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EXAMINING CRIME SYMBIOSIS:
THE IMPACT OF ALCOHOL OUTLETS
ON VIOLENCE IN NEARBY
NEIGHBORHOOD PARK ENVIRONS

By
William Cameron Stelzig
B.S., University of Louisville, 2010

A Thesis
Submitted to the Faculty of the
College of Arts and Sciences of the University of Louisville
In Partial Fulfillment of the Requirements
for the Degree of

Master of Science

Justice Administration
University of Louisville
Louisville, Kentucky

May 2012

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A Thesis Approved on

April 12, 2012

by the following Thesis Committee:

Eric McCord, Thesis Director

George Higgins

Haifeng (Charlie) Zhang

DEDICATION

This thesis is dedicated to my parents

Mr. William “Sonny” Stelzig

and

Mrs. Donna Brewer

and to my step-father

Mr. Sanford “Bud” Brewer,

who have given me invaluable educational opportunities.

ACKNOWLEDGMENTS

I would like to thank my thesis chairs, Dr. George Higgins and Dr. Eric McCord, for their assistance and patience throughout the thesis process. I would also like to thank my other committee member, Dr. Haifeng (Charlie) Zhang, for his time, comments, and interest in my research. I would also like to thank Thomas Sawyer from the Kentucky State Data Center for his assistance in obtaining the census data used in the study. Also, I would like to thank those friends and family members who provided the encouragement and support which allowed me to complete the research and further my education.

ABSTRACT

EXAMINING CRIME SYMBIOSIS: THE IMPACT OF ALCOHOL OUTLETS ON VIOLENCE IN NEARBY NEIGHBORHOOD PARK ENVIRONS

William Cameron Stelzig

April 12, 2012

Recent criminological research has shown the importance of place, as places create the opportunities required for crime to occur. This study tests for the presence of crime symbiosis, or the interactive relationship between alcohol outlets and nearby neighborhood parks. A growing body of criminological literature has identified both neighborhood parks and alcohol outlets as criminogenic land uses. The study examines the counts of off-site and on-site alcohol outlets within 500 and 1,000 feet of neighborhood park environs as predictors of violent crime in park environs. Measures of concentrated disadvantage are included in the analyses to determine if factors of the larger neighborhood influence the variations in violent crime in the park environs. The study finds support for the proposed symbiotic relationship between off-site alcohol outlets neighborhood park environs, but not on-site outlets. The measures of concentrated disadvantage were also found non-significant at these places.

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CHAPTER ONE

INTRODUCTION

Many researchers have focused on the individual factors that lead to crime, primarily those of motivation. However, an alternative approach is to examine the extent ecological factors contribute to the spatial distribution of crime. In recent years, criminological research has shown the importance of place in crime studies, as places create the opportunities required for crime to occur (Brantingham & Brantingham, 1981, 1982, 1995; Eck & Weisburd, 1995; Felson & Clarke, 1998; Roncek, 1981; Roncek & Bell, 1981).

The primary focus of this study is to test for the presence of crime symbiosis, or interactive relationships between alcohol outlets and nearby neighborhood parks (Felson, 2006). Felson (2006) described crime symbiosis as an ongoing relationship between two parties, in which one party is provided some sort of illicit benefit. An example of this concept would be the ongoing relationship between an hourly motel and a prostitute. The hourly motel benefits financially by having the room rented, and the prostitute benefits by having a place to ply her trade.

Felson (2006) further suggests these crime symbiotic relationships may occur between places, or more specifically between the routine activities of users related to specific places, as places (e.g., buildings, vacant lots, parks, bus stops) cannot physically

interact with one another. Crime symbiosis is specifically concerned with the crime advantage that is created through the interactions of the routine activities associated with one type of land use and the routine activities of another land use (Felson, 2006). This study looks for support for the concept of crime symbiotic relationships by examining the extent to which alcohol outlets impact violent crime levels at nearby neighborhood parks and their immediate surrounding neighborhood.

Neighborhood parks are examined in the present study due to recent research that has identified them as criminogenic land uses (Groff & McCord, 2012; Hilborn, 2009; Knutsson, 1997; LaGrange, 1999; Stelzig, Denton, & McCord, 2011; Westover, 1985). The routine activities commonly associated with neighborhood parks, primarily being a lack of guardianship, makes them appealing locations for motivated offenders. Three known studies have specifically provided evidence of an association between neighborhood parks and alcohol outlets by finding positive correlations between evidence of alcohol use in neighborhood parks and violent crime (Denton, Stelzig, & McCord, 2011; Knutsson, 1997; Stedman, 2005).

Alcohol outlets are also selected to be tested for crime symbiosis with neighborhood park environs because of previous research identifying them as criminogenic land uses (Murray & Roncek, 2008; Roman, Reid, Bhati, & Tereshchenko, 2008; Roncek & Bell, 1981; Roncek & Maier, 1991), the before mentioned connections between alcohol use and neighborhood parks (Denton et al., 2011; Knutsson, 1997; Stedman, 2005), and the routine activities associated with the land uses of on-site and off-site alcohol outlets.

Research Questions

The study seeks to answer one primary question: Is there evidence that crime symbiosis exist between alcohol outlets and neighborhood parks?

The Present Study

This study attempts to answer the research question by examining violent crime levels within park neighborhoods in the city of Louisville, Kentucky. The study is guided by a theoretical connection between the criminogenic land uses of alcohol outlets and neighborhood park environs by the concept of *crime symbiosis* (Felson, 2006). The dependent variable is the density of violent crime, calculated from crimes reported to the Louisville Metro Police Department aggregated for the years 2008, 2009, and 2010 and the areas of each park and their immediate surrounding neighborhood. Predictor variables include the counts of both on-site and off-site alcohol outlets located within a buffer of 0 to 500 feet, and a buffer from 500 to 1,000 feet surrounding the neighborhood parks. Sociodemographic factors, specifically measures of concentrated disadvantage, are also controlled for within the neighborhood park environs.

Measures of concentrated disadvantage are utilized in this study to control for their documented impact on violent crime (Morenoff, Sampson, & Raudenbush, 2001; Sampson, Raudenbush, & Earls, 1997; Warner, 2003). The findings of the present study may also add to the current knowledge of the use of sociodemographic factors indicative of concentrated disadvantage. Sociodemographic data, provided by the American Community Survey's 5 year estimates (2005-2009), include five variables representing the theory of concentrated disadvantage.

A Geographic Information System (GIS) is used to aggregate individual crime incidents within the unit of analysis and to provide a count for each type of alcohol outlets within two specific zones adjacent to the unit of analysis. Statistical analyses are conducted using SPSS (Version 19). GeoDa software is used to apply a LaGrange multiplier test for spatial autocorrelation and multicollinearity in the residuals of the multivariate models. Ordinary least squares (OLS) regression is used to perform the multivariate analyses.

