stop present within the block group) and non-bus stop locations have a value of 0 (i.e., bus stop not present within the block group). This type of variable is also referred to as binary allowing for constraints of the logistic distribution to estimate probabilities that lie between 0 and 1. The dependent variable, which measures the presence of crime within the block group, is equal to 1 if crime was highly present within the two years of data and 0 if crime was very low or not present at all within the block group location. The logistic regression model was used to estimate the factors that influence crime within the block group locations.

The goal of logistic regression analysis is to predict the outcome of individual independent variables using the most parsimonious model (Menard, 1995). In order to accomplish this goal, the model used within this quasi-experiment tests the null hypothesis that bus stop locations (i.e. predictor variables) do not significantly predict the response variable (i.e. individual crime rate incidents). Separate models were run including a prediction for each crime incident. These models were conducted through a binary logistic regression analysis (using continuous bus stops as the predictor variable) and multivariate

logistic regression using the latent social disorganization constructs and total population as control variables.

Each individual crime incident type became a dichotomous dependent variable for separate analyses conducted with bus stop locations being the primary predictor variable. Therefore, incident types were dummy coded according to the results from frequency quartiles. Incidents that did not fall within the high 75th percentile were coded (0) and incidents falling within the 75th percentile were coded (1). Table 9.4 indicates the results of the frequency distribution on how block groups were dichotomously coded for each crime incident.

Table 9.4. Coding block groups for crime incident presences.

Incident Type	Crime Rate (per 1,000): Coded (0) not present rate	Crime Raw Numbers: Coded (0) not present total
Alcohol	2.6719 or less	2 or less
Armed Robbery	.8748 or less	1 or less
Assault	2.1288 or less	1 or less
Disorderly	4.1569 or less	3 or less
Domestic Abuse	1.2797 or less	1 or less
Obstruction	4.7643 or less	5 or less
Truancy	1.4968 or less	1 or less
Unarmed Robbery	1.2037 or less	1 or less
Weapons	1.3201 or less	1 or less
Total Crime	20.8540 or less	19 or less

Table 9.4 represents the dichotomous breakdown for crime incident presence in order to complete the logistic regression analysis. An assumption is made that block groups within the upper 75th percentile of crime will be affected more by bus stop locations than those areas that contain fewer crime incidents within the logistic regression analysis. Within this type of model, bus stop locations are being tested in terms of predictability of high crime block groups, or at least those that fall within the 75th percentile.

The main use of logistic regression is to calculate the probability of success over the probability of failure by giving an odds ratio. Logistic regression utilizes a maximum likelihood estimation (MLE) method, which is an iterative process that allows for an estimation of the coefficients within the given model. The MLE process maximizes the log likelihood and provides a measurement for the probability or the

odds of observing a particular set of values in the dependent variable based on the observed values of the independent variable (Menard, 1995). In the case of the quasi-experimental model, this means testing for bus stop locations in areas with the highest crime. The prediction being made is that the higher the likelihood estimation the higher the probability of observing bus stop locations.

The slope coefficient (ß) is interpreted as the rate of change in the "log odds" as the predictor variable changes. Since the dependent variable is dichotomous, within logistic regression the slope coefficient is not very useful and the interpretation of the log coefficient or odds ratio is usually more intuitive. The actual value of the dichotomous dependent variable has no intrinsic interest but the 'odds' of probability that the variable can be predicted from the independent variables is of interest. Each individual crime incident was run as its own dependent dichotomous variable after completion of dummy coding. Therefore, each incident was utilized within a separate model to test for the effects of bus stop locations on specific crime type. In Table 9.5, the binary logistic regression analysis controlled for the latent constructs established in the full hybrid model test; concentrated disadvantage, immigrant concentration, residential stability, and also total population within each block group as determined by the 2000 census data.

Table 9.5. Multivariate Logistic Regression models predicting reported crime at bus stop locations while controlling for total population, concentrated disadvantage, immigrant concentration and residential stability. (N=114 block group neighborhoods)

Incident Rates	ß	S.E.	Wald	Odds Ratio	Sig.	X^2	Model Sig.	Nagelkerke R^2
Alcohol	.206	.063	10.693	1.229	.001	26.951	.000	.292
Armed Robbery	.219	.056	15.147	1.244	.000	30.085	.000	.319
Assault	.207	.062	11.022	1.230	.001	37.111	.000	.377
Disorderly	.168	.059	8.098	1.183	.004	46.779	.000	.462
Domestic Abuse	.236	.076	9.624	1.266	.002	40.642	.000	.438
Narcotics	.340	.092	13.536	1.404	.000	57.529	.000	.556
Obstruction	.288	.079	13.301	1.333	.000	40.198	.000	.425
Truancy	.150	.050	9.152	1.162	.002	21.183	.000	.227
Unarmed Robbery	.165	.055	9.100	1.179	.003	36.970	.000	.377
Weapons Violations	.185	.058	10.350	1.203	.001	36.503	.000	.365
Total Crime Rate	.266	.081	10.862	1.305	.001	37.416	.000	.416

[a] **Logistic regression utilized continuous bus stop independent variables and dependent dummy coded crime rates for block group locations containing total crime rates higher than 20.85 incidents per 1,000 residents or block groups labeled as concentrated with 20 total incidents or more.**

Model fit statistics also appear within the table since these will change for each crime incident. The model fit gives the chi-square (χ^2) statistic, which reflects any error associated with the model. Significant chi-square statistics means that the null hypothesis of the slope (ß) coefficients being (0) or none of the independents being linearly related to the log odds of the dependent variable can be rejected. As seen in Table V.11 all the model chi-squares were very significant. The last statistic is the Nagelkerke R^2, which gives the logistic analogy to R^2 in OLS regression. For all of the crime incident types, the dichotomous bus stop coefficient was positive and statistically significant.

Table 9.5 provides the most detailed information on the impact of bus stops for each individual crime incident. Rates of crime within each block group were left out to avoid redundancy since findings were similar. Bus stop locations carry the greatest predictability power for narcotics violations with almost one and half times the likelihood of these type of violations occurring in block groups that have bus stop locations compared to those block groups that have fewer than three bus stop locations. Overall, bus stop locations predict 1.3 times as many of the given crime incidents occurring compared to non-bus stop block group locations.

These models were also conducted with bus stops that appeared in the 75th percentile. This allowed only 35 block groups to be represented by the highest concentration of bus stop locations rather than 74 in the previous models tested in Table 9.5. Within the analysis that includes concentrated bus stop locations, the odds of any crime rate incident occurring is 5.75 times more likely than block groups that contain less than eight bus stop locations. Concentrated disadvantage, immigrant concentration, residential stability and total population were again controlled for within the logistic regression model and the chi-square was significant (χ^2 =30.024; p<.001; Nagelkerke R^2 = .345). These statistics become even more interesting when using data over a six-year period (1995-2000) as opposed to two years of crime data. When six years of crime data is used, the log odds of a crime incident occurring in areas with concentrated bus stop locations (i.e., more than 8 bus stops present within a single "neighborhood" block group) is over 20 times the likelihood of crime incidents occurring in non-bus stop concentrated areas. However, this type of analysis is biased through the use of past dependent variable data being predicted by more current independent census variable data.

According to these results, both crime pattern theory and routine activities theory appear to be supported. Both these theories predict that crime occurs within individuals routine paths. If bus stop locations do predict crime, it can be argued that more incidents are likely to occur in place-specific areas that bring individuals together within their routine paths. It can also be argued that crime occurring in or around these areas occurs when there are suitable targets, motivated offenders, and lack of capable guardians.

Policy implications should direct police resources towards areas that contain eight or more bus stop locations in an effort to provide more capable guardianship and problem-oriented solutions. Unlike collective efficacy solutions that require rallying community members or attempting to increase residential stability and home ownership, police initiatives can be more focused on place specific assessments and more meaningful responses. A geographical response may include spreading out bus stop locations over other areas of the city and testing if changes in their locations decrease incidents of crime based on making changes to resident's routine pathways. This type of routine activities situational solution falls under a CPTED crime prevention approach for designing out crime. It is advisable that police and transportation authorities run their own data analysis to determine the impact of public transportation on neighborhood crime level. If a determination is made that bus stop locations are serving as crime facilitators problem solving can be conducted within each unique location.

CHAPTER 10

Observations of Hop Spot Bus Stops

Although more sophisticated statistical software was utilized for within the research to locate hot spots throughout the City of Lansing, a mixed methodological approach was also chosen to add more depth to answer the 'why' questions that naturally follow the 'where' findings. This strategy again references Brantingham and Brantingham's (1981) recommendation for conducting research through a cone of resolution with the final step of this spatial analysis project being directed towards qualitatively inspecting the physical attributes in the top five hot spot bus stop locations.

The observations were completed through a systematic yet unobtrusive methodology. These observations were conducted for the purpose of observing the social interactions and physical surroundings within the hotspot locations where bus stops were found. The researchers conducting the observations did so unobtrusively, menaing no direct contact was made with any of the bus stop patrons or other users of space surrounding the hotspot bus stop locations. This nonparticipant research methodology within the natural setting was believed to be the best strategy for obtaining the most accurate information about the social and physical reality surrounding the bus stop locations. A variety of days and times were selected to conduct the nonobtrusive observations. This allowed for some temporal controls regarding seasonal, time of day, and day of week.

Properly conducted observational research can be characterized by the following:

1. The observations capture the natural social context where the particular behavior occurs.
2. The observations grasp significant events or occurrences that might influence the social interactions of the participants.
3. The observations aid in determining the reality of particular geographic locations.
4. The observations help identify regularities and recurrences in social life by comparing and contrasting data obtained in one study with those obtained in studies of similar natural settings. (Babbie, 2001, p. 222).

These types of observations differ from experimental research observations in which events are deliberately manipulated to affect certain results. The observational data used for the given research attempted to capture the natural context of specific bus stop locations without having any type of influence over those locations. The major purpose for conducting the observational research portion of this project includes the following:

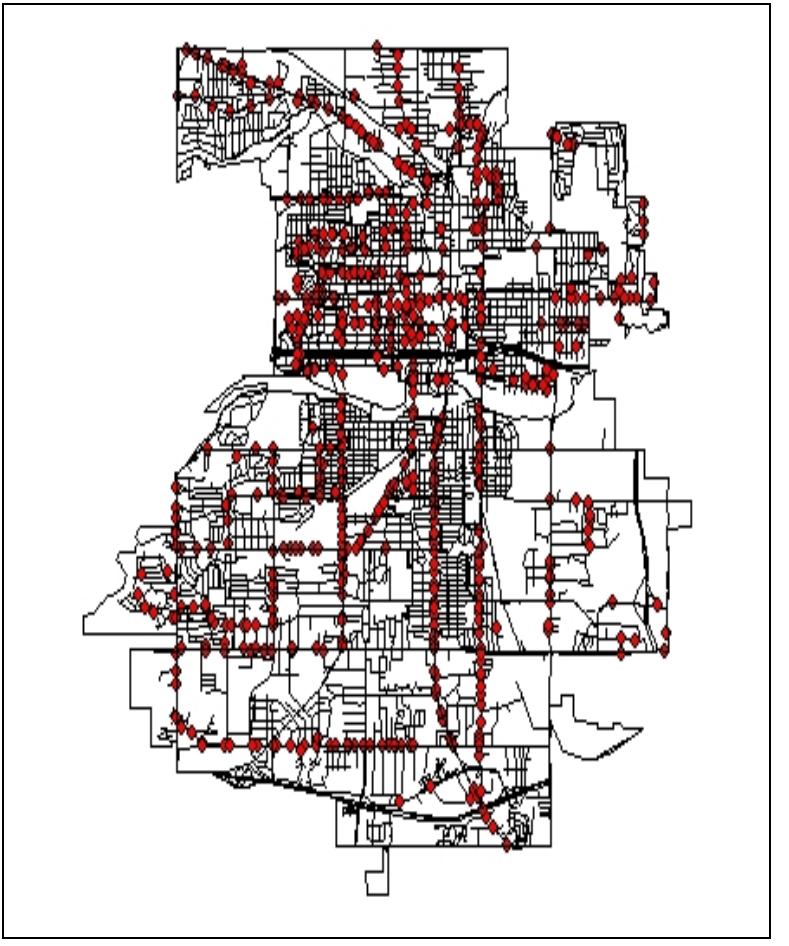
1. Permitted the researcher and the raters to view the processes which lead to a given phenomenon that is the focus of this study by observing a reality that is untapped by the other data gathering methods.
2. Provided the opportunity to give a graphic description of particular segments of social life that cannot be acquired through any other means but direct observation, thus supplementing the information that evolves from the official data. This type of mixed methodology allows for triangulation of more than one data gathering tool for investigating bus stop locations. Thus, the end product is a more complete picture of why criminal incidents may be higher at particular bus stop locations in comparison to other locations.
3. Observational research gave an exploratory insight into what types of future research would be necessary for a more enriched understanding of this type of street-level crime that encompasses public transportation.

All 638 bus stop locations in the given city used in this research project were mapped to the 114 census block groups. The locations of these bus stops came from a spreadsheet that was put together by the main bus company. Addresses were then individually mapped utilizing ArcView software and layered into a street map. Bus stop locations were last recorded by the bus company in 1999, so links closely match both the criminal incident data and the census variables. A map showing the location of the bus stops appears below in Figure 10.1. As suspected, most of the bus stop locations appear clustered along major thoroughfares throughout Lansing, Michigan, which may challenge the results of the logistic regression findings. Brantingham and Brantingham (1984) showed how crime tends to cluster around major thoroughfare pathways or nodes since these areas typically produce higher frequencies of routine activities and easier escape routes for offenders.

The proposition made is bus stops are often located within areas with high street accessibility. While this is convenient for transit users to locate a bus stop, it may also produce increased crime and lower quality of life since these street segments are easily accessible to heavier volumes of traffic and criminal opportunities. Potential design solutions include complex street networks with limited access (e.g., dead-ends, cul-de-sacs) that could restrict traffic flow in an area and serve to reduce the exposure to criminal opportunity (Brantingham and Brantingham, 1984). An argument may follow that frequent transit users will eventually learn where bus stops are located, even if they are not positioned within the busiest street segments.

A recent example of this type of approach can be found in Alexandria, Virginia where the city created a Neighborhood Traffic Calming Program (NTCP, 2002) that called for collaboration efforts to reengineer street designs, utilize targeted enforcement, and increase community input and education. The goal of NTCP is to provide increased protection and quality of life for residential neighborhoods by redirecting excessive volumes of traffic and allowing increased legitimate street use of pedestrians and bicyclists. Some of these same approaches should be sought after when analyzing crime surrounding bus stop locations.

Figure 10.1. Map of Lansing, Michigan streets and bus stop locations.



From the ArcView mapping software, the top five locations with the highest amount of criminal incidents over the two-years of incident data were highlighted and chosen to be analyzed qualitatively through systematic observation. This methodological strategy follows Reiss's (1971) recommendation that advocated systematic observations as a key measurement strategy within natural social phenomena. According to Reiss (1971) this type of situational analysis should include

checklists for researching crime pattern concepts. These checklists were developed for the given research project allowing for future replication and testing reliability. Social pattern measurements and physical disorder attributes that surrounded both hot spot and low-crime bus stop locations were quantified through nonparticipatory observational research checklists or 'windshield' surveys. A checklist indicating the variables that were qualitatively observed within each bus stop location appears in Appendix A.

In order to reach uniformity within each bus stop observed, the coding sheets filled out for each bus stop location chosen were rated on the presence or absence of the same social patterns and physical attribute measurements. In an effort to improve reliability of the findings, each location was observed at a minimum of nine time periods over a seven month span (June 2003-December 2003). These observational times allowed for ecological differences such as weather environment in summer versus winter months and time differences such as morning rush hour, evening rush hour, and late evenings.

The literature points to observing, "immediate settings in which behavior occurs" or conducting situational analysis by "searching for regularities (i.e., patterns) in relationships between settings and behaviors" (Patton, 1987, p.113). The observations of the hot spot bus stop locations attempted to do the latter in search of what Felson (1996) labeled natural crime prevention, or lack thereof. Observations were conducted during multiple periods of the given month to consider ecological daytime and nighttime differences. In addition, interrater reliability was improved by utilizing six different recorders, including the main researcher, during this seven-month period of observations on the top five hot spot locations.

General agreement was found within each of the locations whenever multiple raters were used, which showed that interrater reliability did exist. The measure of intercoder agreement among the raters was conducted by comparing rating sheets that were done at the same time by multiple raters. Intercoder reliability means that consistency was found in the content analysis conducted by the observers (Tinsley and Weiss, 2000) and independent coders reached identical conclusions about the physical and social surroundings of specific bus stop locations.

Several undergraduate students from Michigan State University School of Criminal Justice were recruited to complete the coding and observational research of bus stop locations. Five students were able to

conduct observations. The student researchers that conducted the qualitative analysis were trained to fill-out observation sheets separately without verbalizing what they were recording. Ratings and observations were then compared and found to match in almost every case and no rater was believed to record carelessly or cause any real divergence. According to Tinsley and Weiss (2000), intercoder agreement within this type of spatial analysis exists when different judges record the same observation (pp. 98). This intercoder reliability is a critical component of the qualitative analysis since it offers increased confidence pertinent to the qualitative aspects of the research design. As pointed out by Neuendorf (2002), the goal of this type of qualitative analysis "is to identify and record relatively objective (or at least intersubjective) characteristics, reliable findings are paramount. Without establishing some level of reliability, the results are useless" (pp. 141). Numeric results from these surveys appear in Table 10.1.

Table 10.1. Results of Windshield Surveys.

	#1 hot spot bus terminal	**#2 hot spot**	**#3 hot spot**	**#4 hot spot**	**#5 hot spot**
Number of observations	27	8	9	9	9
Observation times	7-9am; 11am-1pm; 3-7pm; 8-11pm	8-10am; 3-6pm; 8-10pm	9-10am; 3-6pm	9-10am; 3-6pm; 9-12pm	8-9am; 3-6pm; 9-11pm
Total Traffic Lanes	YES	NO	YES	NO	NO
Street Lights	YES [a]	YES	YES	YES	YES
Cars per minute	38	27	N/A	40	55
Loitering Youth	YES [b]	YES	YES	NO	YES

[a] Parking lot lights across the street from the main entrance of the bus terminal shut off at 10pm.

Table 10.1. Results of Windshield Surveys. (continued)

	#1 hot spot bus terminal	#2 hot spot	#3 hot spot	#4 hot spot	#5 hot spot
Loitering Adults	YES [b]	YES	YES	YES	YES
Public Drinking	YES [c]	YES	YES	YES	NO
Illicit Drug Use	NO	NO	NO	NO	NO
Prostitution	YES (once outside of terminal)	NO	NO	NO	Possibly
Vandalism / Garbage	YES (internal and external)	YES	YES	YES	YES

[b] Youth and adults often loiter but mainly on the outside of the terminal. Loiters inside the terminal are told to leave by the contract security officers.