The first model tests the explanatory power of concentrated disadvantage on the violence levels found in the park environs. The second and fourth models examine the impact of the counts of alcohol outlets within 500 feet of park environs on violent crime; net the effects of concentrated disadvantage. The third and fifth models examine the impact of the counts of alcohol outlets located within 500 to 1,000 feet of park environs on violent crime; net the effects of concentrated disadvantage and the alcohol outlets within 0 to 500 feet.

Outline of the Remaining Chapters

The following chapters explain the current literature, the study, and results in detail. Chapter 2, Literature Review, is an examination of the research on crime symbiosis, the measures of concentrated disadvantage that have been related to crime, and the criminogenic effects of alcohol outlets and parks. An analysis of the previous research identified gaps in knowledge which the current study aims to fill. This chapter concludes by presenting the hypotheses to be tested. Chapter 3, Methodology, describes in detail how the study was conducted. It identifies in detail the data used, methods of data processing, and the analytical methods. Chapter 4, Results, presents descriptive data

for the study area and the results of the hypotheses testing. Chapter 5, Summary and Conclusion, summarizes the results of the analyses in a practical manner and discusses their implications to policy, limitations, and future research possibilities.

CHAPTER TWO

LITERATURE REVIEW

This study examines the impact of specific types of places, alcohol outlets, on crime levels at other specific places, neighborhood parks and their immediate surroundings. Broader neighborhood sociodemographic impacts are also considered by testing the significance of concentrated disadvantage indicators.

This chapter is composed of three major sections. The first section explains the theory of crime symbiosis. The second section presents a review of previous spatial research on the distribution of violent crime around parks and alcohol outlets and explains how the activities associated with each influence crime opportunity. The third section presents the theory of concentrated disadvantage and explains how measures thereof may influence variations in violent crime levels in neighborhood parks. At the end of the chapter, research hypotheses are presented.

The relationship between crime and places has been a focus of many researchers. The “Chicago School” of sociology was an early leader of this initiative in the 1920’s (Park, Burgess, & McKenzie, 1925; Shaw & McKay, 1942). Criminological theorists of this school of thought include, Robert E. Park, Ernest Burgess, Henry McKay, and Clifford R. Shaw, all of whom examined crime-place relationships within Chicago and

identified ecological and social characteristics which influenced crime at neighborhood levels.

Many years later, environmental criminology emerged as a new approach to understanding crime. Expanding on the earlier work of criminologists from the Chicago School, environmental criminologists seek a better understanding of crime, criminality, and victimization as they relate to particular places, and secondly, to the way individuals conduct their routine activities in space and thus impact crime levels (Brantingham & Brantingham, 1981; 1982). Place-based research set out to analyze the relationships between crime, urban design, and urban architecture with an emphasis placed on the individual crime events instead of an examination of offender motivations (Eck & Weisburd, 1995).

Crime Symbiosis

Felson coined the phrase, “Crime Symbiosis” in his book, *Crime and Nature* (2006). In its simplest form, crime symbiosis is defined as “a close and prolonged relationship between two parties, providing illicit benefits to at least one of them” (Felson, 2006, pp.163-164). The idea of symbiosis concerns people’s daily, routine activities that interact with the routine activities of others, resulting in a criminal advantage to one or more of the parties. An example would be the crime symbiotic relationship between a fence of stolen goods and a burglar. The fence routinely interacts with burglars to obtain goods to sell and may obtain information about easy crime targets. The fence may then pass on the information to other burglars in order to increase the amount of goods the fence can sell. In this example the burglar financially benefits from

the relationship after selling the stolen goods and the fence benefits by having more goods to sell.

Felson (2006) also suggests that a crime symbiosis may occur between an individual and an “organization,” or a place, which possesses its own unique, daily, routine activities. An example would be a crime symbiosis between a nightclub and a drug dealer. The nightclub management might tolerate the drug dealer in the business because of the financial benefits created by the increased number of customers the drug dealer attracts. The drug dealer, in turn, benefits from the legitimate business, as the nightclub provides access to clients in a safer, less public place than a street corner.

In the present study, Felson’s (2006) concept of a crime symbiosis is expanded to consider crime symbiotic relationships between two places. The daily, routine activities associated with some land uses attract high portions of motivated offenders (Brantingham & Brantingham, 1995), who in-turn, may interact with the daily, routine activities of other land uses, resulting in a crime advantage to either one, or both groups of place users. For example, there could be a crime symbiosis between a budget motel or drug treatment center, and a nearby shopping center. Research has suggested that budget motels (Schmerler, Hunter, Eisenberg, & Jones, 2009) and drug treatment centers (Taniguchi & Salvatore, 2012) attract motivated offenders. The motivated offenders take advantage of shoplifting opportunities provided by the nearby shopping center; opportunities that are created due to the routine activities associated with the business. The offenders shoplift to sell or trade the goods to acquire resources used to fulfill other needs/addictions. In this example, the presence of the budget motel or drug treatment center attracts more offenders to the area of the shopping center who benefit by taking

advantage of the shoplifting opportunities at the nearby stores. The stores in-turn are additionally harmed by the presence of the nearby motel.

The crime symbiotic relationships may further be classified into three different types: mutualism; parasitism; and forms of passive assistance (Felson, 2006). To determine which type of crime symbiosis exists, two questions can be asked: (1) Does the crime depend upon, or draw from another activity in ongoing fashion? (2) Does the second activity also benefit? If the answer to question number one is yes, then a symbiosis exists. The answer to question two can help determine the type of symbiosis that exists. If the question is answered yes, then it is mutualism (i.e., both parties benefit from the relationship). If the answer is no, then it could be parasitism (i.e., the first party benefits, but the counterpart is harmed as in the above example) or a form of passive assistance (i.e., one party benefits from the other, without helping nor harming it much) (Felson, 2006).

The present study posits that the routine activities associated with alcohol outlets introduce motivated offenders to crime opportunities in nearby parks and their immediate surrounding neighborhoods created by the routine activities associated with those locations. The relationship is also thought to be one of parasitism because although the presence of alcohol outlets is thought to harm the nearby neighborhood park, the alcohol outlets may benefit from the possible increase of customers that the nearby park attracts.

The following sections include the relevant literature examining crime at and around, and the routine activities of, parks and alcohol outlets.

Parks, Activities, and Crime

The purpose, design, and use of parks have evolved over the past 110 years in the United States (Byrne & Wolch, 2009). Once viewed as being directly related to one's health, parks evolved from being the focus of biologists to the focus of psychologist and sociologists, who were convinced that social problems had environmental origins. By the 1930's, the manner and amount of use, or rather misuse, parks received became a concern. This period led to the creation of the modern park we are now familiar with, where parks are functionally segregated into playgrounds, museums, outdoor concert venues, and public garden spaces.

People use parks for a wide variety of reasons, including, but not limited to, recreation, exercise, relaxation, socializing, and for solitude. Parks are also utilized for illicit or criminal purposes, including voyeurism, exhibitionism, sexual gratification, drug sales, drug use, and thievery (Byrne & Wolch, 2009).