[c] Public drinking is not allowed at the bus terminal and transit users are often warned not to drink at the terminal and some are issued temporary no trespass citations for drinking

Table 10.1. Results of Windshield Surveys. (continued)

	#1 hot spot bus terminal	#2 hot spot	#3 hot spot	#4 hot spot	#5 hot spot
Vacant Buildings	NO	YES	N/A	NO	NO
Target Hardening	YES	YES	YES	YES	YES
Natural Surveillance	YES	NO	NO	NO	YES & NO
Easy Escape	YES	YES	YES	YES	YES
Damaged Buildings	NO	YES	NO	NO	NO
Broken Windows	NO	NO	NO	NO	NO
Vacant / Unused Lots	NO	YES	NO	YES	NO

By this stage of the research, it was predicted that visual cues surrounding bus stop locations do matter and are highly correlated with crime clustering that was observed through the mapping software techniques. In this manner, the association of independent measures of officially recorded data from both the census bureau and the dependant data from the local police department were tested against the systematic observations of high crime bus stop locations. Since the research methodology at this stage was conducted through nonparticipatory observations, special attention was placed on the physical image surrounding the bus stop locations rather than on social interaction observations. However, through the use of Brantingham and Brantingham's (1984) foundation, street pattern measurements were also used that included number of traffic lanes, volume of traffic, loitering youth/adults, public drinking, illicit drug sales, and suspected prostitution. Outside of these basic street pattern measurements, the

main theoretical test was directed towards physical attribute measurements originally defined in Newman (1973). These measurements included type of residential/business establishments, recognition of vandalism/litter, vacant buildings/lots, structures with some type of security presence, and an overall rating of the area surrounding the bus stop location.

Assumptions of bus stop locations

Bus stop locations represent public spaces and, unfortunately, official statistics utilized within the given unit of analysis do not specify when crimes occur in or near bus stop locations. Often incident data includes intersecting streets or a specific address. In attributing crime data to bus stop locations, the geocoded bus stop locations (as seen in figure 10.1) were layered within the geocoded crime incident mapped data. Interestingly, the top ten hot spot crime specific locations all appear at or very close to bus stop locations. The top five hot spot crime locations within the city were chosen for a more in depth analysis through systematic nonparticipatory observation.

The main assumption made at this stage of the research was that the crime incidents within specific hot spot locations could be attributed to the bus stop location. However, there were several public space structures besides bus stop locations that often appeared at intersections or even specific addresses, such as phone booths, liquor stores, convenience stores, etc. Since the incident data only provides general locations without additional information about the specificity of the crime site or additional information on offenders/victims, it is not possible to know with exact certainty what element within the hot spot location can be claimed to have potentially contributed to the incident. However, it was of interest that all of the top ten hot spot specific crime locations all appeared within very close vicinity to a bus stop or the main city bus terminal. In addition, since the incident data was sanitized to only account for outdoor related crimes as coded by the reporting police officers, the construct validity appeared to be sound. At the very least, the spatial data results appears to indicate that bus stop locations may facilitate crime problems within hot spot areas by adding potential targets to areas that may already have an over abundance of motivated offenders.

Some general similarities were found in systematically analyzing the top five hot spot areas throughout the given unit of analysis. First, each

hot spot location included at least four traffic lanes and appeared at busy intersections. The volume of traffic was averaged through the three locations by counting the number of cars per minute. The average hot spot location acquires an average of 38 cars per minute. In addition, pedestrian traffic remained high at these locations during the warmer months and during prime times such as 3-6pm and during weekend evenings. Although no known illicit drug selling or prostitution was witnessed during any of the observations, informal contact with both city police officers and contracted security made claims that all five hot spot locations have frequent problems with these types of crime.

Analysis of the Top Five Hot Spots

#1 Hot Spot Location

The main bus terminal represents the single largest clustering of crime incidents in the given city for the two years of analyzed crime data. Although the terminal itself was considered different from the typical bus stop locations, it cannot be ignored within this study. Like most other urban areas, transit security measures are directed solely at the centralized terminal since the terminal is the location for the highest number of raw criminal incidents and greatest passenger vulnerability. Within conducting a systematic observation of the bus terminal, a unique checklist was developed separate from the bus stop observations. The checklists were completed multiple times by three different researchers during the months of July, August, and November. This checklist was also unique since it did not fit the "windshield" survey format since much of the unobtrusive observation took place inside the bus terminal or outside of the terminal. Unlike the bus stop locations, it was much easier for the observers to fit-in at the often crowded bus terminal.

The observation checklist for the bus terminal was developed by referencing other risk assessment audit observations from similar public transit settings. For example, Hoel (1992) argued that the principle objective of security measures directed within bus terminals should focus on the visibility of transit users to the bus company's personnel, police, security, and other passengers. This visibility follows Newman's (1981) natural surveillance theory and argues that criminal acts have a greater likelihood of being prevented or help can be summoned quickly enough to deter easy escape paths. According to

suggested architectural design of transit station areas (Hoel, 1992, p. 515) the following defensible space considerations were analyzed when observing the main bus terminal as part of the systematic observations:

1. Ticket collection/information booth centrally located for greatest visibility.
2. Straight corridors and passageways, with ample width and good lighting.
3. Closed-circuit TV monitors on platform areas and other hidden locations
4. High levels of illumination.
5. Clearly defined station and circulation areas no larger than needed for passenger boarding.
6. Provision of variable-size areas for peak and off-peak periods to avoid passenger isolation and feelings of vulnerability.
7. Minimum number of exit and entry points.
8. Locked and supervised toilet facilities.
9. Clearly defined corridors and waiting areas partitioned from storage and nonpublic spaces.
10. Fences, one-way gates, and other directional devices to control passenger flow.
11. Warning alarms to attract attention, break up fights, or summon police.

A checklist that referenced Hoel's (1992) model was used as part of the systematic survey instrument for the city's main bus terminal and can be seen in Appendix B following the general observational bus stop checklist. Based on the security risk analysis checklist, the main bus terminal was rated according to the presence and/or absence of the above features, in addition to a thorough analysis of the immediate exterior surrounding the terminal. This combined interior and exterior observational rating system was unique in comparison to bus stop locations since the main terminal offered a unique structure and a unique quantity of official crime incidents.

Exterior physical attributes noted that surrounded the bus terminal included a four lane intersection. This area of the city produces some of the greatest traffic flow with an average of 48 cars per minute that passed the bus terminal during prime time observation periods (i.e., 3-6pm) weekdays. Surrounding land use includes only commercial

properties with no residential housing within the immediate area. A shared parking lot for a local college and surrounding strip malls increases additional traffic around the terminal. In addition to the city bus station, another company that runs buses throughout the state also operates within this same terminal allowing more transient pathways to interact with local community members who are using the public bus system.

It is also interesting to note the bus terminal opened in October 1997. The old bus terminal was located a block away. When comparing crime data within the intersection of the new bus terminal prior to 1998 against data from 1998-2000, it is clear that crime has risen quit dramatically within the given space after the opening of the new bus terminal. There was a 43% increase in the incident data at the location of the new bus terminal in 1998-2000 as compared to 1995-1997 data. However, it is challenging for researchers and law enforcement personnel to equate the new terminal to actual increased crime or increased reporting of crime due to new contract security guardianship that more accurately observes, interferes, and records criminal activities within this given space. Regardless, law enforcement presence and official statistics have made the space within and surrounding the new bus terminal, the number one hot spot in the given city and this location requires observation that is more direct.

Figure V.13 shows a photograph inside the main city bus terminal. Clearly most of the defensible space strategies suggested by Hoel (1992) can be seen within figure V.13 and were observed while completing the predefined checklist. The information booth appears at the center of the terminal providing a centralized location for guardianship. CCTV cameras are posted above the information booth and cameras point down the aisles to either side of the main booth. In addition, CCTV cameras appear near the end of the aisles and there are two additional exterior cameras. Wide, straight and well-lit corridors allow for clear lines of sight and natural surveillance. There was no vandalism present inside of the bus terminal at any of the three periods (i.e., July, August, November) in which observations took place. An incidental amount of fast food litter was found during the November observation. However, a full-time cleaning staff as well as contracted security personal generally keeps the terminal free from litter or graffiti.

Although the bus terminal reports some of the highest crime concentration in the city used for analysis, the inside of the terminal

appears to be fairly secure. Because of the high security, data also points to frequent incident reporting conducted by the contract security inside and outside the immediate bus terminal. This presents some serious questions in terms of the accuracy of official crime data. In areas with paid guardians, we might expect high official incident data since it is the job of these space handlers to report any ordinance, status, disorderly, or criminal acts. These findings also present challenging questions for criminologists who utilize official data since it may not be readily recognizable if maintenance of physical and social disorder in specific spatial locations can have a deterrent effect on crime and disorder. Because of these challenges bus stop locations outside of the terminal were also analyzed.

Figure 10.2. #1 Hot Spot interior of main bus terminal. (Photo A)

Despite the observed defensible space mechanisms, the bus terminal location produced the highest amount of crime incidents in the entire city used for the research project. While it appears that the physical design features can affect crime and fear, the literature has shown that there is no guarantee that proper design will produce expected results. This kind of research finding was discovered by Merry (1981) who conducted a participant observation study of a single public housing facility with numerous defensible space target-hardening devices, which failed to have any effect on residents' feeling of safety. Merry (1981) concluded her study by arguing that the general failure of the defensible space concept to bring about reductions in crime must be placed on the inability of the physical environment to effectively create feelings of territoriality (i.e., collective efficacy). In other words, good defensible space design does not guarantee that a space will appear safe nor that residents will care to defend the space. An area may be defensible, yet undefended (Lab, 2000).

Further analysis of the exterior bus terminal was also conducted since the official crime incident data does not specify an exact location of the offense, only the address of the bus terminal. The intersection of the bus terminal was used for mapping purposes, so any crime occurring in or around the terminal is attributed to the structure.

A further examination of the exterior perimeter surrounding the bus terminal found less defensible space mechanisms in place. Figure 10.3 and 10.4 shows the area where buses arrive and depart from opposite directions. These areas are frequently crowded according to interviews with contracted security personnel that work at the bus terminal. These areas also become frequent locations for disorderly conduct, alcohol violations, assaults, and drug dealing. According to unstructured interviews with the contracted security personnel, most of the security reports and police officer intervention arise from the exterior of the bus terminal.

While both the interior and exterior terminal locations offer many opportunities for victimization or illicit narcotic sales, it also offers high natural surveillance to potentially intervene and report these offenses. However, one of the challenges Newman (1972) faced from his critics was that increased natural surveillance does not generalize to lower crime. Transit users are often surrounded by strangers and are not likely to intervene in situations for which they do not feel any type of collective efficacy. In these instances, capable guardians may be lacking (Cohen and Felson, 1979) if the contracted security presence,

made up mainly of young college students, is not constant or not seen as a major deterrent. Outside of the contracted security personnel, there is not a strong likelihood that the movement of bus passengers will deter much of the misconduct at the terminal. This premise was based on observations that the majority of passengers are only at the terminal temporarily while they await their bus transfer and their motivation is usually directed at leaving the terminal as quickly as possible rather than paying attention to or intervening in any type of misconduct. Consequently, the terminal can be seen as having low collective efficacy.

Observations conducted on the exterior of the bus terminal noted numerous occasions of loitering youth and adults. Although the contract security personnel strives to make sure loiters do not frequent the bus terminal, this becomes difficult when youth will loiter on the streets surrounding the terminal and walk in and around the terminal. This problem was especially noteworthy during observation that took place during the warmer months when loitering youths and adults often used the exterior of the terminal for socialization and places to meet up with friends and relatives. According to Felson et al., (1996) public transit loitering can cause a series of problems including increase fear of crime among older transit users and a higher potential for disorderly acts of conduct.

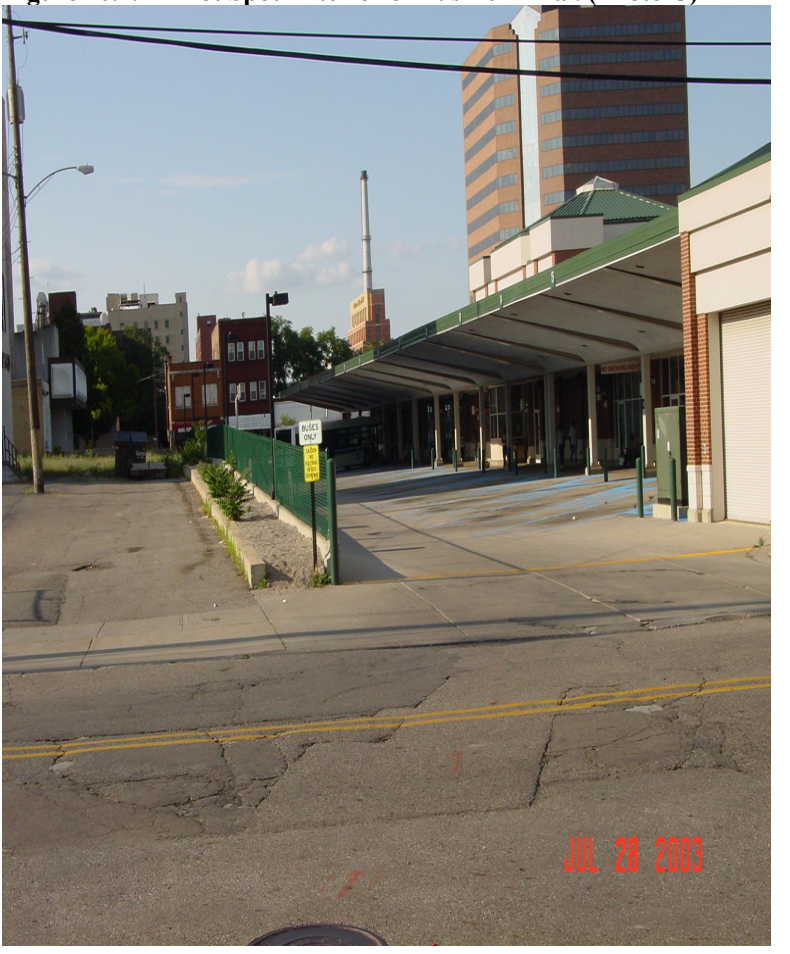
Figure 10.3 shows the exterior area in front of the buses that often becomes heavily crowded during peak hours. Figure 10.4 shows the bus terminal from the opposite side in addition to showing an alley way and an area that offers less natural surveillance in addition to quick escape routes to and from the terminal. The exterior areas become particularly crowded by younger students (or truants) going to and coming from school during the early morning hours and mid-afternoon. Informal discussions with employees from the bus company revealed that many of the students who utilize the city's bus system have had their school bus privileges revoked because of misbehavior and are now forced to use the city bus system to get to and from school. Consequently, there seemed to be some indication that these children are more disorderly than other schoolchildren.

Several youth have had no trespass citations written against them due to loitering, disorderly conduct, or other criminal activities that they have participated in while at the bus terminal. These youth often face arrest for violating the no trespass citation issued by the police or the contract security. During these situations, these youth are then

supposed to wait at the surrounding bus stops to transfer buses rather than at the terminal. Each of these situations provides unique challenges for both the contract security at the terminal and the wider community. Businesses surrounding the immediate space around the terminal are particularly affected by loitering youth around bus stop locations, especially those who are not allowed in the terminal by security. Once outside the terminal, the contract security does not exercise any authority at the actual bus stops. However, they may once the transit users enter the interior of a bus.

Figure 10.3. #1 Hot Spot exterior of main bus terminal. (Photo B)

Figure 10.4. #1 Hot Spot Exterior of Bus Terminal. (Photo C)



#2 Hot Spot

The second highest hot spot for crime is located within the number one hot spot block group. Photographs of this intersection appear in figures 10.5-10.9. Observation within this location revealed several characteristics that have been attributed to both fear and increased

official crime. As figure 10.5 reveals, some efforts have been made to improve the area surrounding this bus stop location, including multiple trash receptacles and a neighborhood watch sign.

Figure 10.5. #2 Hot Spot noting multiple trash receptacles, neighborhood watch, and overgrowth landscaping (Photo A).

The goal of any neighborhood watch is to prevent crime by increasing community awareness and problem solving. The catalyst for these programs is often found through mutual problems of area residents and business owners who participate with the goal of increased feelings of communal needs and joint activities to meet those needs. In its most effective form, these programs should provide informal social control over the area of the community that needs attention. However, Bursik and Grasmick (1993) point out that many neighborhoods are socially disorganized and unable to exert control over residents or illegitimate users of space. Further analysis of the #2 hot spot location shows landscape overgrowth that can symbolically serve as a sign that no one cares about the area and intervention by neighborhood residents is not likely (Wilson and Kelling, 1982). A more in depth observation revealed additional problems.

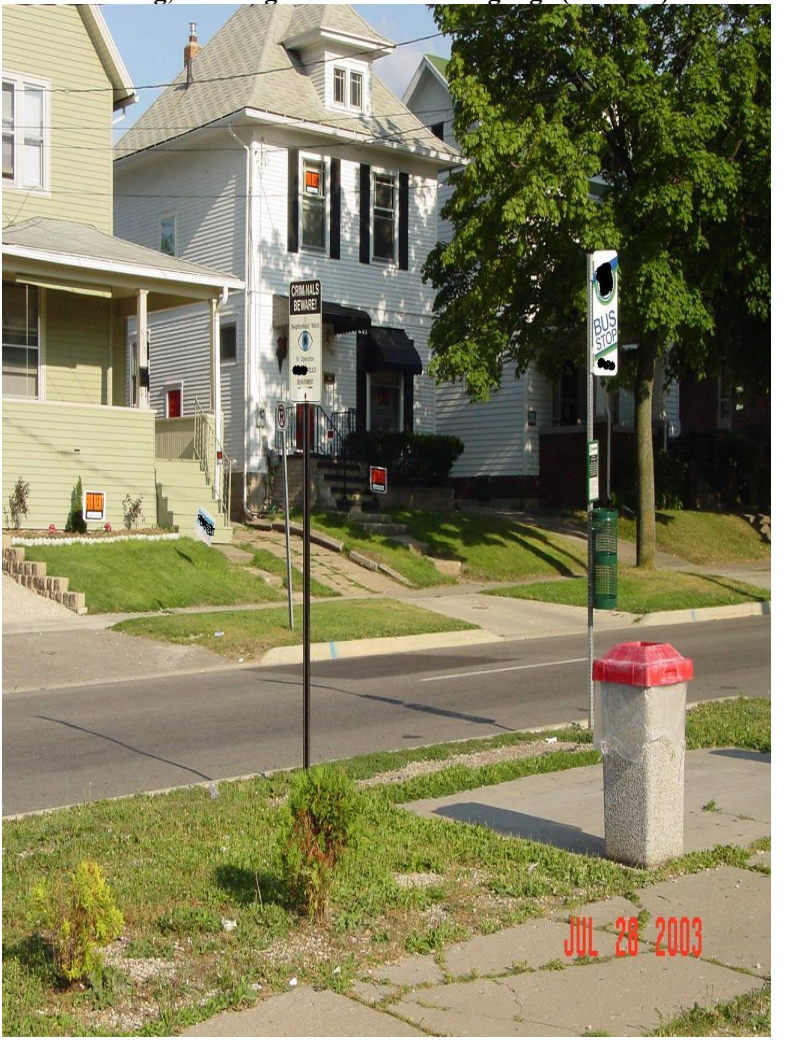
Bursik and Grasmick (1993) utilized early Chicago School research from Shaw and McKay (1942) and argued that neighborhoods should draw on a variety of resources to control social behaviors. These include, but are not limited to, local businesses, churches, schools, and other local networks. One way in which the neighborhood watch program contributes to the social control level at this intersection is through the heavy use of surveillance, which requires the ability to distinguish legitimate space users from illegitimate users of an area. Some areas of concern for this hot spot location are noted in figure 10.6.

Figure 10.6 shows rental housing with several signs attached to the windows providing some indication that this property is not currently occupied. Therefore, surveillance is unlikely, collective efficacy is probably low, and the owners may be finding it difficult to find renters at this location. These rental signs remained in place during observations in June, July, and September but were removed during observations in December.

Research findings throughout this project have confirmed that low collective efficacy within neighborhoods contributes to higher crime. Despite efforts to control trash and loitering, this area of Lansing, Michigan continues to be a hot spot for illegal activity. The location was frequently mentioned by public transit management personnel, private security at the main bus terminal, and Lansing police officers. Despite efforts by all three legitimate space users (i.e., businesses and residents) will ultimately impact use of the bus stop location or areas surrounding local business and rental property. If efforts are not made

to encourage and find unique ways facilitate guardianship within this area other such efforts are likely to only have short-term results.

Figure 10.6. #2 Hot Spot bus stop noting low collective efficacy, rental housing, and neighborhood watch signage (Photo B).



The last photograph of the intersection for this #2 hot spot bus stop location (Figure 10.7) shows a 24-hour convenience store that sells liquor late into the evening and often becomes a meeting place for loitering youth and adults. Research is fairly consistent that points to a relationship between the presence of liquor establishments and crime in the surrounding area (Roncek and Bell 1981; Roncek and Pravatiner 1989; Roncek and Meier 1991; Block and Block 1995). Further research has shown that some areas that sell liquor produce a disproportionate amount of crime and violence (Sherman, Schmidt, and Velke 1992).

One of the troubling aspects of this research project was being able to adequately disseminate the data and articulate the catalyst for the given crime statistics. It is very likely that much of the crime incidents that were coded by the police as occurring outdoors at this #2-hotspot location were being driven by the 24-hour convenient store that also sells alcohol. However, it can also be suggested that the bus stop location, on the opposite side of the intersection from the convenient store, provides even more risk for this area since transit users' routine pathways are forced into this geographic space that is already at-risk. Consequently, it is not being suggested that the bus stop location causes increased crime, but at the very least, it may be argued that the location within an already viable space may be seen as a facilitator for increasing crime. To use an appropriate analogy, the bus stop location may be seen as fuel (i.e., providing suitable targets) to a fire (i.e., motivated offenders) within the hot spot location.

Eck and Spellman (1987) would likely argue that the #2 hotspot location could be classified as a *den* with repeat location problems involving different offenders and different targets interacting at the same location over sustainable periods of time. Indeed, a six-year analysis of data consistently showed this intersection to be one of the leading hotspots of crime in Lansing, Michigan, second to the bus terminal. This would be referred to as a *den iniquity* problem where potential targets encounter motivated offenders in a place where place management and collective efficacy is ineffective. Thus, this intersection continues to facilitate the noted criminal incidents.

A leading question follows, which came first, the crime or the bus stop location. In answering this type of chicken or egg question, the matter becomes more complicated since the data is incomplete regarding accurate spatial recordings or time-series analyses actively being conducted on public transit locations. This lack of research is not

unique to Lansing, Michigan, but for most cities throughout the country. Although every attempt was made to determine the timing of putting in the bus stop locations in Lansing, Michigan, links have not ordinarily been made between bus stop placements and the impact on crime. Thus, bus companies seldom keep track of dates when bus stops have been created. In addition, officers do not generally specify in their report riding if a facility's location was believed to trigger a criminal incident.

Figure 10.7. #2 hot spot showing the 24-hour convenience store, liquor sales, loitering youth/adults, and rental property across the intersection from the bus stop. (Photo C)

#3 Hot Spot location

The third location with the highest amount of official crime incident clustering takes places at the address of a large grocery-shopping chain store. Again, it is important to note that crime data used for the analysis stage does not include any incidents that occurred inside the store. In addition, incidents such as motor vehicle theft or theft from a motor vehicle are not included within the given crime statistics. As seen in 10.8 the bus stop is located within the shopping center's parking lot and includes a bus shelter rather than simply a sign as was found in the #2 hot spot location.

Figure 10.8 #3 Hot Spot bus location noting large shopping center parking lot. (Photo A)

Figure 10.9 shows a wider photograph of the bus stop location in reference to the shopping structure. The bus stop sets off to the east side of the shopping structure rather than in front of the building entrance cutting off much of the natural surveillance. Again, it is quite possible that many of the incidents recorded at this location occurred in the parking lot or in front of the store location rather than specifically at the bus shelter. Since this type of information is not readily available through the official police incident data utilized for the research, it is assumed that many of the recorded incidents have also occurred at the bus stop location that is located about 75 yards away from the east side of the shopping structure's main entrance.

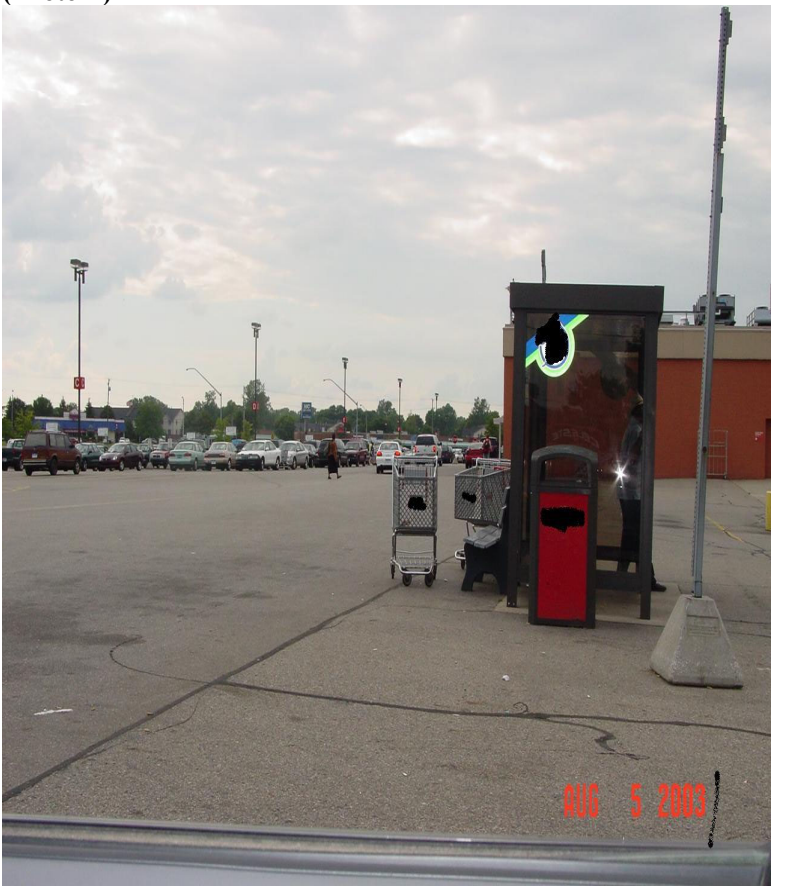
In terms of the observations that took place at this location, traffic lane use was not applicable, but the shopping structure provided an obvious need for the bus stop location. Consequently, pedestrian traffic remained high, including multiple observations of loitering youth and adults in and around the bus shelter location. Other incidents recorded at this location included public drinking at the bus shelter location while noting that the shopping structure is open 24-hours and does carry a liquor license. Since this area contains only the shopping structure and a large parking lot, little collective efficacy exists from the customer base. The question then becomes if the employees, especially full-time employees, are likely to become "capable guardians" of the surrounding structure.

Eck's dissertation (1994) recommends a tripling of guardianship with guardians of targets, handlers of potential offenders, and managers of places. The guardian provides surveillance and protection of the area, the handler is suppose to exert control over the movement and behavior of the potential offender, and the managers are suppose to take action to keep the offenders and victims from coming into contact with one another. Eck's (1994) suggestions are particularly challenging, and noteworthy, for shopping areas such as the #3 hot spot location. These suggestions directly challenge assumptions of responsibility on the part of the business to ensure safety for both employees and customers.

The store utilizes a staff of proprietary security officers. However, unstructured interviews with the security personnel found that the main emphasis of security is directed internally toward employee theft and limited external protection against shoplifting. The proprietary security team, other than reactively contacting the local police department upon a customer complaint, initiates very few incidents that occur within the

parking lot. Two CCTV cameras record the parking lot area on a 24-hour basis, but this is mainly done for liability concerns in major cases such as homicide or abduction. Store security generally felt that parking lot security was the responsibility of the municipal police department and little effort has been made by the police department to shift this responsibility back to the store or bus company (See Scott & Goldstein, 2005).

Figure 10.9. #3 Hot Spot location noting the bus stop location is not positioned within the front site line of the shopping structure. (Photo B)



#4 hot spot

The #4 hot spot location for crime incidents also contained a 24-hour convenient store that holds a liquor license. The outside of this store is adjacent to the bus stop location in figure 10.10. In fact, this same store is part of a chain found at the #2 hot spot location. Similar observations were found at the #4 hot spot location as the #2 hot spot location. Again, the traffic included a four-lane highway and loitering as well as public drinking was observed at the bus stop location, especially during the evening hours. Unlike the #2 hot spot location, this bus stop was closer to the 24-hour convenience store and did not have trash receptacles at the bus stop location. Consequently, it was not surprising to find more litter surrounding this bus stop location than other locations. In addition, the convenience store included a gas station, unlike the #2 hot spot location.

Since the incident level data acquired from the city police department only includes the intersection as the location for the #4 hot spot, it is not possible to determine any type of spatial catalyst for crime with any type of certainty. It is, however, being suggested that several features within this intersection may be creating the hot spot. This includes the rental housing within the area and lack of collective efficacy, the 24-hour convenient store with a liquor license, lack of natural surveillance at the bus stop location from the gas station/store or the main intersection, and easy escape paths from the intersection area towards the rental housing units. Other photograph angles of this intersection are shown in the proceeding Figure 10.11.

Figure 10.10 #4 Hot Spot location noting 24-hour convenience store, gas station, litter surrounding the bus stop location. (Photo A)

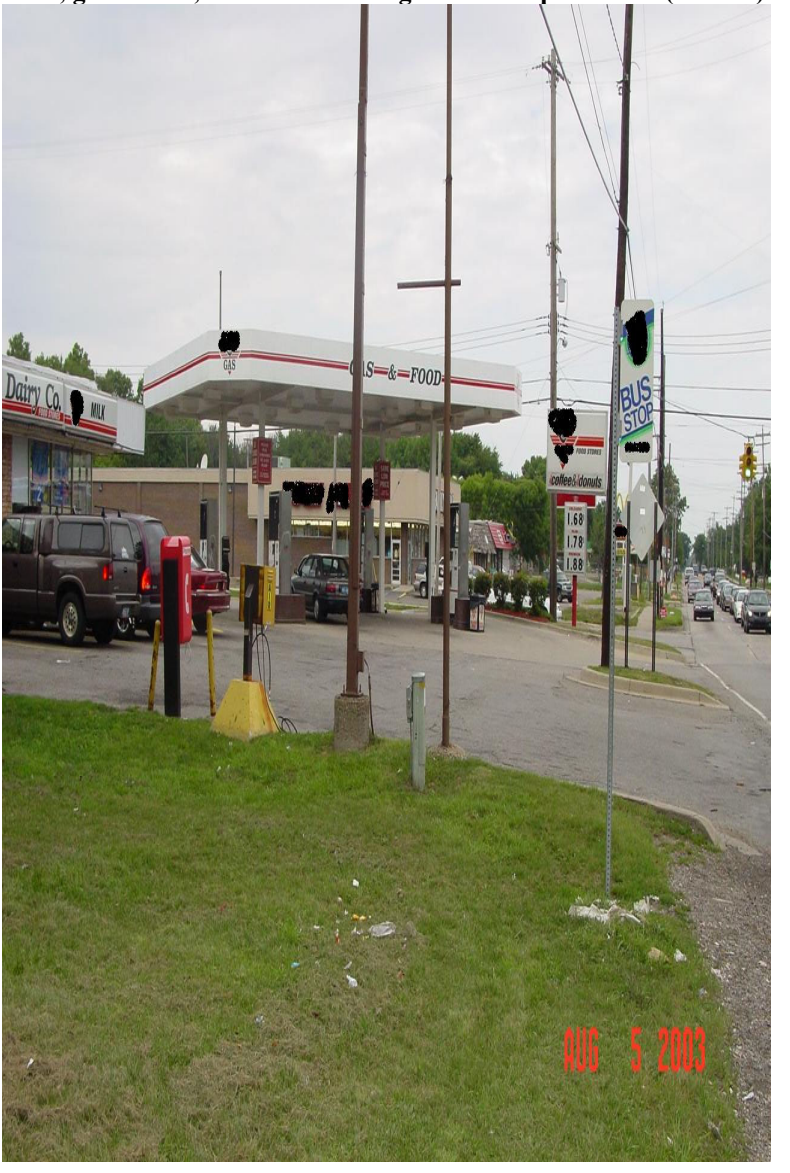


Figure 10.11 shows a photograph of the #4 hot spot intersection taken from across the street. Through this observation angle, other areas of interest included a public pay phone (also seen in Figure 10.10) and the rental buildings across a field from the bus stop location. This field, along with the surrounding trees, was seen to potentially block natural surveillance of the bus stop area and provide an easy escape path, again citing Newman's (1973) defensible space theory.

Figure 10.11. #4 Hot Spot location noting public phone and rental property in the background along with easy escape paths. (Photo B)

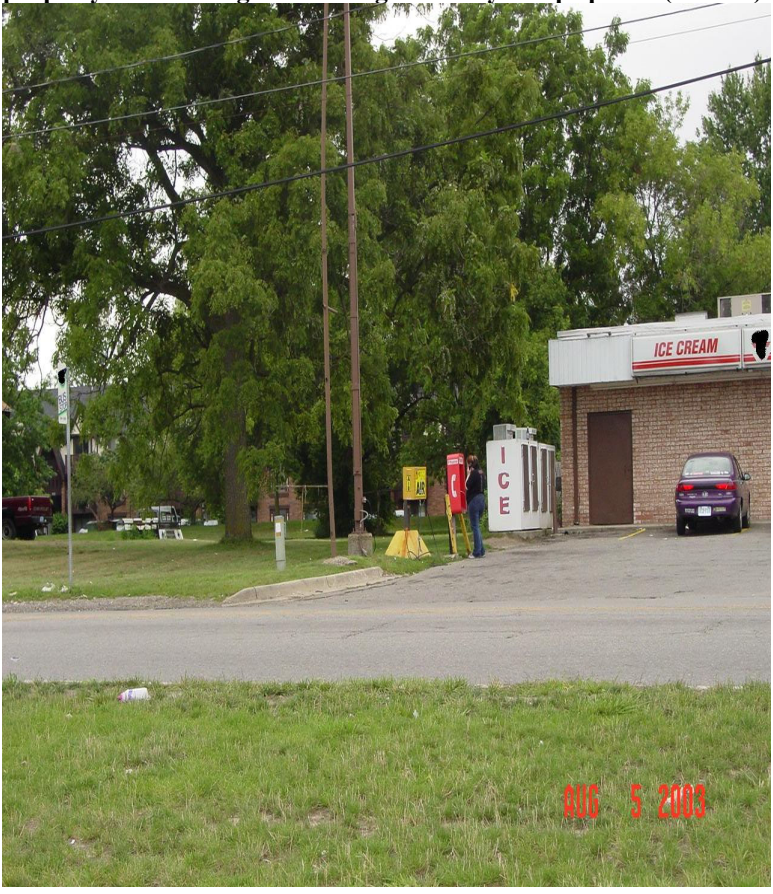


Figure 10.12 also highlights the general isolation of the #4 hot spot intersection. According to (Brantingham and Brantingham, 1993, 1996) this bus stop location would be considered part of a node of activity between pathways. Offenders are likely to develop mental maps of this area after extensive use. In terms of other structures surrounding this intersection, the bus stop can also be described as part of the edge of the node because of its isolation to the main area. According to Brantingham and Brantingham (1981) edges are areas that constitute prime spots for deviant behavior since there is limited natural surveillance.

Figure 10.12. #4 Hot Spot noting isolation and lack of natural surveillance. (Photo C)

Again, the assumption made is that this bus stop location is a catalyst for much of the recorded crime at this intersection location. It is quite possible that the convenience store/gas station is a major mechanism for crime at this location. However, multiple observations of this location noted frequent crowding by both legitimate transit users and loiters. Crowding and safety issues at this particular bus stop were frequently noted during informal conversations with both transit management and local police officers. In addition, the bus stop location is on the side of the 24-hour convenience store out of the normal visual range of customers and employees. For these reasons, it may also be possible that this bus stop location is at the edge of the given node and provides a suitable target for motivated offenders within an area of low collective efficacy.

#5 hot spot

The last hot spot explored contained two bus stop locations within one of the busiest intersections in Lansing, Michigan. This intersection has several businesses in a strip mall. Interestingly, the bus stop locations appear to be in better visual surveillance to area businesses and the intersection in general. However, some early spatial research points to some reasons why natural or informal surveillance alone may not always be an effective crime prevention strategy.

Angel's (1968) study of street crime in Oakland, California looked at the relationship between crime and population density. Angel argued that crime is related to the intensity activity on the street and as this intensity increases from very low to low, potential targets warrant the attention of potential offenders. However, Angel also asserted that higher levels of use cause crime to fall because there are enough people to ensure informal surveillance. Angel's research further showed that commercial strip malls were especially risky areas to crime since the linear nature of the strip tends to decrease the intensity of pathways making it easier for offenders to commit crime. The bus stop in Figure 10.13 shows a regular signed bus stop set some distance from the strip mall area across from the main intersection. Figure 10.14 shows a second bus stop shelter location, which is again situated some distance from the strip mall area. The location of the intersection makes up the fifth hot spot and also contains the two bus stop locations pictured below.