Multiple studies have found strong relationships between parks and crime (Crewe, 2001; Evans & Oulds, 1984; Groff & McCord, 2012; Hakim & Shachamurove, 1996; Hilborn, 2009; Knutsson, 1997; LaGrange, 1999; Lockwood, 2007; Rengert & Wasilchick, 1985; Stelzig et al., 2011). Parks are also mentioned in several studies examining the specific crime of burglary (Crewe, 2001; Evans & Oulds, 1984; Hakim & Shachamurove, 1996; Lockwood, 2007; Rengert & Wasilchick, 1985). Those studies found increased risk of residential burglary (Crewe, 2001; Evans & Oulds, 1984; Lockwood, 2007; Rengert & Wasilchick, 1985) and commercial burglary (Hakim & Shachamurove, 1996) when targets were located adjacent to vacant land uses, green spaces, or parks. The studies suggested that burglary targets adjacent to vacant land uses,

green spaces, and parks are appealing because of a lack of surveillance and guardianship; making it easy for offenders to approach their targets (e.g., homes or businesses) undetected and escape quickly. It is likely that if the vacant or public spaces were utilized more or in some other manner, legitimate users would provide the guardianship needed to deter offenders from getting at the adjacent targets undetected.

Wilcox, Quisenberry, Cabrera, and Jones (2004) examined neighborhood factors that contributed to crime. In their multivariate analysis, Wilcox et al. (2004) built upon a previous study (Kurtz, Koons, & Taylor, 1998) by identifying parks/playgrounds as a separate variable of nonbusiness, nonresidential land use. The study also considered any mediating or moderating affects of disorder and factors of social disorganization, including those of concentrated disadvantage. Through multiple models, it was found that the park's positive association with violence was moderated by measures related to neighborhood instability. However, the presence of the park was positively associated with burglary in neighborhoods, and the effects were not substantially mediated by concentrated disadvantage or neighborhood instability (Wilcox et al., 2004). The presence of playgrounds was also shown to increase disorder in the neighborhood. These findings support the idea that the activities associated with specific land uses may greater impact certain crimes than some socioeconomic measures; but the findings also revealed multiple theoretical mechanisms (interactions between concentrated disadvantage, neighborhood instability, and disorder levels) may be involved in the relationship between parks and crime.

Groff and McCord (2012) used reported crime data to provide additional empirical evidence linking neighborhood park environs to crime. The park environs,

defined as the parks plus 50 foot buffers encircling them (essentially, the park and the immediate adjacent neighborhood), were found to have higher crime densities than the overall density of the city and of 500 randomly selected street intersections. Physical characteristics of the parks were assessed in reference to crime levels in the park neighborhoods. Findings suggested parks with characteristics which prompted consistent and extended periods of use by legitimate users, such as organized sports including baseball, basketball, football, or soccer, provided higher levels of guardianship and significantly reduced crime levels. In regards to this study, Groff and McCord's (2012) study is limited by the lack of multivariate analyses to examine a possible relationship found by Wilcox et al. (2004), between crime in parks or green spaces and sociodemographic factors that may account for additional variations in crime levels.

A similar study conducted in Louisville, Kentucky replicated much of the methodology from Groff and McCord (2012) (Stelzig et al., 2011). The authors found crime densities of the park environs higher than the city-wide density and that found around 400 randomly selected street intersections. It was also found that the presence of certain characteristics of parks (i.e., benches, improved walkways, drinking fountains, and restrooms), were significantly related to reductions in violent, property, and disorder crime. Although the significant park characteristics differed between the two studies (Groff & McCord, 2012; Stelzig et al., 2011), theoretically they both illustrated park features which extended the periods of use by legitimate park users, thus providing higher levels of guardianship and significantly negative relationships to crime (Stelzig et al., 2011). This study also included multivariate analyses which controlled for selected sociodemographic variables, finding them to be non-significant in the regression models.

Understanding the relationship between fear of crime (Crewe, 2001; Knutsson, 1997) and perceptions of crime (Westover, 1985) in relation to parks is necessary due to the fact that fear and perceptions of crime affect the use and levels of guardianship of these public places. A guardian is defined as anyone whose mere presence prevents a crime from occurring (Cohen & Felson, 1979). Parks are land uses which are essentially “owned by all but controlled by none,” in the sense that they are public spaces in which the users and neighboring residents are responsible for protecting, but often fail to do so (Groff & McCord, 2012, p. 2; Hilborn, 2009). If legitimate users perceive or fear crime at the parks, they will be unused and left as unprotected space, for which law enforcement are the lone guardians (Taylor & Harrell, 1996). Parks with limited use will have substantially reduced levels of guardianship and may foster activities that attract offenders and are conducive to crime.

Westover (1985) examined the perceptions of crime among park users. Significant differences were found between males and females. Females displayed higher fear levels and avoidance of those areas they feared most, reducing surveillance and guardianship in those areas. Respondents overall, did not perceive there to be high levels of crime at the parks. Westover commented that lack of a perception of high crime could be attributed to those potential users who have the highest perceptions of crime not visiting the parks, therefore not being interviewed.

Crewe (2001) measured fear of crime by examining calls for service along Boston’s South-West Corridor Park and found rates from houses abutting the park three to five times greater than in the surrounding neighborhood. Interviews with residents bordering the park revealed a sense of feeling less safe walking through the park than

through the nearby commercial area, especially at night. The statement indicates that the residents bordering the park were likely to not often use the park due to the park's routine activities which give nearby residents a feeling that the park is not the friendly public place it was designed to be, all hours of the day. The study does show by the increased calls for service of houses abutting the park that the nearby residents want the park to not create fear and to feel safe in their homes, but are unwilling to act as guardians themselves and rely on police responses to provide the only guardianship. Future qualitative research, similar to this study, needs to be done to test the theoretical findings of the quantitative research of parks, particularly focusing on what factors would encourage nearby residents to use the space and act as guardians.

LaGrange (1999) examined how the presence of high schools and malls impact property crime levels at nearby transit stations and parks. High schools and malls bring in large numbers of juveniles into the community, some portion of which are offenders. The presence of a high school or mall created crime opportunities in the nearby parks and transit stations through the interaction of the activities associated with the land uses studied. An unstated, symbiotic relationship exists due to high schools and malls drawing a large number of juveniles into the area for legitimate purposes; the motivated offenders then select nearby transit stations and parks as the locations to commit criminal acts due to the routine activities associated with the places (e.g., lack of guardianship). The result being increased property crime levels at transit stations and parks.

The literature, although limited, has identified direct relationships between the presence of parks and increased crime at and around the locations. Studies have suggested the increased crime levels of parks may be related to the characteristics of the

individual parks. Those characteristics which promoted increased guardianship were associated with lower crime levels. The literature between fear of crime and perceptions of crime furthers the argument of a lack of guardianship because if legitimate users fear, or perceive parks to be high crime places, they will not utilize the public space, ultimately diminishing the level of guardianship of parks. The study conducted by LaGrange (1999) also provided support for a crime symbiosis between multiple places, high schools/malls and parks/transit stations, even though the study did not seek to test the concept.