Figure 10.13. #5 Hot Spot intersection noting heavy traffic and commercial property. (Photo A)

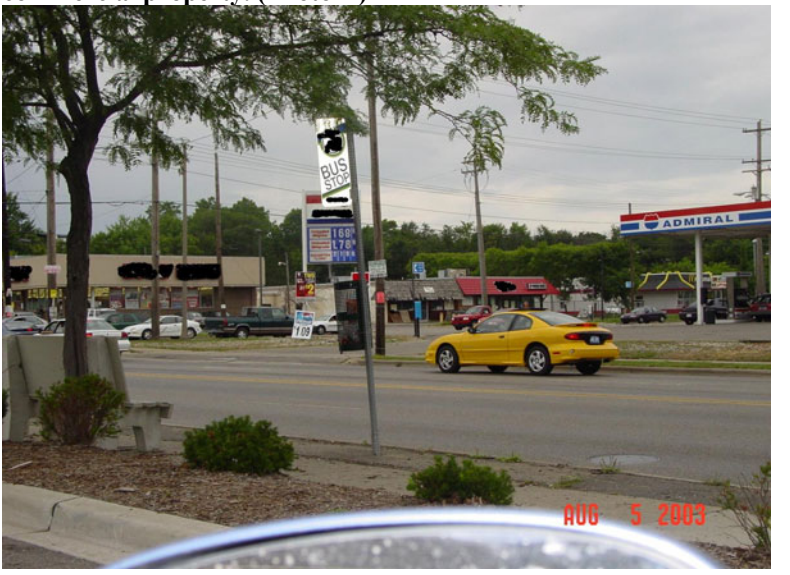


Figure 10.14. #5 Hot Spot noting a second bus stop shelter location. (Photo B)

This page intentionally left blank

CHAPTER 11

Conclusions and Recommendations

On September 25, 2000, the American Sociological Association and the Consortium of Social Science Associations held a joint Congressional seminar (Sampson, Squires, and Zhou, 2001). At this seminar, Chicago sociologist Robert Sampson spoke about the need to observe neighborhood contexts as units of analysis separate from individuals. He emphasized that understanding the pathways to healthy and unhealthy communities can lead to crime prevention strategies that cost less than traditional methods. Concentrations of disadvantage, immigrants, and racial segregation have shown increasing gaps between neighborhoods in recent studies (Sampson, et al., 1999; Simpson, 2004; Vankempen and Ozuekren 1998). At the ASA seminar, Sampson pointed out that the increases should be of concern since ecological concentrations of disadvantage lead to geographic hot spots not only for violence and crime, but have also resulted in disproportional higher rates of infant mortality, low birth weight, and physical abuse. According to Sampson, a mediator to these unhealthy spatially concentrated variables is collective efficacy, in which residents increasingly intervene to protect their territories. The concept of collective efficacy was measured in my study through owner-occupied housing and those who have lived in their residency for more the five years. Although the measurements for collective efficacy were not as detailed as Sampson and colleagues (1997, 1998), the results from this study show that neighborhoods do matter and a great deal of value can be placed on investing in local communities and empirically analyzing problems in areas where crime shows unusual clustering.

Applying social ecology to criminal justice policy has various ethical, legal, and political concerns. Sampson (1986) accurately points out the that legacy of Shaw and McKay's research in Chicago continues to offer support for programs such as the Chicago Area Project (CAPS), which looks toward social control through increasing community organization rather than changing individual offenders. The assumption of the social-control strategy is that the social ecology of neighborhoods does affect individual behavior. Future research endeavors should strive to test problem-oriented solutions within the given ecological settings.

New GIS technology has enabled the visualization of these ecological constructs, crime patterns, trends, and the identification of hot spots that have already come to the attention of the police. However, an ideal analysis would incorporate early warning systems across time and space that would be used to make more informed proactive responses in terms of problem-oriented and crime prevention policing. These predictive models would be able to identify hot spots of crime and disorder as well as areas where crime is abating (Groff and LaVigne, 2001). However, only a few published works exist on the use of GIS spatial crime analysis for predicting future crime escalation (Olligschlaeger, 1997; Rossmo, 1995; Groff and LaVigne, 2001).

SUMMARY OF THEORETICAL FOUNDATION

Crime theory generally is divided into examinations of criminal offenders or examinations of criminal events. In the past, criminological theory was dominated by a focus on offenders (Clarke, 1980), but researchers and crime prevention practitioners have become increasingly aware of the role that specific environmental areas play in crime. These environmental areas have been referred to as *crime places* throughout recent criminological literature. Places are defined as very small areas such as specific street corners, exact addresses, or bus stop locations. At the place level, explanations focus on crime events rather than analyzing criminal offenders.

Four areas of the theoretical foundation utilized in crime place research are: collective efficacy, rational choice, routine activities, and crime pattern theory. All four theories were utilized throughout my research, which emphasized criminal places in the form of neighborhoods and at the micro-level with bus stop locations. These

theories can be considered mutually exclusive under environmental criminological perspectives.

Collective efficacy

This theory was tested following the PHDCN model in Chicago. Within the literature, social cohesion has been defined as the willingness and ability to act on behalf of the public good. From this definition, social capital was defined through owner-occupied housing percentage within block groups, which was argued to represent a willingness to make efforts for the larger good based on higher levels of social capital. This increased social capital was shown to mediate the effects of having concentrations of foreign immigrants and significantly related to lower criminal incidents in my data. It can be further argued that this correlation occurs through shared values of the homeowners and encourages additional support through more interactional patterns than in neighborhoods with less capital. These shared values encourage greater enforcement of prosocial norms than those areas with lower levels of collective efficacy. These findings indicate the importance of encouraging collective efficacy in areas surrounding high crime areas. This encouragement is perhaps more challenging in commercial areas than in residential areas, but can still be seen as a worthwhile goal for city planners and progressive proactive police management.

Rational choice theory

This theory provided the basic rationale for defining place and crime by suggesting that offenders will select their targets through a hedonistic cost/benefit rationale (Cornish and Clarke, 1986). There have been claims that this type of perspective may be untestable because it may always be possible to interpret behavior as rational from the perspective of the offender (Parsons, 1951) except in the cases of extreme mental disorder. Other researchers have demonstrated that it is possible to test various forms of rational choice theory (e.g., Hogarth and Reder, 1987; Cornish and Clarke, 1986). Rational choice assumptions were critical for the given research project, although no emphasis was placed on analyzing individual offender choices. Rational choice assumptions provide the link for a more empirical analysis of situations, routine activities of both victims and offenders, and crime pattern theory. It

has been suggested that bus stop locations in areas with high crime rates may increase the opportunity for motivated offenders by providing increased targets. Areas that lack adequate surveillance (i.e., costs) may provide increased opportunity (i.e., benefits) for offenders who are making rational cost benefit analyses within the given spatial targets.

Routine activities theory

The use of the routine activities theory focused on the behaviors of targets and the possibility that controllers (e.g., handlers, guardians, and place managers) affect the amount of crime by their mere presence. Guardianship was measured within block groups through the amount of home ownership and general stability in terms of time at a residency. This theory also argues that as routine activities change so may the amount of crime. Bus stop locations provide a unique spatial area that forces routine activities to those areas and the research has shown that these areas become more risky for the space users. It was no coincidence that the spatial areas most at risk in the city also contained bus stop locations. These locations invariably force routine activities of potential victims and offenders into these locations through space and time. Qualitative findings pointed out that the addition of other risky structures leading to risky behaviors (i.e., 24-hour convenient stores with liquor licenses, rental property, loitering youth/adults around bus stop locations) can have additive ramifications for legitimate transit users during their routine activities.

According to routine activities, motivated people (e.g., teenage loiters, drug users, unemployed adults) are ones most likely to commit crime. If these individuals congregate in a particular neighborhood, or in a particular part of the neighborhood such as the bus stop, this area has an increased propensity to become a hot spot. Clearly, the observational research conducted on these hot spot bus stop locations invariably found the presence of motivated potential offenders. Yet, motivated offenders must still have the opportunity to find suitable undefended targets before they commit a crime, and legitimate transit users appear to provide unlimited numbers of targets in areas that lack adequate surveillance.

Crime Pattern Theory

Crime pattern theory integrates rational choice with routine activities theory (Clarke and Felson, 1993). However, the focus of crime pattern theory is how targets come to the attention of offenders over time, space and availability (Brantingham and Brantingham, 1993). This rational decision-making process occurs during the offenders' routine activities. As potential offenders conduct their normal daily and nightly activities, they become aware of easy targets. While it is recognized that a few offenders may aggressively seek out areas that are not part of their routine, most will conduct their searches within the areas with which they are most familiar and this search will take place through the course of noncriminal activities. This analysis showed that bus stop locations may be seen as easy targets for offenders during their normal everyday activities.

The use of these theories provides the foundation for constructing a general theory of crime places. This type of theory should continue to be developed through the growing literature that links crime and place and has been encouraged in the past (Eck and Weisburd, 1995). Studies of criminal offenders and crime places can compliment each other. Offenders who are considered motivated still need the opportunity or crime event in order to issue an explanation. In attempting to develop a theory about crime places, it is necessary to determine why some targets are attractive and others are not. Therefore, a future research direction should be directed at further analyzing the attractiveness of some bus stop locations over others. We may want to know what type of routine activities of offenders, victims, and guardians contribute or deter the likelihood of crime occurring in a particular place.

There is a practical relevance to the given research presented in my study. The growing recognition of crime place and crime control is perhaps best exemplified by the number of law suits that have come about claiming that certain areas are inherently unsafe or unnecessarily dangerous[8] (Fischer and Green, 1998). Through local community

[8] "We've heard a lot about corporate responsibility as it relates to accounting practices. But management and community responsibility goes much further than the bottom line. It also extends to assuring that employees and the public are free from the threat of harm on the job or in their neighborhood." -Senator Joe Biden, August, 2003.

policing efforts, resources can be made available to assist residential and commercial property managers in their efforts to secure their property and deter illegal activity. In addition to acknowledging the legitimacy of my research findings, training programs have been developed through the federal government to assist neighborhoods in their fight against public outdoor related crime (U.S. Department of Justice, Bureau of Justice Assistance, 2000).

THREE PART CONCLUSION

Part I: Collective Efficacy Model Test

The ecological model developed by Sampson and colleagues (1997) argues that community residents become empowered through their knowledge of and trust in each other to take action against threats. Within these communities, there is a greater likelihood that formal alliances will be made through neighborhood watch groups and community policing initiatives. Public spaces, such as bus stop locations, should also be better protected within these communities. Often, these bus stop locations are part of the property owned by a business or private resident. Nonresidential land use and population turnover affects residents' ability to know one and another. These variables also affect the willingness of legitimate space users to observe and intervene in disruptive actions that take place at the bus stop location. Sampson and colleagues (1997) reformulation of social disorganization theory argue that residents high in collective efficacy have the ability to overcome disorganization. According to Sampson and Raudenbush (1999):

> "A theory of collective efficacy does not render structural constraint irrelevant; rather, it proposes a mediating mechanism while at the same time instating on an independent role for agency in all corners of the social structure" (p. 613).

Through spatial identification of both collective efficacy concepts and crime clustering, proactive police management strategies are better positioned for collaborative enforcement and problem-solving initiatives than at any other time. These departments have become much more risk-focused in terms of identifying the underlying causes of disorder and the factors that place space users most at risk for criminal and problem behaviors (Rich, 1999). As these causes become

more well-known, police departments are being encouraged to share their findings with the wider community. One strategy for engaging the community to get involved with crime control involves making aggregate crime data available to the public, often through the department's website. Several police departments now have interactive maps within their departmental websites. These websites may be best served to also display levels of informal social control or collective efficacy with an explanation of what the research conducted by Sampson and colleagues (1997) argues. Collective efficacy data should be gathered through other means such as surveys rather than simply through home ownership or residential mobility, as this is seen as a limitation of the collective efficacy data gathered for Lansing, Michigan and discussed more thoroughly in the limitations section.

Leaders in one community have commented that the mapping system improved communication between the police and residents by ensuring that they shared a common platform on which to judge the nature and extent of neighborhood problems (Redlands Police Department, 1999). As this information becomes increasingly shared, an expectation arises for legitimate space users to more uniformly take a role in crime prevention initiatives that are risk-focused. Residents who are educated about the need for and benefits of collective efficacy become more adaptable consumers for tracking their own neighborhood crime data realities rather than erroneously gathering this information from television news drama. As this crime data consumerism increases it can be expected that general levels of informal social control may also increase. This type of data may also serve as a mechanism of lowering overall fear of crime.

Neighbors Against Drugs (NAD) Sheboygan, Wisconsin: An example of increasing collective efficacy[9]

For example, in the winter of 2003 residents living in Sheboygan, Wisconsin began a problem-oriented policing project that pushed to raise levels of collective efficacy within neighborhoods where residents were reporting suspected drug activity. Residents were educated through improved documented reporting mechanisms about what to

[9] The NAD initiative was a finalist for the 2005 Herman Goldstein Award at the 16th Annual Problem-Oriented Policing conference in Charlotte, North Carolina.

look for to confidentially verify residential drug dealing. After being educated, participating residents documented data about dealing activities within their neighborhoods. This documentation followed the collaboratively posting of bright red signs in their yards labeled "Neighbors Against Drugs" (NAD). Each neighbor was asked and agreed to post these signs by their residence. Each neighbor received a NAD sign with the exception of the property where suspected dealing had occurred. Thus, the property where alleged drug dealing was occurring was shamed by the other neighbors posting the NAD signs. Residents and community police officers also worked with landlords of the suspected dealers to civilly abate their lease if they did not own the property.

This residential collective efficacy initiative has resulted in victory being claimed on 66 drug houses in 27 neighborhoods (see Kooi, Priebe, and Kirk 2005). In addition, six-month posttest follow-up surveys found significant changes in these targeted neighborhoods in terms of fear of crime and suspected return of drug activity. Specifically, 40% of residents rated their neighborhood safe before the NAD collective efficacy initiative and 82% of residents rated their neighborhood safe 6-months after the NAD initiative. In addition, 52% of residents suspected drug activity in their neighborhood before the NAD collective efficacy initiative and only 5% suspected drug activity had returned 6-months after victory was proclaimed by the effected neighborhoods. Preliminary comparisons of official data in neighborhoods that were given the NAD intervention a year before and a year show a 36% reduction in calls for service, 93% drop in burglaries, 92% drop in simple theft, and nearly a 100% drop in motor vehicle theft. Challenges directed towards displacement need to be more fully assessed. However, this level of neighborhood change is highly unlikely within a traditional buy-and-bust law enforcement approach to neighborhood drug dealing, which frequently ignores prevention and facilitation of collective efficacy.

PART II: Quasi-Experimental Design testing crime predictability of bus stop clusters

The quasi-experimental design was used to test the overall impact of bus stop locations on the number of crime incidents while controlling for the latent concepts that were established in the first part of my research methodology. These tests showed that bus stops clustered

closely together do indeed seem to attract increased crime incidents, while controlling for other social ecological variables: total block group population, concentrated disadvantage, immigrant concentration, and residential stability. Policy implications of these findings may appear somewhat obvious, or at the very least point out the need to separate bus stop locations within high crime areas or remove them altogether.

This removal of bus stop locations within high crime areas may be seen as part of an overall gentrification movement. For example, community changes are often seen as occurring within cycles. As these changes occur, progressive police administrators and city planners often look towards revitalizing certain neighborhoods that appear disorganized. Urban areas often undergo stages of decline in terms of socioeconomic status and increased population density (Bursik and Grasmick, 1993) followed by renewed efforts to replace obsolete housing and increase businesses. As part of this renewal or gentrification process, planners would be wise to also look at the availability of potential victims within high crime areas and determine if there reasons that the routine pathways of these victims are unnecessarily encountering a large clustering of motivated potential offenders.

Part III: Systematic Qualitative Observations of Bus Stop Locations

The part I structural equation model research design was based on the assumption that human behavior can be explained by "social facts" that were investigated by various methodologies that utilized a more "deductive logic of the natural sciences" (Horna, 1994, p. 121). This quantitative measurement strategy attempted to measure "how much" and "how often" (Nau, 1995) as a means for examining the behavioral components of specific public space usage. The weakness of this approach lies mainly in the failure to ascertain a deeper underlying meaning and explanation for why crime incidents cluster. The qualitative research design was associated with an interpretative approach rather than only utilizing discrete, observable data.

Because the bus stop locations and intersections that contain bus stop locations are at the smallest micro-level data, it was decided that the given incident data was appropriate for investigating these spaces qualitatively provided the information would not otherwise have been found through the aggregate independent variable data. This depth

allowed the project to achieve "*verstehen"* (also referred to as interpretive sociology) or a more empathetic understanding of the social/physical environments that surrounds the hot spot locations. Specifically, the qualitative approach gave a more explicit view of the given data.

My research project "blended qualitative and quantitative methods of research to produce a final product which highlights the significant contributions of both" (Nau, 1995, p. 1). In addition, it can be argued that the "qualitative data supported and explicated the meaning of the quantitative research" (Jayaratne, 1993, p. 117), especially in terms of observing low collective efficacy within the hot spot locations. Qualitative information about the immediate environment of block groups with the highest number of criminal incidents was generated through the windshield surveys. Most spatial crime analysis is still largely exploratory. As such, the use of the qualitative methods allows for the possibility that unexpected developments may arise as part of the research process (i.e., serendipity). The quantitative analysis complements the findings of the qualitative research by indicating the number of incidents that were formerly found in and around the bus stop locations. The qualitative analysis appeared to confirm the data that emerged from the quantitative analysis. These systematic observations helped to provide further information about why particular bus stop locations attract a higher number of criminal incidents than other bus stop locations.

Each windshield survey entailed a systematic inspection of the bus stop location and the immediate surroundings of the bus stop. A rating sheet was developed prior to the inspection. Separate investigators were used at the same time and in the same vehicle to rate the attributes surrounding the bus stop locations in an effort to reduce potential rater bias. Each individual rated their areas independent of the other researchers and responses were later compared to assess reliability. Little bias existed in comparing systematic rating sheets, indicating high inter-rater reliability. The information from the windshield surveys were used to assess defensible space and incivility concepts.

Incivility refers to a variety of factors involved in disorder and general community decline. Two general categories of incivility that were concentrated on through the observations included negative physical attributes and social interactions. Physical attributes of incivility included broken windows, abandoned property, litter, graffiti, and vandalism. Social incivilities included public drinking, loitering

youth/adults, illicit drug sales and prostitution. Both transit users and potential offenders are believed to see signs of incivilities surrounding the bus stop locations as an indication of a lack of social cohesion, high transiency, a lack of resources, and/or overall low social control (Lewis and Salem, 1986; Skogan, 1990).

According to Patton (1990) and Nau (1995) these types of systematic observational studies coupled with mixed quantitative analyses provides enough "trustworthy" information to validate research findings and argue against other limitations. Just as data speak for themselves and emerge into themes and patterns, so did the understanding of the environments surrounding bus stop locations provide "trustworthy" empirical information through the systematic efforts of the raters to find credible, confirmable, and dependable data. The use of an audit trail offers visible support that the observational research data were integrated into the overall research findings of my project. Technical literature, comparable observations by multiple raters, and links with official data all combine to confirm that a research design that utilizes mixed methodologies can provide a more in depth and complete analysis. The use of a triangulation of multiple data sources also addresses both the internal validity concerns and/or limitations.

Weick (1968) proposed that when researchers observe a particular phenomenon increased validity occurs. The synthesis of official data sources, mapping specific locations of those data sources, and actually observing those locations provides an image of what is "real." These combined approaches are believed to provide a fuller understanding of the complexity of relationships between various sources of data. In addition, these qualitative steps also provide some arguments for the complexity of spatially mapping data and accurately recording and spatially locating raw data.

Expanding hot spot spatial analysis

Place-oriented crime prevention strategies have begun to carry critical importance in police resource allocation and policy implementation. We now know that crime does not occur evenly through urban landscapes, but is concentrated in relatively small places that generate more than half of all criminal events (Pierce et al., 1988; Sherman et al., 1989; Weisburd et al., 1992). Research has also shown that even in the most crime-ridden neighborhoods, crime clusters in a relatively few

discrete locations and other areas remain relatively crime free (Sherman et al., 1989). Arguments that follow from these observations claim that crime problems can be alleviated more effectively when police administrators focus their attention on these discrete hot spot locations (Sherman and Weisburd, 1995; Weisburd and Green, 1995).

In their review of spatial place-oriented crime research, Eck and Weisburd (1995) identified four components that deal with the role of place in crime that fit within my analysis of bus stop locations and crime. The first component was labeled "facilities". This called for a closer look at structures such as bars and rental properties surrounding bus stop locations. Bars may serve to increase the risk of transit users being harassed by intoxicated patrons. Rental properties may lower levels of collective efficacy. People loitering at the bus stop locations provide targeted victims or a customer base for those who may be motivated to sell narcotics or prostitution. These facilities, including the bus stops, have an immediate environmental impact on crime depending on the type of people attracted, the way the space is managed, or the level of collective efficacy present through business owners, security or the police. The next component is "site features" such as easy escape pathways, lack of guardianship, and the presence of valuable items, which can influence offenders' choices, and general opinions of the area. Proper police crime analysis should take into account public transportation features in determining why these locations tend to become hotspots for criminal activity. Third, studies of "offender mobility" suggest that offenders select easy targets according to characteristics such as gender, age, race, demeanor, and the overall distribution of crime targets. Transit patrons often become easy prey for offenders who live in the area and may be more familiar with the area than the transit user. The fourth component occurs through a direct outgrowth of offender mobility patterns and is directed at researching "target selection", arguing that offenders seek places that give cues that indicate acceptable risks and gains. These target selections are found during daily legitimate routines.

Crime analyzers should pay close attention to determining why hot spots occur and if the hot spot is located in a place with public transportation, analyze why that location is being selected by offenders. A meaningful response should be implemented based upon the analysis as a means to address the environmental problems causing the hotspot. A proper assessment should follow to determine if the response created the appropriate change. For a more thorough explanation for

implementing problem-oriented policing visit the POP Center website at www.popcenter.org.

Within Eck and Weisburd (1995) component research summation, locations external to "facilities" should also be taken into consideration. Although structures or "facilities" have been shown to impact crime, often the behavior that occurs outside of these establishments provides the most visible signs conducive to raising fear and effecting neighborhood quality of life. As demonstrated through this project's use of dependent variables, it can argued that outdoor-related crime matters most in terms of the overall quality of life within the neighborhood, and these crimes do cluster. Many of these disorderly/criminal behaviors were seen in and surrounding bus stop locations. Events such as open prostitution, illicit drug sales, loitering youth, and public drinking occur most frequently in areas that already have negative facilities, such as liquor stores, abandoned housing, rental property, and 24-hour convenient stores. However, these events may be further enhanced through features external to the facilities that also cause an influx of increased targets through forced routine activity movement, such as bus stop locations. The environmental cues need to be addressed within a problem-oriented response.

RECOMMENDATIONS

Studies have found that more transit crime occurs at bus stops (Levine et al., 1986; Sideris, 1999) than bus vehicles, yet most transit agencies focus their attention driver safety and property damage within the vehicle. In addition, most of the attention by transit authority toward bus stops recommends increased police presence rather than exploring environmental design solutions (Transit Cooperative Research Program, 1994). Even with the focus on increased police presence at suspected high-crime bus stop locations, responses by public officials are not always positive as the question of responsibility always arises.

Who is responsible for transit security?

The research presented throughout this book calls into question levels of responsiveness and responsibility to monitor behaviors in public space locations. Felson (1995) argues that levels of informal social control vary depending on the form of spatial responsibility. The tendency to discourage crime will vary with the primacy of

responsibility: personal, assigned, diffused, and general responsibility. Those with personal responsibility will be most likely to intervene with a potential offender. However, those with general responsibility are likely to ask someone with more responsibility to talk with the potential offender or wait until a crime has occurred and then contact the police afterwards. By this time, the crime has already taken place and very likely, the offender has fled. According to Felson (1995), the level of responsibility not only affects the likelihood that crime will be discouraged but also that such discouragement will occur directly and quickly. The public is unpredictable in terms of exercising responsibility to offenders and it may become necessary to look towards other assigned forms of responsibility. If Felson (1995) is correct, we may challenge some of the assumptions underlying community-oriented policing and look more towards specified solutions that underlie problem-oriented policing.

Are the Police responsible for bus transit safety?

The viewpoint of most public transit management is that crime within the transit system is part of the overall urban crime problem and the responsibility of the local law enforcement agency (Hoel, 1997). However, this contention should take into account that the existence of a new bus stop location or bus terminal may pose serious public safety issues and increased risk to neighborhood quality of life. Spatially and statistically this research project has shown that some bus stop locations are highly correlated with crime and the main city bus terminal reports the largest concentration of crime within Lansing, Michigan. Many bus companies are validly concerned about public safety issues and will likely rely on law enforcement for the solutions. Transit management often contends that it is the obligation of local law enforcement agencies to protect citizens within their jurisdiction and employees of these policing agencies should be better trained and equipped to provide security within public transportation[10] (Hoel, 1997).

[10] This information and opinion was verified through personal interviews with the transit management company that was utilized throughout the research process.

However, local law enforcement officials often regard large-scale public transportation as a specialized problem beyond their means to address. Policing administrators may be wise to negotiate and even reeducate transit management about efficient use of law enforcement resources as a means of shifting responsibility back to the transit user, businesses and residents surrounding the bus stops and the bus company (See Scott & Goldstein, 2005). Transit systems in urban areas are usually within their own separate governmental agency with their own resources. Consequently, police administrators often view transit safety as the responsibility of the transit system to provide its own security force or to reimburse the local police for additional protection it may furnish. According to Wallace and Buren (1974) several problems exist in relying on local law enforcement to furnish transit security:

1. Jurisdictional confusion. When transit lines cross governmental boundaries, what happens when a crime occurring in one community is reported to the police in another community?
2. Reporting and response to crime. Lack of centralized control of crime reports within the city's public transportation system may cause delays or inconsistency. Lack of coordination, an ill-defined chain of command, and lack of accountability lead to loss of confidence from transit administrators and the public.
3. Police patrol coverage. The temporal and number of police assigned to patrol transit properties can vary considerably without any reliable record keeping of their deterrent effect.
4. Crime recording. Methods for recording crime may vary considerably and it's often difficult to systematize data with transit user feedback.

5. Specialized training required by transit police. Policing transit systems often requires special skills and knowledge, including an understanding of the characteristics of transit users and crime types most often affecting transit systems. This is often why a single police force accountable to only the transit

> system may be more effective with furnishing a centralized location for reporting crimes, conducting specialized patrol procedures, creating more accurate crime statistics, and providing specialized training for specific transit problems.

Ultimately, the type of police organization available to service transit systems will affect the level of security given to transit users. If the services lack coordination and effective administration, then the deterrent effect of any security program may be limited. The planning that surrounds policing terminals and bus stop locations typically involves an assessment of past problems, as was completed throughout this book. The results of the data assessments should be utilized to further the organizational and fiscal responsibility of transit agencies and the surrounding public. Indeed, new methods for shifting and sharing responsibility for public safety problems (Scott and Goldstein, 2005) surrounding public transit needs to be made more directly.

In 1983-85 Levine and colleagues (1986) conducted a study of bus crime in west central Los Angeles. They documented several intersections where there was a heavy concentration of crime, bars, adult bookshops, massage parlors, liquor stores, and bus stops. A transit crime task force was established after their research to examine ways of improving security around the most dangerous bus stops. Recognition from this project's results could lead to more attention placed on improving the overall security of transit users in those locations that are most at risk. Solutions include the removal of bus stop locations in areas of known crime hot spots or more concentrated problem solving in areas where hot spots have consistently been found. As part of an ongoing research venture, bus stop removals or shifts to surrounding locations should be followed by a post measurement analysis of official statistics within those areas to determine if the bus stop location did contribute to the given crime hot spot. In order to effectively measure and compare results, police presence and response to the area would have to remain the same as it was before removing/relocating the bus stop or stops.

As pointed out in the preceding limitations section, official statistics may not provide the best means for measuring performance of formal/informal social control mechanisms. If the police are to take bus stop related crime seriously, newly developed police performance models, referred to as "change agent" models, would enhance

measurements of the official and unofficial effects of bus stop crime and bus stop removal on crime. These change agent models seek to measure inputs and outputs created by police departments (Thibault, Lynch, and Mcbride, 2001). This type of model is necessary for looking not only at official crime statistics but for also concentrating on crimes or nuisances that may not be reported to the police but nonetheless raise the fear of crime. The change agent model recommends that the police results and performance measures be based on quantitative measures (e.g., How many services were provided? How much did we produce?) and qualitative measures (e.g., How well did we deliver the services? How good were our products?). The qualitative measures look towards creating positive changes in the quality of life in a community (Thiabault, Lynch, and Mcbride, 2001), and potentially increasing levels of collective efficacy and various forms of guardianship. Ratings for the qualitative effectiveness of these strategies can be measured through direct contact with transit users. In addition, other modes of gathering data reactions include community leadership meetings and discussions with questionnaires, focus groups from the community where services are targeted, and community attitude surveys distributed in areas with the highest levels of transit users or areas with the highest levels of transit related crime. Questions and feedback should look for issues concerning the courtesy of officers, how fearful transit users feel, and general questions about how well the police or transit security are doing within the community.

Sherman (1992, 1995) challenges the argument that an analysis of official data alone cannot lead to beneficial results. Through official data, he found that "chronically violent couples can be identified and predicted and chronic locations of domestic calls can be predicted" (Sherman, 1992, p. 214). He also found that "over half (53%) of all domestic calls in Minneapolis occurred at buildings with four or more calls in 1986" (1992, p. 227). Sherman's research findings add to the internal validity of my research and use of official data. Within the "dial-a-cop" community mentality, Sherman (1989, 1995) argues that chronic hot spot locations determined through official data are not normally given extra attention to try to reduce the heavy demand on police. Within proactive police systems, we may expect that agencies would provide extra coverage for hot spot areas since this type of police presence has beneficial results without serious displacement issues (Sherman, 1995). This combined proactive police presence within known hot spot areas could be used first before having to

remove bus stop locations. However, if hot spot area bus stops are removed in addition to increased police presence, later research results would be biased because it would not be known if the bus stop location did in fact increase crime within the given hot spot locations.

The Dirty Data Problem

A more aggressive police approach by spatial data analysis is not without its challenges. Often, data organization problems exist, defining hot spot locations vary, and overall effectiveness of choosing known to analyze crime incidents, arrest locations, or calls for service are all debatable and in need of further research discussion. Challenges for the proactive policing strategies based on the use of the official data include:

1. Having more specific incident locations from spatial analysis: For example, recorded spatial data often include multiple names, such as Martin Luther King, Blvd. being labeled MLK, Martin, Luther, or King Blvd. within a single database. More sophisticated crime analysis has to be conducted to ensure that the data are accurately accounting for the fact that these are all one location.
2. Finding a criterion for defining a hot spot location, such as rates of incidents, actual raw number of incidents, types of crime, distinguishing from outdoor or indoor related crimes, use of calls for service, incidents and arrests. All of these choices may cause "hot spots" in different areas of the community.
3. Getting more accurate information about criminal incidents and making better efforts to record and map the data to the appropriate location. For example, bus stop locations could be used more accurately within the crime data statistics than an intersection address that could include multiple structures within the given intersection.

An evaluation of effectiveness should combine the number of recorded police incidents related to the lowering of police incidents within the area. Within this type of evaluation, pre and posttest

questionnaires are given to the users of hot spots spaces to evaluate the success or failure of police intervention. These questionnaires could also be given outside of the hot spot areas to evaluate any displacement issues. Transit users may benefit greatly from this type of response.

Debating general responsibility and assigned responsibility: Environmental solutions?

Newman (1972) and Jacobs (1961) argued that the power of natural surveillance and proper environmental construction would increase general responsibility. In contrast, Mayhew (1981) and Clarke (1992) emphasize the need for assigned responsibility. Out of this debate, Felson (1995) makes an interesting argument that new technology will continue to improve the impact of general responsibility through wide ownership of video camera equipment and cellular phones. Felson (1995) also points to new uses of electronic bulletin boards that help citizens share data and general information about criminal activities.

A more simplistic and perhaps realistic response to crime problems surrounding bus stops would be to devise situations in which the opportunity to commit crime is less abundant. The location of the bus stop invariably has to be taken under consideration. Some bus stop locations can be target hardened, such as replacing a sign with a shelter so transit users are separated from the nontransit space users[11]. Other specific design solutions could include widened sidewalks or the creation of nubs that extend the sidewalk only at the bus stop location (Sideris, 1999). These nubs are believed to help minimize the conflict between transit users and other pedestrian traffic (Fitzpatrick, 1997).

The use of the space surrounding bus stop locations has been shown to be a critical component of the research findings. Negative land uses such as 24-hour convenient stores that also carry a liquor license appear to generate crime. The bus stops may provide easy targets for these already crime filled areas. High crime areas that also include a bus stop location push transit users' routine activities into areas that increase the risk of their victimization. It is also possible that the bus stops

[11] The decision to invest in replacing a bus stop sign with a shelter should undergo consideration. During informal interviewing of transit management, it was pointed out that some shelters become targets for vandals and have been replaced by signs because of the vandalism problem.

themselves have a reciprocating influence on the number of incidents within the hot spot locations, as an increased number of transit users are as likely to be offenders as they are victims. There is growing evidence that crime victims are much more likely to commit crime themselves (Ireland and Widom, 1995).

Because of these seemingly reciprocating problems, the decisions about where to place a bus stop should consider the outlying area. The use of space surrounding bus stop locations is vital to the area's quality of life. This quality of life can also be affected by the placement of a bus stop location. A bus stop location placed in an area can serve to increase the opportunity to commit crime and can negatively impact the quality of life for not only transit users but also other legitimate space users. Placing a bus stop on the side of a parking lot or on the side of businesses without any consideration for natural surveillance issues is likely to increase the risk of victimization. Bus stops placed within the visibility of active businesses, homes that are owned and not vacant, and in areas with little transience are likely to be less at risk. These areas are also more likely to have increased collective efficacy, which was shown earlier in the research to mediate some of the other neighborhood social attribute problems.

According to Neman's (1972) approach, defensible space concepts provide the best model to inhibit crime surrounding bus stop locations by creating a physical expression of a social fabric that defends itself. That is, the physical characteristics of an area can influence the social interactions and behaviors of the space users. The four elements that Newman's (1972) defensible space theory includes some of the best recommendations for placing bus stop locations in a manner that inhibits rather than discourages crime:

1. Territoriality- ability and desire of legitimate users of an area to lay claim to the area through the establishment of real or perceived boundaries.
2. Natural surveillance- designing the public space so that legitimate users can be observed during the day or night, inside or outside, without the aid of special devices.
3. Image- maintaining the social space so that it has an appearance that is not seen as isolated and is cared for and that area space users will take action when ever anything is amiss.

4. Milieu- the placement of the bus stop location should be within an area that has low-crime and high-surveillance that will inhibit criminal activity.

These strategies were reworked into four intermediate goals that also fit within recommendations for creating bus stop locations that do not adversely affect crime: access control, surveillance, activity support, and motivation reinforcement (Kushmuk and Whitemore, 1981).

1. Access control- the ability to regulate who comes and goes from an area, with the intent of limiting access to legitimate space users. This can be accomplished through redesigning bus routes and bus stop locations so that the flow of transit user space is brought into areas that have low-crime and and/or high surveillance. These actions may also help eliminate easy escape routes for offenders who do illegitimately enter the area.
2. Surveillance- actions to enhance the ability of legitimate space users to observe the presence of others and their activities by placing bus stops in the direct site lines of area businesses employees, customers, or residents. By placing bus stops in commercial areas directly in the center of business site lines, both employees and customers help to provide increased natural surveillance. Area businesses should also be observed to ensure that there are unobstructed views out the windows. Underlying these suggestions is the assumption that increased surveillance may also increase some form of collective efficacy and observers will inform the police or take some other type of action if disorder or crime is occurring.
3. Activity support- functions that assist and enhance the interaction between transit users and other legitimate space users in the surrounding area. Many transit users become regular users of space and may indeed develop relationships with area businesses or even residents that surround their bus stop location.

Many live close to their bus stop locations. The ability for a community atmosphere to develop a caring attitude is built, in part, through the physical appearance and design of an area (Neman, 1972; Kushmuk and Whittemore, 1981). Since the impact of access control and surveillance rely on the behavior of the space users, these individuals must be willing to intervene in situations where public space is not be used legitimately. As this willingness increases, the effort and risk for the offender should increase as the greater chances of observation and intervention increase.

4. Motivation reinforcement- enhancing the feelings of territoriality and social cohesion through physical design features and building pride in the area.

Motivation reinforcement is perhaps the most challenging feature from this model. However, through community policing approaches, a combined official response with a more systematic look at spatial crime causation, can have lasting effects on increased residential safety. The following strategies are proposed to combat bus stop crime.