Alcohol outlets, acting as attracters of motivated offenders, were theorized to play a major role in these symbiotic relationships and therefore were selected to be examined in the present study. Felson (2006) suggested that alcohol consumption offers the strongest symbiosis between legal and illegal activity. He provided the example that bars, although legally licensed, may act illegally by serving alcohol to minors or by continuing to serve after hours. Additionally, they can encourage drug violations and other offenses at the locations or in nearby places at various times such as in nearby parks when levels of guardianship are low (Felson, 2006). The following section reviews the current spatial literature that examines the additional criminogenic effects of alcohol outlets.

Alcohol Outlets, Activities, and Crime

The activities associated with a land use can greatly impact crime opportunities at the location and in surrounding areas. Land uses such as alcohol outlets have been shown to attract high numbers of motivated offenders (Brantingham & Brantingham, 1995; Brower & Carroll, 2007; Loukaitou-Sideris, 1999; McCord, Ratcliffe, Garcia, & Taylor, 2007), allow individuals to become intoxicated making them easy targets or increasing their aggressiveness (Barnwell, Borders, & Earleywine, 2006; Bushman & Cooper, 1990;

Cohen & Felson, 1979; Graham, Schmidt, & Gillis, 1996; Ito, Miller, & Pollock, 1996; Norström, 1998), and many possess poor place management which can lead to decreased guardianship and an increase in crime opportunity (Block & Block, 1995; Eck, 1994; Kennedy & Forde, 2006; Miethe & McDowall, 1993).

Not all types of alcohol outlets foster the same routine activities. For this reason, on-site and off-site alcohol outlets are analyzed separately in the present study. The current literature occasionally makes a distinction between on-site and off-site alcohol sales (Loukaitou-Sideris, 1999; Murray & Roncek, 2008; Roman et al., 2008). On-site locations sell alcohol to be consumed by patrons within the establishment or place of business. These places include bars, clubs, or pubs and are distinguished by the type of state liquor license they obtain. Off-site locations sell alcohol pre-packaged and intended to be consumed away from the store. Off-site establishments include liquor stores and convenience stores/gas stations and are also distinguished by the type of state liquor license they obtain. Crime types are commonly disaggregated in spatial research, as places impact specific crime types differently (Clarke & Eck, 2003). Locations and crime types are differentiated because the routine activities of on-site and off-site outlets differ and result in various opportunities for different crimes.

The routine activities associated with the two types of outlets may vary greatly in relation to their impact on nearby parks. Off-site outlets provide no supervision of patrons while alcohol is consumed, likely sell alcohol in greater quantities due to packaging and lower prices per unit, and can be seen as arming consumers with possible weapons by the glass containers in which the alcohol is sold in. Off-site outlets may also reduce the number of intoxicated individuals in public, as some consumers purchase the alcohol to

be consumed within a residence or other indoor area, or they may increase levels of public drinking and publicly intoxicated individuals due to consumers taking purchased alcohol to nearby areas of low guardianship, such as parks, to consume it. On the other hand, on-site outlets may provide a controlled social environment where place managers control their customer's amount of drinking and do not release consumers into the public with potential weapons (beer bottles). They do however release intoxicated individuals into the public with lowered inhibitions who may be more likely to take advantage of crime opportunities through a flawed rationale (Clarke & Cornish, 1985; Cornish & Clarke, 1986, 2008).

The documented relationship between alcohol use and aggression may explain the increase of violent crimes at or around alcohol outlets (Barnwell et al., 2006; Bushman & Cooper, 1990; Graham et al., 1996; Ito et al., 1996; Norström, 1998). Alcohol consumption has also been shown to lower inhibitions which ultimately lead to the increased aggression among users (Bushman, 1997; Bushman & Cooper, 1990). Individuals with reduced inhibitions also perceive crime opportunities through a distorted lens; individuals under the influence of alcohol are more likely to rationalize their behavior and take advantage of crime opportunities found at or around alcohol outlets (Clarke & Cornish, 1985; Cornish & Clarke, 1986, 2008).

Research also shows evidence of a frequent codependence between alcohol and drug addictions (Barber, 1994; Best, Rawaf, Rowley, Floyd, Manning, & Strang, 2000; Hawks & Bahr, 1994; Knutsson, 1997; Wadsworth, Moss, Simpson, & Smith, 2004). This may also account for increases in crime levels at and around alcohol outlets.

Spatial criminology had not empirically examined the relationship between the locations of alcohol outlets, alcohol use, and patterns of violent crime until the 1980's (Gorman et al., 2001; Roman et al., 2008; Roncek & Bell, 1981; Roncek & Maier, 1991; Scribner, MacKinnon, & Dwyer, 1994). On-site and off-site alcohol outlets have been shown to significantly increase violent crime at the census block level (Loukaitou-Sideris, 1999; Murray & Roncek, 2008; Roncek & Maier, 1991), census tract (Scribner, Cohen, Kaplan, & Allen, 1999; Zhu, Gorman, & Horel, 2004), and within a zip code (Gruenewald, Freisthler, Remer, LaScala, & Treno, 2006).

The spatial research using the alcohol outlets as a unit of analysis has revealed increased crime counts for violent, property and disorder crimes in the ranges of 300 to 1,056 feet from the alcohol outlets. Distances of 300 feet (Loukaitou-Sideris, 1999), 400 feet (Rengert, Ratcliffe, & Chakravorty, 2005), 500 feet (Murray & Roncek, 2008; Roncek & Maier, 1991), and 0.2 miles (1,056 feet) (Frisbie, Fishbine, Hintz, Joelson, & Nutter, 1978) have been specifically analyzed and revealed the presence of an alcohol outlet to significantly increase crime within the examined distance. Increased crime counts have been shown to be as far as a quarter of one mile from an alcohol outlet for Uniform Crime Reports (UCR) Part 2 crimes (or, disorder crimes which include drugs, alcohol, weapons, disturbances, and prostitution) (Loukaitou-Sideris et al., 2002).

In the reviewed literature, the impact of alcohol outlets has been evaluated either through dummy variables indicating the presence of an alcohol outlet, or the count of alcohol outlets within a specified distance from the unit of analysis. For example, Rengert et al. (2005) and Roncek's series of studies (Roncek & Faggiani, 1985; Roncek & Lobosco, 1983; Roncek & Maier, 1991) identified census block groups and census blocks

for either containing or not containing a bar, while Zhu et al. (2004) investigated how alcohol outlet density affected violence in surrounding neighborhoods. Few of the previously summarized studies examined how the increased number of outlets affected crime, particularly at multiple specified distances in relation to the unit of analysis. The current study contributes to the body of literature relating alcohol outlets, parks and crime by analyzing how counts of alcohol outlets at multiple distances from park environs affect violent crime density within park environs.

The presence of alcohol outlets was shown to increase violent crime levels at the facilities, the immediate surrounding neighborhood, in the surrounding three blocks (1,500 feet), within the census block group, tract, or zip code. The literature has also suggested additional variables, particularly, factors of concentrated disadvantage and social disorganization, may influence variations in violent crime in studies utilizing larger units of analysis than a park environ or other specific place.

Two studies examining alcohol outlet crime have unknowingly found support for a crime symbiosis between alcohol outlets and neighboring lands uses without referring to it as thus (Loukaitou-Sideris, 1999; Loukaitou-Sideris et al., 2002). Loukaitou-Sideris (1999) found that of the ten highest crime bus stops identified in Los Angeles, California, eight were located within 300 feet of a liquor store or bar. The authors theorized that crimes were increased at the bus stops due to the nearby alcohol outlets attracting a greater number of motivated offenders. Loukaitou-Sideris et al. (2002) later analyzed crime at and within a quarter of one mile (1,320 feet) of Green Line train stations in Los Angeles, California, finding the presence of an alcohol outlet also related to increased

levels of crime and disorder. Type II crimes, 90% of which was vandalism, saw the greatest increases due to the presence of an alcohol outlet within 1,320 feet.

Theoretically, the close proximity of the bus stops and train stations to alcohol outlets allowed for an interaction of the routine activities of public transit and the land use of alcohol outlets, positioning targets or victims in the same space and time with offenders and making crime more likely to occur. Both studies are indicative of a crime symbiosis between public transit stops/stations and alcohol outlets.

Loukaitou-Sideris (1999) also finds evidence of crime symbiotic relationships between land uses other than alcohol outlets and parks or transit stations. The study conducted a second examination, creating matched pairs of high and low-crime bus stops that were within two blocks of one another. An environmental inventory (an examination of land use composition) of the four matched pairs revealed that the high-crime bus stops had many more “negative environmental attributes” (i.e., liquor stores, bars, budget motels, pawn shops, adult bookstores, or vacant lots/buildings) (Loukaitou-Sideris, 1999). The study illustrated that not just alcohol outlets, but multiple negative businesses attract offenders and concentrate targets, ultimately leading to criminal behavior. The study provides ideas for future research by providing evidence that a crime symbiosis may exist between other land uses than alcohol outlets, as shown by the relationship between budget motels, pawn shops, adult bookstores, or vacant lots and multiple UCR part I and part II crimes committed at bus stops.

Crime Symbiotic Relationship between Alcohol Outlets & Parks

Previous studies have provided direct evidence of a crime symbiotic relationship between alcohol outlets and nearby parks (Denton et al., 2011; Knutsson, 1997; Stedman,

2005; Westover, 1985). In the first study (Denton et al., 2011), trained researchers surveyed neighborhood parks in Louisville, Kentucky. The researchers assessed evidence of alcohol use by reporting observed levels of alcohol related litter (i.e., empty beer cans/bottles, liquor bottles) on a five-item Likert-type scale, with scores ranging from 0, indicating no evidence of alcohol use to 5, indicating high levels of evidence of alcohol use. The study found statistically significant correlations between the higher levels of evidence of alcohol use in the neighborhood park environs and violent crime density (Denton et al., 2011). The findings empirically support the argument that patrons of alcohol outlets are using neighborhood parks to consume alcohol and this in turn is related to higher levels of violent crime.

Stedman (2005) examined 28 parks in Chula Vista, California. Initial findings clearly related the elevated crime in 4 of the 28 parks to alcohol consumption by the park users. The parks were identified due to the increased violent and disorder calls for service at the locations. The city instituted a ban on alcohol at each of the 4 parks, Eucalyptus, Friendship, Lauderbach, and Memorial Parks. A continued examination of the 4 parks which banned the use of alcohol revealed one particular park, Lauderbach Park, was attracting transients to congregate due to its close vicinity to homeless shelters, free meals, recycling centers, and liquor stores. A physical relationship was observed between the presence of an alcohol outlet, specifically a liquor store, and evidence of public drinking and increases in violence in the nearby park(s).

Westover (1985) examined a group of three regional parks in the mid-west.¹ The study revealed half of the 268 participants observed alcohol consumption within the three parks studied, despite that all three parks prohibited the use of alcohol. It was also noted

¹ Regional parks are larger than neighborhood parks and have a much larger service area and population.

that one third of the participants said they had witnessed some form of disorder crime being committed while visiting the park. This qualitative research provides support for the theoretical symbiotic argument linking alcohol outlets and parks.

Knutsson (1997) was one of the earlier studies to empirically examine the relationships between parks and crime, while also assessing fear of crime of park users and at nearby locations. The study is also the only found to unknowingly support a crime symbiosis, specifically, between an off-site alcohol outlet and a nearby park. In this mixed methods study, Knutsson observed a liquor store in close proximity to the park and noted through observations and interviews with offenders, the use of both alcohol and drugs within the park. It was found that offenders used the park to congregate with other drug/alcohol users and drug dealers due to a lack of guardianship of the parks. The activities of the parks also created high levels of fear of crime within the park and disrupted businesses surrounding the park. The illegitimate routine activities that became associated with the park further deterred legitimate users who provided guardianship and surveillance. The implementation of a stationary narcotics unit and increased police patrols (i.e., increased guardianship) around the park led to the near eradication of illegitimate park users and ultimately a decrease in crime and fear of crime at the park as residents returned to use it. Knutsson's (1997) study offers some of the strongest support for crime symbiosis between land uses and how reduced guardianship can influence the symbiotic relationship between alcohol outlets and parks.

The three studies, Denton et al. (2011), Stedman (2005), and Westover (1985), provide strong empirical and observational support for the existence of a crime symbiotic relationship between alcohol outlets and violent crime in neighborhood parks. Knutsson's

(1997) research advanced the proposed relationship by providing observational evidence of a crime symbiotic relationship between the two land uses.

The following section examines the criminological literature related to concentrated disadvantage.

Concentrated Disadvantage

In addition to the counts of on-site and off-site alcohol outlets, other neighborhood influences may also affect levels of violent crime in neighborhood park environs. Many of these interrelated variables, including high percentages of female headed households, unemployed persons in the civilian workforce, families receiving public assistance, high percentage of Blacks in the population and families below the poverty level load on a single variable in factor analysis and are referred to as concentrated disadvantage (Morenoff et al., 2001; Sampson et al., 1997; Warner, 2003).

Concentrated disadvantage represents the economic disadvantage in racially segregated urban neighborhoods. Wilson (1987) argued that the decline in 'blue collar' jobs in the 1970's resulted in reduced job opportunities for minorities. He argued that long term and high levels of joblessness led to concentrated disadvantage among blacks in urban areas. Racial isolation and joblessness has been shown to increase crime in many communities (Massey and Denton, 1988; 1993; Wilson 1987). It has been expressed that the concentrated disadvantage faced by Blacks led to a reduction in males suited for marriage, increased incarceration rates, family disruption, as well as high crime rates in minority neighborhoods (Parker & McCall, 1999; Sampson, 1987). The residents of these communities often resorted to crime careers to overcome the loss of the unskilled and semi-skilled jobs (Johnson, Williams, Dei, & Sanabria, 1990).