1. Remove bus stop locations from high crime areas and measure crime for a specific period of time after the bus stop removal. If the bus stop cannot be removed do to public demand, create a shelter that separates waiting transit users from other pedestrians on the sidewalk and enforce no loitering policies within that shelter from the city police department and/or patrols by private security firms. Reschedule buses to reduce overcrowding at the bus stop location.
2. Move the bus stop to a safer location where lighting may be improved or less official crime is being reported. Create tougher ordinances against liquor sales in areas with high crime.
3. Create public educational programs for public bus stop safety. Within commercial neighborhoods, create a "business watch" program similar to neighborhood watches, while utilizing private security personnel with

local police coordination to create a safer public space sidewalk environment.

In addition to concentration directed at bus stop locations, serious safety consideration should also be directed towards the number one hot spot location, the main city bus terminal. Within the terminal CCTV cameras are used but may not serve as any type of deterrent effect. Recommendations include not only utilizing CCTV cameras, but also allowing for monitors to be posted within the terminal so transit users can see what the cameras are actually recording. Public-view monitors have been shown to reduce theft in retail stores (DiLonardo and Clarke, 1996), but remain untested in reducing crime in such places as public transit. Several entrances/exits exist throughout the terminal for boarding buses. There are also entrance/exit doors at the ends of the terminal that could possibly be closed to deter non-transit pedestrian sidewalk traffic from more freely entering the terminal.

Hoel's (1993) suggestion of locking toilet facilities does not seem feasible although the New York City subway system did just that in the 1970s. Informal interviews conducted with security personnel at the terminal did confirm that drug selling/use and alcohol consumption is frequent within the toilet facilities at the bus terminal. The last possible suggestion is to implement a warning siren as suggested from Hoel (1992). Again, informal interviews with security personnel at the Lansing, Michigan bus terminal found that fights are frequent within or nearby the terminal and security personnel have been injured breaking up these fights. In several cases security personnel have used mace against the parties involved and this has caused injuries to surrounding transit users as well as the security personnel. The warning siren offers the possibility of quickly deterring or ending the problem situation as well as attracting the attention for increased intervention. This type of implementation would need to be measured through a pre- and post-test design over a period of months.

LIMITATIONS

One of the problems with research utilizing official statistics within the link between crime and place is the failure to differentiate crime density (i.e., crimes per land area) and victimization risk (i.e., crimes per target) (Brantingham and Brantingham, 1977). Boggs (1965) pointed out that

most calculations of crime rates are not estimates of crime risk since researchers will often use inappropriate measures of crime opportunities (i.e., targets) as the denominator for their calculation. For example, rates of robbery were calculated in this research by dividing the number of robbery incidents reported to the police by the population of a block group. Since the focus of the study was on bus stop locations, a more efficient denominator in a risk calculation would have been the number of transit users or number of people who have routine activities within the given block group. Counting the number of people who use a block group location rather than the number who live in the block group is a better determination of a risk calculation. This type of data acquisition is a difficult and time-consuming process. However, it is quite possible that crime will be concentrated in one area rather than another simply because there are more targets. Use of this data would add to validity issues when testing is completed at the neighborhood level.

Sherman et al., (1989) suggested that micro-level spatial analysis on small distinct areas is a necessary step for progressing criminological research. The increased use of crime mapping technology and widespread use of computer-aided police data has allowed for more thorough analyses of spatial crime data than has been previously available to researchers. Maltz (1994) argues that the next frontier of statistical analysis lies in the development of finding better ways to display various official data through spatial analysis. This argument urges researchers to let the data speak for themselves rather than being filtered through statistical algorithms (Maltz, 1994). While the suggestions of both Sherman et al., (1989) and Maltz (1994) were taken under consideration in the research process, a serious limitation of the dependent data utilized for my research also was recognized. Researchers have used victimization surveys in the past to specifically show that bus stop crime is underreported (Levine and Wachs, 1985, 1986).

Police officers believe that bus stop crimes are grossly underreported because victims do not believe that their stolen property can be recovered or the perpetrators of the offense will not get caught (Sideris, 1999). In addition, although immigrants were accounted for in the collective efficacy model test, it can also be predicted that new immigrants may be fearful of authorities and tend not to report crimes. This prediction was found to be true when bus stop riders were surveyed in Los Angeles (Sideris, 1999). Other studies have found

through survey data that much more crime occurs than is reported to the police, as referred to as the dark figure of crime. Almost half of robbery victims and 60 percent of simple assault victims do not report being victimized to the police (Bureau of Justice Statistics, 2001).

Official sources of crime data, such as the FBI's Uniform Crime Report or the Lansing, Michigan police data have inherent flaws and biases related to the measurement methodology and potential reporting biases from the officers who write the reports. However, crime data used in most environmental research typically come from official statistics, despite the criticisms that have been levied against this type of data (Hindelang, 1974; Savitz and Wolfgang, 1970; Skogan, 1990). The primary weakness of using official data is that the analysis only examines crime that has come to the attention of the police. If increased immigrant concentration occurs in some neighborhoods, less crime may be reported, thus biasing conclusions researchers draw from the use of official data. However, because it was predicted that areas with high immigrant concentration, concentrated disadvantage, and/or concentrated bus stop locations would produce more crime than areas without these attributes, criticism for not including unofficial (i.e., not reported or not recorded by the police) provides some reliability support.

The limitations of official data for transit crime research are particularly challenging as phones may not be readily available to report crimes at these locations. Researchers have argued that true transit crime may be far greater than is shown in any type of formal criminal justice statistics (Sideris, 1999; Levine and Wachs, 1986; Felson et al., 1996). Other issues revolve around the reporting mechanisms surrounding public transit. It was noted that a new bus terminal in Lansing, Michigan was opened in October 1997. A substantial increase in crimes was reported during the following three years after the opening of the new bus terminal. However, it is quite possible that the new contract security team and better patrolling by the Lansing, Michigan police department amounted to more accurate crime reporting rather than actual increases in crime. In addition, other spurious effects exist such as the crackdown on truancy that was shown to greatly increase the number of reported truancy incidents for data in the year 2000. Despite these events, this data were accounted for with the rest of the incident data. Since the incident data did not factor separately in the initial principle components analysis, violent and disorderly incidents were analyzed in the aggregate.

According to a study of violent crime against transit employees, a study of transit crime should differentiate between violent, property, and quality of life crimes (Reed, Wallace, and Rodriguez, 1999). However, incidents did not load separately so data in the aggregate was seen to relate directly to transit users. In addition, all crimes were coded as occurring outdoors. However, it may have been useful to make a distinction between crime types as was done by other transit crime researchers. Quality of life crimes have included public drunkenness, vandalism, and disorderly conduct while violent offenses could include assaults, robberies, etc. However, many quality of life crimes are not recorded within official statistics and were not available through the data given by the police department utilized for this research. Thus, much of the data would have had to been acquired through alternative sources.

Along with acquiring unofficial data for further analysis, another limitation of using only official data is having no knowledge of transit users' perception of crime. Fear of crime can cause obvious reductions in the use of public transportation. In fact, residents responding to a survey cited "fear of safety" as the most important deterrent for not using a public bus system (Sideris, 1994). A study of multiple urban public transit operations found that perceptions of crime severity vary by factors such as the size of the region served, type of transit service available (Hartgen et al., 1993), and other factors associated with riders, such as their age and gender (Sideris, 1994). In addition, individuals who use the transit system infrequently or not at all are more likely to be fearful and perceive more crime than is actually present (Reed, Wallace, and Rodriguez, 1999). Consequently, this type of research knowledge is beneficial to transit managers and local law enforcement.

Part I: Collective Efficacy Model Test Limitations

Part of the limitations of this research was not analyzing temporal ordering between the mediator variable and concentrated disadvantage on total crime. For example, Skogan (1990) reports findings that crime rates play a role in overall neighborhood dissatisfaction and intentions to move. In addition, Dugan (1999) studied 22,375 households and found that any crime that occurs near one's residence affects one's likelihood of moving, but this finding is limited by income capabilities. Recent studies have found that persistent unemployment increases the

risk of poverty (Taylor, 2002; Taylor and Morrell, 2002), thus creating a temporal issue for the original factor indicators of concentrated disadvantage.

Another limitation of the research comes from the problem of multicollinearity when there is not a clear separation from the predicted outcome of disorganization (crime) and disorganization itself. Multicollinearity among ecological variables is a well-known problem in social disorganization research (Land, et al., 1990). The problem occurs when the causal construct (exogenous variables) is equated with the crime phenomenon, creating a cause and effect dilemma. This problem was evident from the bivariate correlation matrix presented in Table V.2 and the intercorrelations seen between the indicating variables, as well as the low standard errors leading to the main exogenous crime variable. The high correlations between predictor variables was a specification problem with early Chicago School research under Shaw and McKay (1942) and continues to affect contemporary research in social disorganization. Future research projects should test temporal issues through nonrecursive models as well as properly specified models that will avoid the problem of multicollinearity.

Other temporal issues may occur between the main endogenous variable (crime) and the ecological indicator variables. Crime effects income and racial distribution. In a panel study of Chicago census tracts, Bursik (1988) reported that delinquency rates have an effect on the number of blacks, number of owner-occupied homes, and number of unemployed. Liska and Bellair (1995) conducted an extensive 40-year panel study of a variety of cities and found that crime rates, especially robberies, reduce the size of white populations. These temporal issues further complicate the given model and call for increased use of non-recursive models and feedback loops, along with longitudinal data or lagged measures[12] of crime that avoid assumption biases present in the use of cross-sectional data.

Kornhauser (1978) challenges ecological researchers by asking if place specific crime rates are the result of aggregate neighborhood characteristics or characteristics of individuals that are selectively aggregated to communities (p. 104). Sampson and colleagues (1997)

[12] Sampson and Raudenbush (1999) used a sample of 195 Chicago neighborhoods and identified their models through the use of lagged crime measures in their equations.

offered one of the first controls for solving individual-level effects through their multilevel data analysis. However, the variables used in my research project included only official crime statistics or wider social level census data rather than individual based data and do not allow for a more complete address of contextual multilevel issues.

Despite the limitations of the data, several researchers have shown that official data can be used reliably to assess differences in ecological crime (Hindelang, 1978; Gove et al., 1985; Sampson and Lauritsen, 1997). The exclusion of data sources, such as self-report of individual-level surveys, can produce an underestimation of the variables being used for theoretical testing. However, official data sources used along with other ecological indicators can provide reliable estimates of crimes most likely to effect bus stop locations. The type of crime data used throughout my research project represents the official public response to crime in an outdoor setting and can include businesses, individuals, adults, and children. This is not always the case in survey or self-report data, which are more likely to be subject to various sampling errors and confidence level limits. In addition, surveys have to deal with recall, wording and interviewer bias, and sampling limitations.

Part II: Quasi-Experimental Limitations

It can be fairly difficult to locate truly comparable units of analysis where socio-economic and demographic factors become controlled. Researchers continue to struggle to find such localities, even 30 years after Newman's original study (Cozens, Hillier, and Prescott, 2001). This study attempted to match block group locations while controlling for other important social attributes that have been found to correlate highly with crime. In an effort to show that the presence of clustered bus stop locations does positively affect crime rates while controlling for other variables, the temporal order issue again arises. The main assumption being made through the quasi-experiment is that bus stops create higher crime. However, it is quite possible that increased pedestrian traffic within an area causes increased risk for victimization, in addition to the need for more public transit use. Although the increased pedestrian traffic within a spatial area does not empirically cause a bus stop to appear, it may contribute to the need for placing that bus stop in the area, which then indirectly increases crime. However, it still becomes the choice of the transit management to place a bus stop in an area that may be conducive to increasing crime. Spatial models

that have served to predict future criminality (see Anselin, et al., 2000; Olligschlaeger, 1997) would be helpful for transit management in making these types of decisions.

Other potential limitations or biases arose in calculating t-score comparisons to test if block group locations could be matched between bus stop and "non-bus stop" block groups. Although all three of the major latent concepts (disadvantage, immigrant concentration, and collective efficacy) were well-matched according to the insignificant t-test for similarities, other indicating variables were significant (i.e., unemployment, minority concentration, and foreign-born), thus showing that the block groups were not well-matched for these three variables. However, these variables were still controlled for within later regression analysis.

Part III: Systematic Observational Limitations

Objections to qualitative research methodologies argue that validity issues are questionable. That is, it is difficult to determine the truthfulness of qualitative findings. As compared to the 114 block groups analyzed in the first part of the research, the qualitative methodology only took into account a sample size of five bus stop locations. This small sample size may lead to arguments that the given discussion on the findings is unrepresentative of the larger population of bus stops throughout the given city or even in other comparable cities.

Other potential limitations can occur through the actual observations. It is possible that even during multiple observations, events that confirm or deny theoretical interests do not actually occur and this could lead to assertions for future research or wrongfully pointing out theoretical discrepancies. The observers, who conducted the nonparticipatory research, could also have misinterpreted certain social interactions by transit users. Since the research was nonparticipatory no space users were engaged to verify the interpretation of any of the observations. Even though multiple observers were utilized at different times of the day and year, behaviors conducted at the time of these observations may not have been typical due to new transit users or unusual events occurring at specific bus stop locations during the time of the observations. Lastly, it is possible that behaviors at the bus stop location that were observed could have been impacted by the presence of the observers (i.e., Hawthorne effect)

despite every effort to train observers to be as unobtrusive as possible. Despite the potential and acknowledgement of these limitations, every effort was made through the qualitative research design and implementation to limit these types of bias.

APPENDIX A

BUS STOP LOCATION OBSERVATION	
Location:	
Date:	
Time:	
Street Pattern Measurements- social patterns	
Number of traffic lanes	
Number of overhead street lights	
Volume of Traffic (number of cars per minute)	
Pedestrian traffic surrounding bus stop	
Loitering youth	
Loitering adults	
Public drinking	
Illicit drug selling	
Prostitution	
Physical Attribute Measurements (At the location or within 100 feet)	
Commercial, Residential, or mixed	
Type of residential units or businesses	
Number of incidents of vandalism	
Extent of garbage surrounding bus stop	
Extent of condoms or drug paraphernalia	
Number of vacant/renovated buildings	
Number of businesses or houses with visible security functions (e.g., gated doors or windows)	
Surveillance of the bus stop from residential housing or surrounding businesses	
Easy escape paths for potential offenders	
Number of buildings damaged by fire	
Number of boarded up doors or windows or broken windows	
Number of vacant, unused lots	

APPENDIX B

EXTERIOR BUS TERMINAL OBSERVATION	
Date:	
Time:	
Exterior Street Pattern Measurements-social patterns	
Number of traffic lanes	
Number of overhead street lights	
Volume of Traffic (number of cars per minute)	
Pedestrian traffic surrounding exterior of the bus terminal	
Loitering youth	
Loitering adults	
Public drinking	
Illicit drug selling	
Prostitution	
Exterior Physical Attribute Measurements (At the location or within 100 feet)	
Commercial, Residential, or mixed	
Type of residential units or businesses	
Number of incidents of vandalism	
Extent of garbage surrounding the bus terminal	
Extent of condoms or drug paraphernalia	
Number of vacant/renovated buildings	
Number of businesses or houses with visible security functions (e.g., gated doors or windows)	
Surveillance of the bus terminal from residential housing or surrounding businesses	
Easy escape paths for potential offenders	
Number of buildings damaged by fire	
Number of boarded up doors or windows or broken windows	
Number of vacant, unused lots	

References

Angel, S. (1968) Discouraging crime through city planning. Working Paper No. 75, Berkeley: University of California.

Anselin, L., Cohen, J., Cook, D., Wilpen, G., & Tita, G. (2000). Spatial Analysis of Crime. In D. Duffee (ed.), *Measurement and Analysis of Crime and Justice* (Volume 4). Washington, DC: U.S. Department of Justice Office of Justice Programs.

Babbie, E. (2001). *The Practice of Social Research* (9th Ed.) Belmont, CA: Wadsworth.

Bachman, R. and Paternoster, R. (1997). *Statistical Methods forCriminology and Criminal Justice.* New York: McGraw-Hill Companies, Inc.

Baller, R., Messner, S., Anselin, L., and Deane, G. (2002). The interchangeability of homicide data sources: A spatial analytical perspective. *Homicide Studies, 6*(3): 211-227.

Bandura, A. (2000). Cultivate self-efficacy for personal and organizational effectiveness. In E.A. Locke (Ed.). *Handbook of principles of organizational behavior*. Oxford, UK: Blackwell.

Barlow, H. (1990*). Introduction to Criminology* (5th Edition). Glenview, IL: Scott, Foresman.

Beavon, D., Brantingham, P., and Brantingham, P. (1994). The influence of street networks on the patterning of property offenses. In R.V. Clarke (ed.), *Crime Prevention Studies* (Vol. 2). Monsey, NY: Criminal Justice Press.

Bellair, P. (1997). Social interaction and community crime: Examining the importance of neighbor networks. *Criminology. 35*:677-703.

Bentler, P. and Bonett, D. (1980). Significance tests and goodness-of-fit in the analysis of covariance structures. *Psychological Bulletin. 88*: 588-606.

Block, R. and Block, C. (1995). Space, place, and crime: Hot spot areas and hot places of liquor-related crime. In J. Eck and D. Weisburd (eds.) *Crime and Place.* Monsey, NY: Willow Tree Press.

Block, R. and Davis, S. (1996). The environment of rapid transit stations: A focus for street crime or just another risky place? In R. Clarke (ed.), *Preventing Mass Transit Crime* (pp. 237-257). Monsey, NY: Willow Tree Press.

Boggs, S. (1965). Urban Crime Patterns. *American Sociological Review* 30 (3): 899-908.

Boba, R. (2005). *Crime Analysis and Crime Mapping*. Thousands Oaks, CA: Sage.

Bordua, D. (1958). Delinquent subcultures: Sociological interpretations of gang delinquency. *Annals of American Academy of Social Science. 338*: 119-136.

Bower, B. (1997). United neighbors take a bite out of crime. Scientific News. 152: 7 (online) http://www.sciencenews.org/sn_arc97/8_16_97/fob2.htm

Brantingham, P. and Brantingham, P. (1978). A theoretical model of crime site selection. In M. Krohn & R. Akers (eds.) *Crime, law and sanctions.* Beverley Hills, CA: Sage.

Brantingham, P.L. and Brantingham, P.J. (1993). Nodes, paths, and edges: Considerations on the complexity of crime and the physical environment. *Journal of Environmental Psychology. 13*: 3-28.

Brantingham, P. and Brantingham, P. (1981). Mobilitiy, Notoriety, and Crime: A study in the crime patterns of urban nodal points. *Journal of Environmental Systems. 11*: 89-99.

Brantingham, P.L. and Brantingham, P.J. (1981). *Environmental Criminology*. Prospects Heights, IL: Waveland Press.

Brantingham, P.L. and Brantingham, P.J. (1991). *Environmental Criminology (reissue)*. Prospect Heights, IL: Waveland Press.