Neighborhoods displaying high concentrations of social isolation and poverty may develop values and norms contrary to those of the rest of society (Sampson & Wilson, 1995; Warner & Wilcox Roundtree, 1997). The subculture of violence that is often created, has been shown to be an important aspect that should be considered in neighborhood-level crime models, as the subcultures may directly affect crime rates or indirectly affect them through their weakening of informal social controls (Sampson & Wilson, 1995).

A meta-analysis of macro-level predictors and theories of crime revealed measures of concentrated disadvantage to be the features of society that promote the convergence of offenders and targets in areas lacking capable guardianship, as they were the strongest and most stable predictors of crime at the macro-level (Pratt & Cullen, 2005). Morenoff et al. (2001), Sampson et al. (1997), and Warner (2003) also found areas of high concentrated disadvantage to have higher levels of violent crime.

The present study examines how the measures of concentrated disadvantage may directly influence violent crime levels in neighborhood park environs. The study also examines the strength of measures of concentrated disadvantage as predictors of violent crime in the neighborhood park environs in an effort to further support the argument of crime symbiosis between alcohol outlets and violence in neighborhood park environs. A strong, significant relationship between the measures of concentrated disadvantage and violence in park environs in the multivariate models would weaken the argument of a crime symbiosis because the selected sociodemographic variables would be explaining a substantial portion of the relationship. Therefore, to accurately test for crime symbiosis

between alcohol outlets and violence in neighborhood park environs, measures of concentrated disadvantage must be used in multivariate regression models.

Summary of Literature Presented

To summarize the literature presented, the clustering of violent crimes in park environs near alcohol outlets (on-site and off-site outlets) results from the accumulated knowledge of observed crime opportunities by the many potential offenders travelling through these areas, lowered inhibitions of patrons who have consumed alcohol, and increased aggression by intoxicated individuals. The question then is how far do these symbiotic relationships exist, or how far out from the park environs should we expect to find (and test for) crime symbiosis between alcohol outlets and neighborhood park environs?

Research on the spatial impact of the criminogenic effects of alcohol outlets suggests they are measurable out to a distance of one to two city blocks, roughly, 500 to 1,000 feet. Studies find this common distance in multiple research methodologies and across crime types. For example, Brantingham and Brantingham (1982) found that commercial burglaries were likely to cluster within one block of bars and fast-food restaurants. Fagan and Davies (2000) analyzed violent crime in 300 foot increments from public housing projects and found violent crime to be significantly higher in the 300 feet immediately surrounding public housing projects, and then decrease dramatically in the adjacent 300 foot buffers. Schweitzer, Kim, and Mackin (1999) conducted a multivariate analysis controlling for many sociodemographic factors and found that the total count of combined violent and property crimes were higher on street-blocks within two blocks of convenience stores (possibly related to the sale of alcohol). Studies examining drug sales

arrests found clusters within one block (roughly, 400 feet) of liquor stores and bars, check cashing stores, and subway stations (McCord & Ratcliffe, 2007; Rengert et al., 2005).

The present study seeks to test for a symbiotic relationship between alcohol outlets and neighborhood parks. It is expected that neighborhood parks will be the locations for which certain crimes are committed more often due to multiple theoretical connections. Parks are chosen by motivated offenders as places to commit crimes due to traditionally low levels of guardianship. Alcohol outlets attract high numbers of motivated offenders to the neighborhoods surrounding them. Motivated offenders initially take notice of the crime opportunities present in nearby neighborhood parks due to a broadened awareness of the area immediately surrounding the alcohol outlets that the presence of the alcohol outlets create, and due to lowered inhibitions and increased aggression from the consumption of alcohol. The legitimate routine activities associated with neighborhood parks interact with the all too common illegitimate routine activities associated with nearby alcohol outlets, creating crime opportunities within the park environs, which is indicative of a crime symbiotic relationship. Neighborhood levels of concentrated disadvantage may also be an important predictor of crime in park environs; therefore measures of concentrated disadvantage are controlled for in the present study.

Hypotheses

Evidence, both theoretical and empirical has been identified in the above literature supporting a crime symbiosis between alcohol outlets and neighborhood park environs. In light of the literature reviewed, the following hypotheses are proposed:

Hypotheses

- H₁ Neighborhood park environs with a larger number of off-site alcohol outlets within 500 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.
- H₂ Neighborhood park environs with a larger number of off-site alcohol outlets from 500 to 1,000 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.
- H₃ Neighborhood park environs with a larger number of on-site alcohol outlets within 500 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.
- H₄ Neighborhood park environs with a larger number of on-site alcohol outlets from 500 to 1,000 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.

CHAPTER THREE

METHODOLOGY

The goal of this study is to determine if crime symbiosis exists between alcohol outlets and neighborhood parks. This chapter describes, in detail, the data sources and variables that were used in the analysis. It also details how the dependent and independent variables are operationalized, as well as the statistical methods used to analyze their relationships.

Data Sources

This study uses data from various government and public sources. Crime data was provided by the Louisville Metro Police Department. Geographic Information Systems (GIS) computerized shapefiles for the parks were provided by Louisville/Jefferson County Information consortium (LOJIC). Sociodemographic data was derived from the 2005-2009 American Community Survey's 5-year estimates. Licensed alcohol outlets in Louisville, Kentucky were identified from an online database maintained by the Kentucky Department of Alcoholic Beverage Control (www.abc.ky.gov). Street views, provided by Google (<http://maps.google.com>), and orthographic fly-over photographs of the city, provided by LOJIC, were used to verify addresses of alcohol outlet locations.

Study Site and Unit of Analysis

The study site is the Louisville Metro policing area of Jefferson County, Kentucky. Louisville Metro was formed in 2003 following a governmental merger of Jefferson County and its largest city, Louisville. Several small communities within the county opted out of the agreement and continue to be self sustaining, including police services. The Louisville Metro Police Department (LMPD) was formed at the time of the consolidation and polices approximately 90% of the county's area and population.

According to 2010 U.S. Census data, Jefferson County has a population of slightly over 741,000 residents. The county consists of two major racial/ethnic groups: whites (72%) and Blacks (21%), with Hispanic/Latinos (4.4%) and Asians (2.2%) comprising the majority of the remainder of the population. Approximately one-eighth (14.6%) of Jefferson County's population reported living in poverty at the time of the 2010 Census, and the county's median household income was estimated at \$45,440. Compared to the entire U.S., Jefferson County's population contains approximately twice the percentage of Blacks, approximately the same percentage of population living below the poverty level and a median household income approximately \$4,000 lower than the national average.