Brantingham, P.L., Brantingham, P.J. and Butcher, D. (1986). Perceived and actual crime risks. In R.M. Figlio, S. Hakim, and G.F. Rengert (eds.) *Metropolitan Crime Patterns*. Monsey, NY: Criminal Justice Press.

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

Buck, A., Hakim, S., Rengert, G. (1993). Burglar alarms and the choice behavior of burglars: A suburban phenomenon. *Journal of Criminal Justice. 21*:497-508.

Buerger, M., Cohn, E., and Petrosino, A. (1995). Defining the "hot spots of crime" and operationalizing theoretical concepts for field research. In J. Eck & D. Weisburd (eds.) *Crime and Place*. Monsey, NY: Willow Tree Press.

Bureau of Justice Statistics (2001). *Sourcebook of Criminal Justice Statistics*. Washington, DC: U.S. Government Printing Office: Table 3.38.

Bursik, R.J. and Grasmick, H. (1993). *Neighborhoods and Crime*. New York: Lexington Books.

Burton, S. (2006). Safer Travel at Night. Winner of the 17th Annual Problem-Oriented Policing conference Herman Goldstein Award. Madison, Wisconsin. (online) http://www.popcenter.org/about-conference-papers.htm

Butcher, K. and Piehl, A. (1998). Recent immigrants: Unexpected implications for crime and incarceration. *Industrial and Labor Relations and Review. 51*(4): 654-679.

Butcher, K. and Piehl, A. (1998). Cross-city evidence on the relationship between immigration and crime. *Journal of Policy Analysis and Management. 17*(3): 457-493.

Byrne, J. and Sampson, R. (1986). *The Social Ecology of Crime*. New York: Springer-Verlag.

Campbell, D. and Stanley, J. (1966). *Experimental and Quasi-Experimental Designs for Research*. Chicago: Rand McNally.

Capone, D. and Nichols, W. (1976). Crime and distance: An analysis of offender behavior in space. *American Behavioral Scientist. 20*: 199-213.

Carr, K. and Spring, G. (1993). Public transport safety: A community right and communal responsibility. In R.V. Clarke (ed.), *Crime Prevention Studies*, Vol. 4 Monsey, NY: Criminal Justice Press.

Cattel, R. (1966). The scree test for number of factors. *Multivariate Behavioral Research. 1*: 245-276.

Chaiken, J., Lawless, M., Stevenson, K. (1974). *Impact of police on Crime: Robberies on the New York City Subway System*. R-1424-NYC. New York: The New York City Rand Institute.

Chilton, R. (1964). Continuities in delinquency area research: A comparison of studies in Baltimore, Detroit, and Indianapolis. *American Sociological Review. 29*: 71-83.

Clarke, R. (1980). Situational crime prevention: Theory and practice. *British Journal of Criminology. 20*(2): 136-147.

Clarke, R., Brantingham, P., Brantingham, P., and Felson, M. (1997). Designing out Crime. Critical criminal justice issues: Task force reports from the American Society of Criminology (NIJ Report No. 158837). Washington, DC: National Institute of Justice.

Clarke, R. and Mayhew, P. (1980). *Designing out Crime*. London: Home Office.

Clarke, R. and Cornish, D. (1983). Modeling offenders' decisions: A framework for policy research." In Tonry, M. and N. Morris (eds.), *Crime and Justice* (Vol. 4). Chicago, IL: University of Chicago Press.

Clarke, R. (1983). Situational crime prevention: Its theoretical basis and practical scope. In Tonry, M. and N. Morris (eds.), *Crime and Justice* (Vol. 4). Chicago, IL: University of Chicago Press.

Clarke, R. (1992). *Situational Crime Prevention: Successful Case Studies*. New York, NY: Harrow and Heston.

Clarke, R. (1993). Fare evasion and automatic ticket collection in the London Underground. In R.V. Clarke (ed.), *Crime Prevention Studies*. Vol. 1. Monsey, NY: Criminal Justice Press.

Clarke, R. (1988). Special issue on situational crime prevention. *Journal of Security Administration. 11*(2): 4-6.

Clarke, R., Cody, R.,and Natarajan, M. (1994). Subway slugs: Tracking displacement on the London underground. *British Journal of Criminology. 34*: 122-138.

Cochran, J., Bromley, M., and Branch, K. (2000). Victimization and fear of crime in an entertainment district crime "hot spot:" A test of structural-choice theory. *American Journal of Criminal Justice. 24*(2): 189-201.

Cohen, B. (1980). *Deviant Street Networks*. Lexington, MA: Lexington Books.

Cohen, J., Gorr, W., and Olligschlaeger, A., (1993). Modeling street level illicit drug markets. Working paper 93-64, The H. John Heinz III School of Public Policy and Management: Carnegie Mellon University, Pittsburgh.

Cohen, J. and Cohen, P. (1983). *Applied Multiple Regression and Correlation Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum.

Cohen, L.E.and Felson, M. (1979). Social change and crime rate trends: A routine activities approach. *American Sociological Review. 44*: 588-607.

Coleman, J.S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology. 94*: 95-120.

Cook, T.D. and Campbell, D.T. (1979). *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston: Houghton Mifflin.

Cornish, D.B. and Clarke, R.V. (1986). Situational prevention, crime displacement and rational choice theory. In Heal, K. and G. Laycock (eds). *Situational Crime Prevention: From Theory to Practice*. London, UK: Her Majesty's Stationery Office.

Cornish, D. and Clarke, R.V. (1986). *The Reasoning Criminal*. New York: Springer-Verlag.

Coulton, C., Korbin, J., Chan, T., and Su, M. (1997). Mapping residents' perceptions of neighborhood boundaries: A methodological note. Center on Urban Poverty and Social Change: Mandel School of Applied Social Sciences.

Cozens, P., Hillier, D., Prescott, G. (2001). Crime and the design of residential property- Exploring the theoretical background. *Property Management. 19:* 136-164.

Crowe, T.D. (2000). *Crime Prevention Through Environmental Design*. Woburn, MA: Butterworth-Heinemann.

Curry, D. and Irving, S. (1988). Gang homicide, delinquency, and community. *Criminology. 26*: 381-405.

Davidson, R.N. (1981). *Crime and the Environment*. London: Croom Helm.

DiLonardo, R.L. and Clarke, R.V. (1996). Reducing rewards of shoplifting. *Security Journal, 7*: 11-14.

Duffala, D. (1976). Convenience stores, armed robbery, and physical environmental features. *American Behavioral Scientist. 20:*227-246.

Durkheim, E. (1839). 1960. *The Division of Labor in Society*. Glencoe, IL: Free Press.

Durkheim, E. (1965). *The Division of Labor in Society*. Translated by George Simpson. New York, NY: The Free Press.

Eck, J.E. (1996). Preventing crime at places. In L. Sherman, D. Gottfredson, D. MacKenzie, J. Eck, P. Reuter, S. Bushway (eds.) *Preventing Crime: What works, what doesn't, what's promising.* (Chapter 7) Washington, DC: Report to the U.S. Congress, prepared for the National Institute of Justice: University of Maryland.

Eck, J.E. (1994). Drug markets and drug places: A case control study of the spatial structure of illicit drug dealing. Ph.D. Dissertation, University of Maryland.

Eck, J.E. and Clarke, R. (2003). Classifying common police problems: A routine activity approach." *Crime Prevention Studies*, Volume 16. M. Smith & D. Cornish (eds). Monsey, NY: Criminal Justice Press.

Eck, J.E. and Weisburd, D. (1995). *Crime and Place*. Monsey, NY: Willow Tree Press.

Eck, J. and Spelman, W. (1987). Problem solving: Problem-oriented policing in Newport News. Washington, DC: U.S. Department of Justice, Office of Justice Programs, National Institute of Justice and Police Executive Research Forum.

Elliott, D.S., Wilson, W., Huizinga, D., Sampson, R.J., Elliott, A., and Rankin, B. (1996). The effects of neighborhood disadvantage on adolescent development. *Journal of Research in Crime and Delinquency. 33*: 389-426.

Enger, S.C. (1997). Infill development strategies for shaping livable neighborhoods. Washington, DC: Municipal Research & Services Center.

Engstad, P. (1975). Environmental opportunities and the ecology of crime. In R.A. Silverman and J.J. Teevan (eds.) *Crime in Canadian Society*. Toronto: Butterworths.

Evans, D.J., Fyfe, N.R. and Herbert, D.T. (1992). *Crime, Policing, and Place: Essays in Environmental Criminology*. London: Routledge.

Hagan, J. and Peterson, R. (1995). Criminal inequality in America: Patterns and consequences. In J. Hagan and R. Peterson (eds.) *Crime and Inequality*. Stanford, CA: Stanford University Press.

Felson, M. (2006). *Crime and Human Nature*. London: Sage Publications.

Felson, M. and Cohen, L.E. (1980). Human ecology and crime: A routine activity approach. *Human Ecology. 8*: 389-406.

Felson, M. and Clarke, R.V. (1998). Opportunity makes the thief: Practical Theory for Crime Prevention. London, UK: Home Office Police and Reducing Crime Unit.

Felson, M. (1986). Predicting crime at any point on the city map. pp. 127-136. in R.M. Figlio, S. Hakim, and G.F. Rengert (eds.) *Metropolitan Crime Patterns*. Monsey, NY: Criminal Justice Press.

Felson, M. (1987). Routine activities and crime prevention in the developing metropolis. *Criminology. 25*: 911-931.

Felson, M. (1994). *Crime in Everyday Life: Insights and Implications for Society*. Thousand Oaks, CA: Pine Forge Press.

Felson, M. (1995). Those who discourage crime. In R. Clarke (ed.). *Crime Prevention Studies*. Vol. 4. Monsey, NY: Willow Tree Press.

Felson, M., Belanger, M.E., Bichler, G.M., Bruzinski, C.D., Campbell, G.S., Fried, C.L., Grofik, K.C., Mazur, I.S., O'Regan, A.B., Sweeney, P.J., Ullman, A.L., Williams, L.M. (1996). Redesigning hell: Preventing crime and disorder at the Port Authority bus terminal. In R.V. Clarke (ed.), *Preventing Mass Transit Crime.* Crime Prevention Studies. Vol. 6. Monsey, NY: Criminal Justice Press.

Fischer, R. and Green, G. (1998). *Introduction to Security*. Woburn, MA: Butterworth-Heinemann.

Fitzpatrick, K. (1997). Design, speed, operating and posted speed relationships. *ITE Journal 3*:52.

Fleissner, D. and Heinzelmann, F. (1996). Crime prevention through environmental design and community policing. U.S. Department of Justice, Washington, DC: Office of Justice Programs.

Garland, D. (1999). The new criminologies of everyday life: Routine activity theory in historical and social context. In A. von Hirsch, D. Garland, and A. Wakefield (eds.), *Ethical and Social Perspectives on Situational Crime Prevention*. Oxford: Hart Publishing.

Geason, S. (1989). *Designing Out Crime*. Canberra Australian Institute of Criminology.

Goffman, E. (1963). Behavior in public places: Notes on the Social Organization of Gatherings. New York: Free Press.

Gordon, R.A. (1967). Issues in the ecological study of delinquency. *American Sociological Review. 32*(6): 927-944.

Gottfredson, M. and Hirschi, T. (1990). *A General Theory of Crime*. Stanford, CA: Stanford University Press.

Gove, W., Hughes, M., and Geerken, M. (1985). Are the uniform crime reports a valid indicator of the index crimes? An affirmative answer with minor qualifications. *Criminology. 23*(3): 451-501.

Greenberg, S., Rohe, W., and Williams, J. (1985). Informal citizen action and crime prevention at the neighborhood level. Washington, DC: U.S. Department of Justice.

Groff, E.R. and LaVigne, N. (2001). Mapping an opportunity surface of residential burglary. *Journal of Research in Crime and Delinquency. 38*(3): 257-278.

Guerry, A. [1833a] (1984) In Research on the Propensity for Crime at Different Ages. Translated by Sylvester, S.F. Cincinnati: Anderson Publishing Company.

Hagan, J. and McCarthy, B. (1997). *Mean Streets: Youth Crime and Homelessness*. New York: Cambridge University Press.

Harries, K.D. (1980). *Crime and the Environment*. Springfield, Illinois: Charles C. Thomas Publisher.

Harries, K.D. and Kovandzic, E. (1999). Persistence, intensity, and areal extent of violence against women: Baltimore City, 1992 to 1995. *Violence Against Women. 5*(7): 813-828.

Hartgen, D., Ingalls, G., and Owens, T. (1993). Public Fear of Crime and its Role in Public Transit Use. Raleigh: University of North Carolina, Center for Interdisciplinary Transportation Studies.

Hatcher, L. (1998). A step-by-step approach to using the SAS system for Factor Analysis and Structural Equation Modeling. SAS Institute Incorporated: Cary, North Carolina.

Hindelang, M. (1974). An analysis of victimization survey results from the eight impact cities: Summary Report. Washington, DC: U.S. Department of Justice.

Hindelang, M. (1981). Variations in sex-race-age-specific incidence rates of offending. *American Sociological Review. 46*(4): 461-474.

Hindelang, M., Gottfredson, M. and Garafalo, J. (1978). *Victims of Personal Crime: An Empirical Foudation for the Theory of Personal Victimization*. Cambridge, MA: Ballinger Publishing Company.

Hoel, L.A. (1992). *Public transportation security*. In G. Gray and L. Hoel (eds.) Public Transportation. Englewood Cliffs, New Jersey: Prentice Hall.

Hogarth, R. and Reder, M. (1987). (eds.) *Rational Choice: The Contrast Between Economics and Psychology*. Chicago: The University of Chicago Press, 1987.

Horna, J. (1994). *The Study of Leisure*. Oxford: Oxford University Press.

Hunter, A. (1985). Private, parochial, and public social orders: The problem of crime and incivility in urban communities. In G. Suttles and M. Zald (eds.) *The Challenge of Social Control:Citizenship and Institution Building in Modern Society*. Norwood, NJ: Ablex Publishing.

Ireland, T. and Widom, C. (1995). Childhood victimization and risk for alcohol and drug arrests. Washington, DC: National Institute of Justice.

Jacobs, J. (1961). *The Death and Life of the Great American Cities*. New York: Vintage Books.

Jayaratne, T. (1993). Quantitative methodology and Feminist Research. In M. Hammersley (ed.), *Social Research: Philosophy, Politics, and Practice*. (pp. 109-123). London: Sage.

Jefferis, E.S. (1998). A multi-method exploration of crime hot spots: SaTScan results. National Institute of Justice, Crime Mapping Research Center.

Jeffrey, C.R. (1971). *Crime Prevention Through Environmental Design*. Beverley Hills, CA: Sage.

Jeffrey, C.R. (1978). Criminology as an interdisciplinary behavioral science. *Criminology. 16*: 149-174.

Jeffery, C. R. (1990). *Criminology: An Interdisciplinary Approach*. Englewood Cliffs, NJ: Prentice-Hall.

Jeffery, C.R., Hunter, R.D., Griswold, J. (1987). Crime prevention and computer analysis of conveneience store robberies in Tallahassee, Florida. *Security Systems. 8*:1-4.

Kaiser, H.F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement. 20*: 141-151.

Kasarda, J. and Janowitz, M. (1974). Community attachment in mass society. *American Sociological Review. 39*:328-339.

Keene, O. (1995). The log transformation is special. *Statistics in Medicine. 14*(8): 811-819.

Kelling, G. and Coles, C. (1996). *Fixing broken windows*. New York, NY: The Free Press.

Kenney, D.J. (1986). Crime on the subways: Measuring the effectiveness of the Guardian Angels. *Justice Quarterly. 3*: 481-496.

Kenney, D.J. (1987). *Crime, Fear, and the New York City Subways.* New York: Praeger.

Kelling, G.L. and Coles, C.M. (1996). *Fixing Broken Windows:Restoring Order and Reducing Crime in our Communities*. New York, NY: Touchstone.

Kooi, B., Priebe, T., Kirk, D. (2005). Neighbors Against Drugs. Presentation as a finalist for the Herman Goldstein Award at the annual Problem-Oriented Policing International Conference. Charlotte, North Carolina.

Kooi, B. (2001). Microanalysis of Relations between Private Security and Public Police Officers: An Extended Hot Spot Analysis. Paper presented at the American Society of Criminology National Conference. Atlanta, Georgia.

Kornhauser, R. (1978). *Social Sources of Delinquency*. Chicago, IL: University of Chicago Press.

Kushmuk, J. and Whittemore, S. (1981). A reevaluation of the crime prevention through environmental design program in Portland, Oregon. Washington, DC: National Institute of Justice.

Lab, S. (2000). *Crime Prevention: Approaches , Practices, and Evaluation*. Cinncinnati, OH: Anderson Publishing, Co.

Lander, B. (1954). *Towards Understanding of Juvenile Delinquency*. New York: Columbia University Press.

LaVigne, N.G. (1997). Safe transport: Security by design on the Washington Metro. In R.V. Clarke (ed.), *Crime Prevention Studies*. Vol. 3. Monsey, NY: Criminal Justice Press.

Levine, N. (1999). CrimeStat software developed under grants from the National Institute of Justice: Washington, DC. (online) www.icpsr.umich.edu/NACJD/crimestat.html.

Levine, N. and Wachs, M. (1985). Factors affecting the incidence of bus crime in Los Angeles, Vol. I & II. U.S. Department of Transportation, Report Number CA-06-0195. Washington, DC: U.S. Department of Transportation.

Levine, N. and Wachs, M. (1986). Bus crime in Los Angeles: Measuring incidence. *Transportation Research. 20*(4): 273-284.

Levine, N. Wachs, M., Shirazi, E. (1986). Crime at Bus Stops: A study of Environmental Factors." *Journal of Architectural and Planning Research. 3*(4): 229-361.

Lewis, D. and Salem, G. (1986). *Fear of Crime: Incivility and the Production of a Social Problem*. New Brunswick, NJ: Transaction.

Loftin, C. and McDowall, D. (1988). The analysis of case-control studies in criminology. *Journal of Quantitative Criminology, 4*: 85-98.

Lowengerg, R.E. and Bandurraga, R.A. Neighborhood watch and the community resource. *Journal of California Law Enforcement. 16*(3): 159-164.

Lusk, A. (2003). The bus and bus stop designs related to perceptions of crime. Springfield, VA: National Technical Information Service.