The unit of analysis for this study is 59 neighborhood park and their immediate surrounding streets located within the Louisville Metro policing area (see, Figure 1). A list of all 122 parks in the Louisville Metro policing area was obtained from the Louisville Metro Parks Department's website (www.louisvilleky.gov/metroparks/). The present study examines only "neighborhood parks" and smaller (i.e., mini-parks, pocket parks, squares), defined as 10 acres or less. This standard for neighborhood parks has

been utilized in previous studies (Groff & McCord, 2012; Stelzig et al., 2011) and coincides with other state and city standards (City of Rio Vista, 2007; Leon Younger and PROS, 2004; Municipal Research and Service Center of Washington, 1994). Many of the neighborhood parks possess amenities including sports facilities, picnic areas, water fountains, and restrooms.

The final set of neighborhood parks was identified through a process which began with a computerized GIS shapefile of 122 parks that was downloaded from LOJIC. The file consisted of polygons representing the parks maintained by Metro Parks.² Only those parks which were 10 square acres or less were retained for the study. Two of the parks retained for the study were directly across a small residential street from each other and were merged into one due to the close proximity. The routine activities of the two locations would be essentially identical, thus being no theoretical reason to differentiate between the two entities. After this step of data processing, a population of 60 neighborhood parks was identified. The sample of 59 parks was finalized after an outlier was identified, which will be discussed in greater detail in subsequent chapters.

Louisville Metro's neighborhood parks were shown to cluster in the western half of Louisville Metro, as illustrated in Figure 1. The densest clusters of parks are located in the north-west portion of the study area. This area includes the central business district and contains a higher percentage of minorities and low-income residents than many other areas of Louisville Metro. The parks located towards the center of the study area and those to the south and east are located in the suburban areas which predominantly display lower proportions of minorities and have median incomes equivalent to, or exceeding the

² A polygon is a multi-sided figure which represents an area on a map and has attributes that describe the geographic feature it represents.

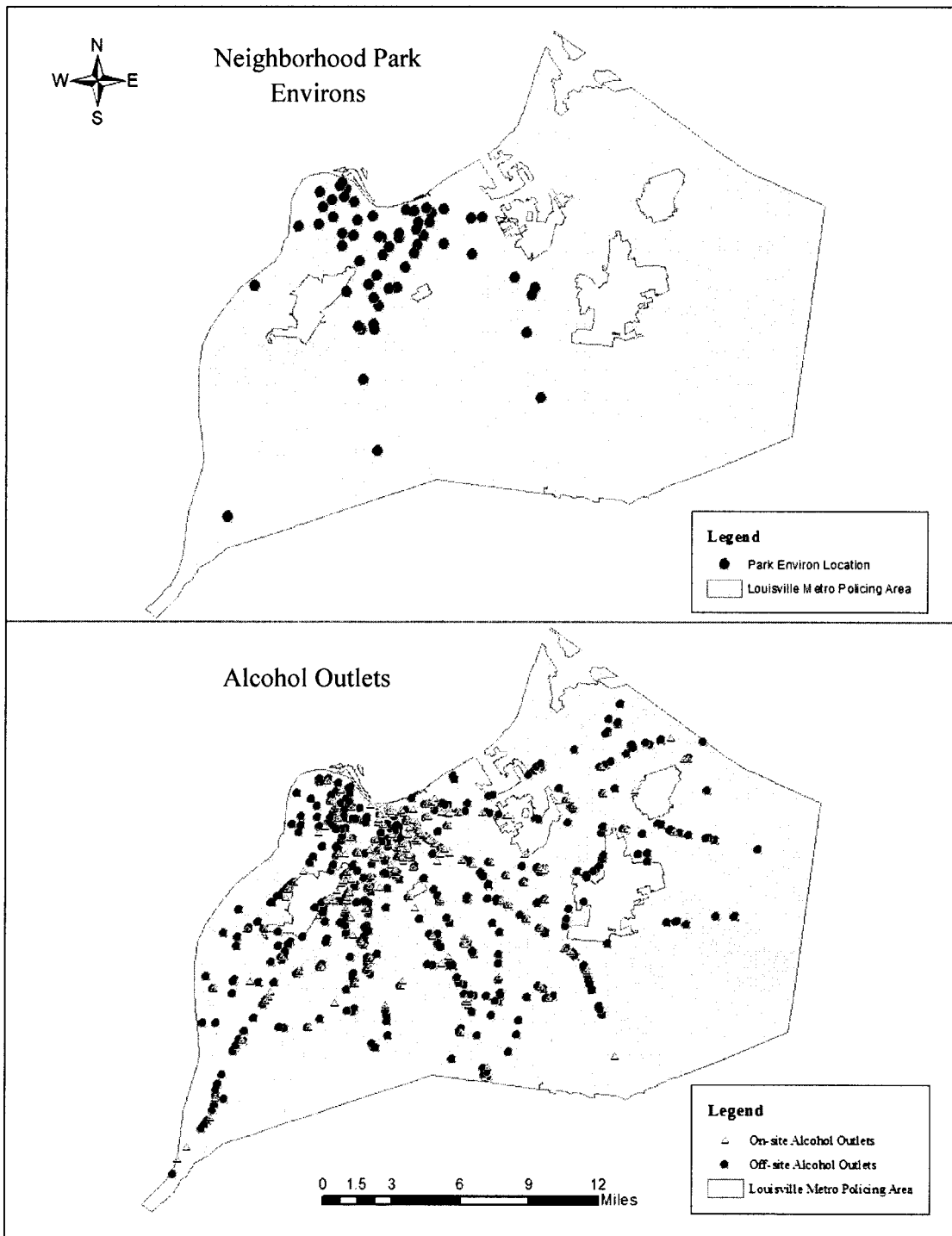


Figure 1. Locations of park environs and alcohol outlets in the Louisville Metro policing area, Jefferson County

County average. The lower map depicts the locations of all alcohol outlets in the Louisville Metro policing area. The outlets are widely dispersed among the city with a slight clustering in the north-west, or central business district, of the study area.

The unit of analysis is the park environ, which consists of the parks and a 50 foot buffer immediately surrounding them. Park environs are utilized for two reasons, one theoretical and the other due to a limitation of the data. Theoretically, the streets adjacent to parks have a reciprocal influence on activities within the parks, a relationship which begs their inclusion. Since the study seeks to understand how the parks and the immediate surrounding neighborhoods are impacted by the count of alcohol outlets within two blocks, the additional 50 foot extension from the parks' border widens their boundaries, roughly to the sidewalk on the opposing side of the street. The broadened area allows an incorporation of the addresses of the neighborhood immediately surrounding the parks, thus creating the park environ

The other reason for utilizing park environs is the limitation of the data. According to the data, it seems common practice for police officers to cite the nearest address or street intersection as the location where a crime occurred rather than the physical address of the park if it occurred within the park. Either way, GIS (the mapping software) places the crime point near the streets centerline, not within the park. The 50 foot buffer is utilized to capture the crimes that were documented within the park, as it is impossible to differentiate between crimes committed in the park or on the surrounding streets. For example, if an assault occurred on a street or sidewalk bordering a park, the responding officer is likely to document the location of the incident to the closest address or intersection. It would be impossible to determine if the confrontation originated within

the park or in the street based upon the data, therefore it was important to use a unit of analysis which does not dismiss crime incidents that were documented in the immediate surrounding area of the neighborhood parks. The average park environ was 481.6 ft. x 481.6 ft., an area of 5.32 acres, making the park environs relatively small units of analysis. Figure 2, illustrates the neighborhood park, the 50 foot buffer which creates the park environ, and its relative size in comparison to a city-block. The 500 and 1,000 foot concentric buffers shown are discussed in greater depth in a later section of this chapter.