Machado-Paes, E. and Levenstein, C. (2004). I'm sorry everybody, but this is Brazil: Armed Robbery on the buses in Brazilian cities. *British Journal of*

Criminology. 44(1): 1-14.
Macko, S. (1998). DOT report says U.S. transit systems vulnerable to terrorist threat. ERRI Daily intelligence report- ERRI risk assessment services. 4(059): 14-18.
Maltz, M.D., Gordon, A.C., and Friedman, W. (1990). *Mapping Crime in Its Community Setting: Event Geography Analysis*. New York, NY: Springer-Verlag.
Maltz, M.D. (1994). Deviating from the mean: The declining significance of significance. *Journal of Research in Crime and Delinquency. 31:* 408-437.
Mann, C.R. (1993). *Unequal Justice: The Question of Color*. Bloomington, IN: Indiana University Press.
Mayhew, C. (2000). Violent assaults on taxi drivers: Incidence patterns and risk factors. *Australian Institute of Criminology*. 178:1-6.
Mayhew, P. (1979). Defensible Space: The current status of crime prevention theory. *Howard Journal. 17*: 150-159.
Mayhew, P. (1981). Crime in public view: Surveillance and crime prevention. In P. Brantingham and P. Brantingham (eds.) *Environmental Criminology*. Beverly Hills, CA: Sage. (Reprinted by Waveland Press, Prospect Heights, IL (1991).
Maxfield, M. and Babbie, E. (2001). *Research Methods for Criminal Justice and Criminology*. (3rd edition). Wadsworth: Belmont, CA.
Menard, S. (1995). Applied Logistic Regression Analysis (Sage Publication Series: Vol. 106). Thousand Oaks,CA: Sage Publications.
Merry, S. (1981). Defensible Space undefended: Social factors in crime control through environmental design. *Urban Affairs Quarterly 16*: 397-422.
Morenoff, J.D., Sampson, R.J., and Raudenbush, S.W. (2001). Neighborhood inequality, collective efficacy, and the spatial dynamics or urban violence. Research Report: Population studies center at the Institute for Social Research.
Nau, D. (1995). Mixed Methodologies: Can Bimodal Research be a Viable Post-Postivist Tool? *The Qualitative Report*. [On-line serial], 2 (3) (online). www.nova.edu/ssss/QR/QR2-3/nau.html
Needle, J. and Cobb, R. (1997). Improving transit security. TCRP Synthesis (21), Washington, DC: Transportation Research Board.
Neuendorf, K.A. (2002). *The Content Analysis Guidebook*. Thousand Oaks, CA: Sage.
Newman, O. (1973). *Defensible Space Through Urban Design*. New York: Collier Books.
Newman, O. (1975). Design Guidelines for Creating Defensible Space. Washington, DC: National Institute of Law Enforcement and Criminal Justice.
Newman, O. (1981). *Community Interest*. New York: DoubleDay.
Newman, O. (1974). The Private Street System in St. Louis. New York, NY: Institute for Community Design Analysis.
Newman, O. (1996). *Creating Defensible Space*. Center of Urban Policy

Research, U.S. Department of Housing and Urban Development: Rutgers University.
Newman, O. and Frank, K. (1980). Factors influencing crime and instability in urban housing developments. Washington, DC: National Institute of Justice.
Norusis, M.J. (1985). *SPSS-X advanced statistics guide*. New York: McGraw-Hill.
Novak, K.J., James, F., Smith, B.W. Revisiting the decision to arrest: Comparing beat and community officers. *Crime and Delinquency. 48*(1): 70-98.
NTCP (Neighborhood Traffic Calming Program (2002). Alexandria, Virginia. Access from Problem-Oriented Policing. (online).
www.popcenter.org/Problems/Supplemental_Material/Speeding/alexandria.pdf
Oc, T. and Tiesdell, S. (1997). *Safe City Centres- Reviving the Public Realm*. Paul Chapman Publishing, London.
Office of Transportation Management (1980). National Conference on Mass Transit Crime and Vandalism. (Compendium of Proceedings). Conducted by The New York Senate Committee on Transportation. Chairman, Senator John D. Caemmerer. Albany, NY: New York State Senate.
Olligschlaeger, A.M. (1997). Artificial neural networks and crime mapping. In D. Weisburd and T. McEwen (Eds). *Crime Mapping and Crime Prevention*. Monsey, NY: Criminal Justice Press.
Palmer, E., Hollin, C., and Caulfield, L. (2005). Surveying Fear: Crime, buses, and new paint. *Crime Prevention and Community Safety: An International Journal. 7*(4): 47-58.
Park, R., Burgess, E., & McKenzie, R. (1925). *The City*. Chicago: University of Chicago Press.
Parsons, T. (1951). *The Social System*. New York: Free Press.
Paschall, M.J. and Hubbard, M.L. (1998). Effects of neighborhood and family stressors on African-American male adolescent's self-worth and propensity for violent behavior. *Journal of Consulting and Clinical Psychology. 66*(5): 825-831.
Patton, M. (1987). *How to use qualitative methods in evaluation*. London: Sage Publications.
Pealstein, A., & Wachs, M. (1982). Crime in public transit systems: An environmental design perspective. *Transportation. 11*: 277-297.
Perkins, D.D., Abraham, R.R., and Taylor, B. (1993). The physical environment of street crime. *Journal of Environmental Psychology. 13*: 29-49.
Phillips, P.D. (1980). Characteristics and typology of the journey of crime. In D.E. Geroges-Abeyie and K.D. Harries (eds.), *Crime: A Spatial Perspective*. New York: Columbia University Press.
Pierce, G., Spaar, S., and Briggs, L. (1988). *The character of police work: Implications for the delivery of services*. Boston, MA: Center for Applied Social Research.

Poyner, B. (1988). Video cameras and bus vandalism. *Journal of Security Administration, 11:* 44-51.

Poyner, B. and Warne, C. (1986). *Violence and Staff: A Basis for Assessment and Prevention*. London: Tavistock.

Quetelet, A. [1833] (1984). *Research on the Propensity for Crime at Different Ages*. Translated by Sylvester, S. Cincinnati: Anderson Publishing Company.

Ramsey, M. (1982). City-centre crime: The scope for situational prevention. Research and Planning, Home Office, London.

Rank, M.R. and Hirschi, T. (1988). A rural-urban comparison of welfare exists: The importance of population density. *Rural Sociology. 53*: 346-356.

Ratcliffe, J.H. and McCullagh, M.J. (1999). The perception of crime hot spots; A spatial study in Nottingham, UK. In N. Lavigne and J. Wartell (eds.), *Crime Mapping Case Studies of Successes in the Field. 6*: 44-51.

Raudenbush, S.W. and Sampson, R.J. (1999). Assessing direct and indirect effects in multilevel designs with latent variables. *Sociological Methods and Research. 28*(2): 123-153.

Redlands Police Department. (1999). Transforming community policing for the 21st century: Risk-Focused Policing.

Reed, T., Wallace, R., and Rodriguez, D. (1999). Study of violent crimes committed against public transit vehicle operators and passengers in Michigan. Ann Arbor, MI: Michigan Department of Transportation.

Reiss, A. (1971). Systematic observations of natural social phenomena. In H. Costner (ed.) *Sociological Methodology*. San Francisco: Jossey-Bass.

Rengert, G.F. and Wasilchick, J. (2000). *Suburban Burglary* (2nd Edition). Springfield, IL: Charles C. Thomas.

Reppetto, T.A. (1974). *Residential crime*. Cambridge, MA: Ballinger.

Rich, T. (1999). Mapping the path to problem solving. National Institute of Justice Journal. Washington, DC: NIJ.

Robinson, S. (1936). *Can Delinquency be Measured?* New York: Columbia University Press.

Roncek, D.W. and Francik, J.M. (1981). Housing projects and crime: Testing the proximity hypothesis. *Social Problems. 29*: 151-166.

Roncek, D.W. and Pravatiner, M. (1989). Additional evidence that taverns enhance nearby crime. *Sociology and Social Research. 73*: 185-188.

Roncek, D. and Meijer, P. (1991). Bars, blocks, and crimes revisited: Linking theory of routine activities to the empiricism of hot spots. *Criminology. 29*: 725-755.

Rosenbaum, D. (1994). *The Challenge of Community Policing: Testing Promises*. Thousand Oaks, CA: Sage.

Rossmo, K. (1995). Geographic profiling: Target patterns of serial murders. Doctoral Dissertation, Simon Fraser University.

Rubenstein, H. (1980). The Link Between Crime and the Built Environment. Washington, DC: National Institute of Justice.

Sampson, R., Morenoff, J., and Raudenbush, S. (2005). Social anatomy of

racial and ethnic disparities in violence. *Public Health Matters 95*(2): 224-232.

Sampson, R. (1998). What community supplies. In R. Ferguson and W. Dickens (eds.), *Urban Problems and Community Development*. Washington, DC: Brookings Institute.

Sampson, R. (1993). Linking time and place: Dynamic contextualism and the future of criminological inquiry. *Journal of Research in Crime and Delinquency. 30*:426-444.

Sampson, R. (1986). Crime in cities: The effects of informal and formal social control. In A. Reiss and M. Tonry (eds.) *Communities and Crime*. Chicago, IL: University of Chicago
Press.

Sampson, R. and Cohen, J. (1988). Deterrent effects of the police on crime: A replication and theoretical extension. *Law & Society Review. 22*: 165-189.

Sampson, R. and Groves, W. (1989). Community structure and crime: Testing social disorganization theory. *American Journal of Sociology. 94*: 774-802.

Sampson, R. and Lauritsen, J. (1997). Racial and ethnic disparities in crime and criminal justice in the United States. In M. Tonry (ed.) *Crime and Justice: An Annual Review of the Research*. Vol. 22.
Chicago, IL: University of Chicago Press.

Sampson, R., Morenoff, J. and Earls, F. (1999). Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children. *American Sociological Review. 64*:633-660.

Sampson, R. and Raudenbush, S. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology. 105*: 603-651.

Sampson, R., Raudenbush S., and Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science. 277*: 918-924.

Sampson, R. and Raudenbush, S. (2001). Disorder in Urban Neighborhoods-Does it lead to crime? National Institute of Justice: U.S. Department of Justice Office of Justice Programs.

Sampson, R. and Raudenbush, S. (1999). Assessing direct and indirect effects in multilevel designs with latent variables. *Sociological Methods & Research. 28*(2): 123-153.

Sampson, R., Squires, G., and Zhou, M. (2001). How neighborhoods matter: The value of investing at the local level. Washington, DC: American Sociological Association.

Sampson, R. and Laub, J. (1993). *Crime in the making: Pathways and turning points through life*. Harvard University Press, Cambridge, Massachusetts.

Shaw, C. and McKay, H. (1942). *Juvenile Delinquency and Urban Areas.* Chicago, IL: University of Chicago Press.

Savitz, L. and Wolfgang, M. (1970). *The Sociology of Crime and Delinquency*. New York: John Wiley and Sons.

Schmidt, L. and Velke, R.J. (1992). High Crime Taverns: A RECAP Project in Problem-Oriented Policing. Final report to the National Institute of Justice.

Washington, DC: Crime Control Institute.
Scott, M. and Goldstein, H. (2005). Shifting and Sharing Responsibility for Public Safety Problems. Washington, DC: Office of Community Oriented Policing Services.
Sherman, L. (1995). Hot spots of crime and criminal careers of places. In J. Eck & D. Weisburd (eds.), *Crime and Place*. Monsey, NY: Willow Tree Press.
Sherman, L. (1992). Attacking crime: Police and crime control. In M. Tonry and N. Morris (eds.), *Modern Policing (Crime and Justice: A Review of Research)*. Chicago: University of Chicago Press.
Sherman, L. (1986). Policing communities: What works? Communities and Crime. (Vol. 15). In M. Tonry and N. Morris (eds.) *Crime and Justice: A review of research*. Chicago: University of Chicago Press.Sherman,
Sherman, L.W. and Weisburd, D. (1995). General deterrent effects of police patrol in crime "hot spots": A randomized, controlled trial. *Justice Quarterly.12*(4): 625-648.
Sherman, L.W., Gartin, P., & Buerger, M. (1989). Hot spots of predatory crime: Routine activities and the criminology of place. *Criminology. 27*:27-55.
Sideris, L. (1994). Reviving transit corridors and transit riding. *Access. 4*:27-32.
Sideris, L. (1999). Hot spots bus crime. *Journal of the AmericanPlanning Association. 64*(4): 395-411.
Siegel, L., Molof, M., Moy, W., Strack, J., and Jordan, F. Jr. (1979). An assessment of crime and policing responses in urban mass transit systems. Mitre Corporation: National Institute of Law Enforcement.
Silverman, E.B. (1999). *NYPD Battles Crime: Innovative Strategies in Policing*. Boston: Northeastern University Press.
Simpson, L. (2004). Statistics of racial segregation: measures, evidence and policy. *Urban Affairs. 41*(3): 661-681.
Skogan, W.G. (1990). Disorder and Decline: Crime and the spiral of decay in American neighborhoods. Los Angeles: University of California.
Skogan, W.G. and Maxfield, M.G. (1981). Coping with crime: Individual and neighborhood reactions. Beverly Hills: Sage Publishing.
Smith, C.J. & Patterson, G.A. (1980). Cognitive mapping and the subjective geography of crime. In Georges-Abeyie, D.E. and K.D. Harries (eds.), *Crime: A Spatial Perspective*. New York: NY: Columbia University Press.
Smith, M. (2005). Robbery of Taxi Drives. Problem-Oriented Guides for Police Problem-Specific Guides Series (No. 34). U.S. Department of Justice Office of Community Oriented Policing Services. (online). http://www.popcenter.org/Problems/PDFs/RobberyTaxiDrivers.pdf
Solvay, S. & Mueller, J. (1966). Rules of the Sociological Method. In G. Catlin (ed.), *Sociological Method*. New York: New York Free Press.
Spelman, W. (1995). Criminal careers of public places. In J.E. Eck and D.

Weisburd (eds.) *Crime and Place*. Monsey, NY: Criminal Justice Press and Police Executive Research Forum.

Spelman, W. (1993). Abandoned buildings: Magnets for crime? *Journal of Criminal Justice. 21*: 481-495.

Spelman, W. and Eck, J.E. (1989). Sitting ducks, ravenous wolves, and helping hands: New approaches to urban policing. *Public Affairs Comment. 35*: 1-9.

Stark, R. (1987). Deviant places: A theory of the ecology of crime. *Criminology. 25*: 893-909.

Sutherland, E.H. (1949). *White-Collar Crime*. New York: Holt, Rinehart, and Winston.

Taylor, R.B., Gottfredson, D., and Brower, S. (1984). Block crime and fear: Defensible space, local social ties, and territorial functioning. *Journal of Research in Crime and Delinquency. 21*: 303-331.

Taylor, R.B. and Gottfredson, S. (1986). Environmental design, crime prevention: An examination of community dynamics. In A.J. Reiss and M. Tonry (eds), *Communities and Crime* (Vol. 8). Crime and Justice Series, Chicago: University of Chicago Press.

Taylor, R.B. and Harrell, A.V. (1996). Physical Environment and Crime. Washington, DC: National Institute of Justice.

Taylor, R.B. (1997). Social order and disorder of street blocks and neighborhoods: Ecology, microecology, and the systematic model of social disorganization. *Journal of Research in Crime and Delinquency. 34*(1): 113-155.

Taylor, R.B. (2001). *Breaking away from broken windows.* Boulder, CO: Westview.

Taylor, R.B. and Harrell, A. (1996). Physical Environment and Crime. National Institute of Justice Research Report.

Taylor, R.B. and Covington, J. (1988). Neighborhood changes in ecology and violence. *Criminology, 26*(4): 553-589.

Thibault, E., Lynch, L., McBride, B. (2001). *Proactive Police Management*. Upper Saddle River, NJ: Prentice-Hall.

Thrasher, F.W. (1927). *The Gang*. Chicago: University of Chicago Press, U.S. Department of Commerce.

Thrasher, E.J. and Schnell, J.B. (1974). Scope of crime and vandalism in urban transit systems, in Crime and Vandalism in Public Transportation. Transportation Research Record, 487.
Washington, DC: Transportation Research Board.

Tinsley, H.E. and Weiss, D.J. (2000). Interrater reliability and agreement. In H.E. Tinsley and S.D. Brown (eds). *Handbook of Applied Multivariate Statistics and Mathematical Modeling*. San Diego, CA: Academic Press.

Transit Cooperative Research Program (1994). Guidelines for the effective use of uniformed transit police/security personnel. Project F-06, Interactive Elements, Inc.

United States Department of Justice. Bureau of Justice Assistance. (2000). Keeping illegal activity out of rental property: A police guide for

establishing landlord training programs. Washington, DC: United States Department of Justice. Office of Justice Programs.

vanAndel, H. (1989). Crime prevention that works: The case of public transport in the Netherlands. *British Journal of Criminology. 29*: 47-56.

Vankempen, R. and Ozuekren, A. (1998). Ethnic Segregation in Cities: New Forms and Explanations in a Dynamic World. *Urban Studies. 35*(10): 1631-1656.

Vold, G.B., Bernard, T.J., Snipes, J.B. (2002). *Theoretical Criminology*. Fifth Edition. Oxford University Press.

Warchol, G. (1998). Workplace violence, 1992-96. Bureau of Justice Statistics Special Report. U.S. Department of Justice, Office of Justice Programs: Washington, DC: 3.

Webb, B. and Laycock, G. (1992). Reducing Crime on the London Underground: An Evaluation of Three Pilot Projects. Crime Prevention Unit Paper 30. London: Home Office.

Weick, K.E. (1968). Systematic observational methods. In G. Lindzey and E. Aronson (eds.) *The Handbook of Social Psychology*, (2nd edition). Reading, MA: Addison-Wesley.

Weidner, R.R. (1997). Target hardening at a New York City subway station: Decreased fare evasion- At what price? In R.V. Clarke (ed.), *Preventing Mass Transit Crime. Crime Prevention Studies*. Vol. 6. Monsey, NY: Criminal Justice Press.

Weidner, R.R., Frase, R., Pardoe, I. (2002). Explaining sentence severity in large urban counties: A multilevel analysis of contextual and case-level factors. *Prison Journal. 82*(2): 56-73.

Weisburd, D. and Green, L. (1994). Defining the street level drug market. In D.L. MacKenzie and C.D. Uchida (eds.) *Evaluating Public Policy Initiatives*. Beverly Hills: Sage Publications.

White, H.R. (1990). Neighborhood permeability and burglary rates. *Justice Quarterly. 7*:57-68.

Wild, C.J. (1994). Embracing the 'wider view' of statistics. *American Statistician. 48*:163-171.

Wilson, J. Q., and Kelling, G.L. (1982). Broken Windows: The police and neighborhood safety. *Atlantic Monthly. 249*(3): 29-38.

Wirth, L. (1938). Urbanism as a way of life. American Journal of *Sociology. 44*: 1-24.

Wirth, L. (1964). *On Cities and Social Life*. Chicago: University of Chicago Press.

Wright, B. (2000). OSHA recommends protective measures to help prevent violence against taxi drivers. National News Release (May 9th) U.S. Department of Labor: Office of Public Affairs.
www.popcenter.org/Library/Tilley/2001/01-53.pdf
Operation Seneca 2001 Tilley Award Winner

This page intentionally left blank

Index