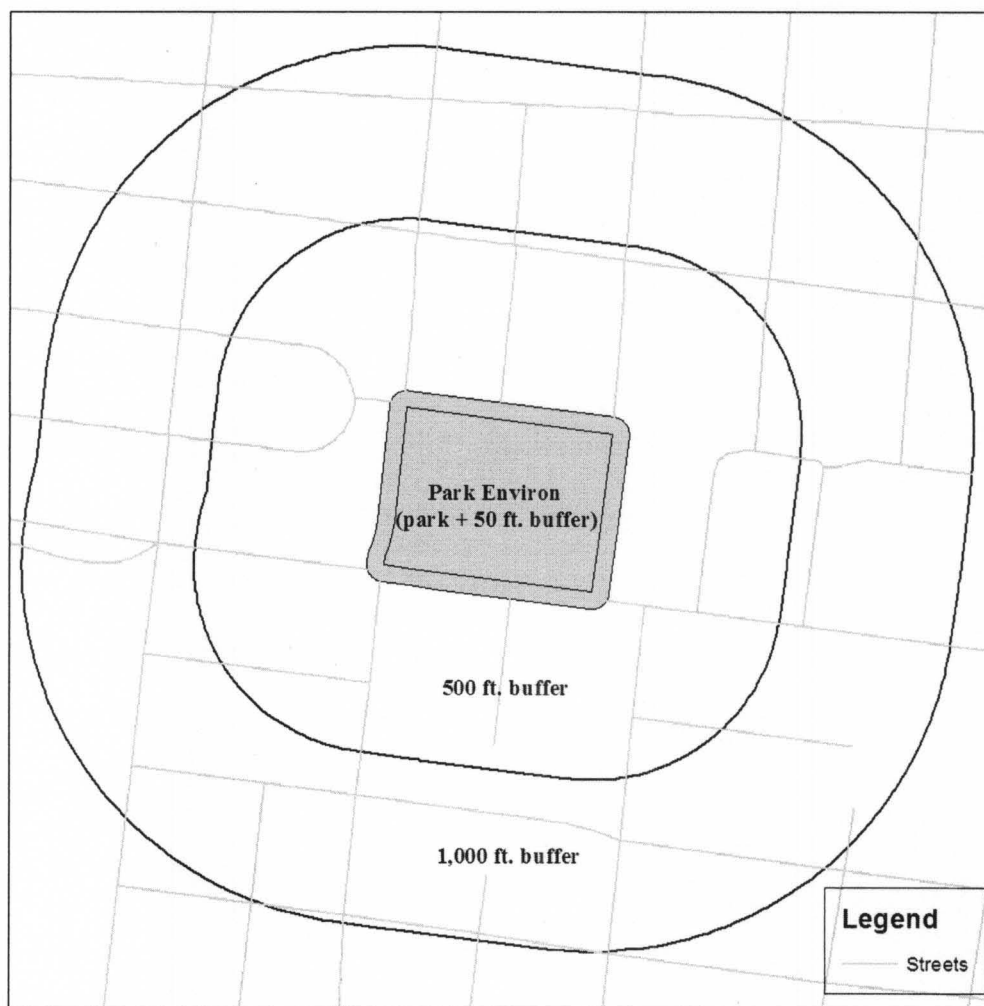


Figure 2. Park Environ and alcohol outlet location distances

Dependent Variable

The present study uses three years of violent crime data obtained from the Louisville Metro Police Department. The database contained all reported violent crime incidents (murders, rapes, robberies, and all assaults) from January 1, 2008 through December 31, 2010, totaling 17,336 incidents, equivalent to 15% of all reported crime during the three year period. The three-year count is used to minimize the impact of annual and seasonal fluctuations and to increase the number of incidents across the units of analysis for examination.

In an effort to focus on violent crimes commonly committed within park environs, only violent crimes that were likely to be committed outdoors were examined with the others omitted. These crimes are most likely to be related to the presence of a park. Examples of crimes omitted from the study include all those related to domestic violence and robberies other than those of a person, as these are crimes which are likely committed within buildings.

ESRI's ArcGIS 10, a Geographic Information System (GIS), was utilized to map the location of the crimes, alcohol outlets, and parks. The crime data was geocoded (electronically assigned) to a map of all addressed streets within the Louisville Metro policing area with a "hit rate" of 94%. Hit rate is a term used to define the percentage of incidents that coincide with an address in the street shapefile and are successfully placed as points on a map. The 94% hit rate exceeds both the accepted hit rate of 90% for accurate mapping as suggested by Bichler and Balchak (2007), and is well above the empirically derived minimum hit rate of 85% suggested by Ratcliffe (2001, 2004).

A process known as spatial joining in GIS was used to assign crimes falling within the park environs to the appropriate park (Chainey & Ratcliffe, 2005). The process resulted in a total count of violent crime incidents per park environ. To control for the variation in size of park environs, the crime counts were divided by the area of each parks environ; expressed as a density of violent crime per 10,000 square feet.

Independent Variables

Independent variables consist of on-site and off-site alcohol outlets and sociodemographic measures of concentrated disadvantage and percent Black.

Alcohol Outlets

For the purpose of this study, alcohol outlets will be distinguished as on-site and off-site locations in order to test each separately for evidence of a symbiotic relationship with the park environs. The on-site outlets include bars, pubs, taverns, and clubs. Off-site outlets include liquor stores, convenience stores, and gas stations that sell alcoholic beverages.

To test for the symbiotic relationship between on-site and off-site alcohol outlets and violent crime density in the park environs, the outlets had to first be identified and located. All outlets within the Louisville Metro policing area were identified by address and state liquor license type via the Kentucky Department of Alcoholic Beverage Control's website (<http://abc.ky.gov>). Using GIS, the on-site and off-site outlets were then geocoded to the map of the Louisville Metro policing area. The geocoded alcohol outlets had a 100% "hit rate," yielding a total of 227 on-site outlets and a total of 617 off-site outlets.

Additional data processing had to take place in order to identify the on-site and off-site alcohol outlets that were located nearby the park environs. GIS was utilized to create multiple concentric buffers, or zones, around the park environs with bandwidths of 500 and 1,000 feet (see, Figure 2). Five hundred foot increments were utilized for the radii of the bandwidths in an effort to mirror the average length of a city block in Louisville Metro and to replicate the average distances previous studies had found significantly related to increased crime. The buffers are utilized to capture the counts of on-site and off-site alcohol outlets within each of the blocks immediately surrounding the park environs. This process allows for an examination of the impact of on-site and off-site alcohol outlets at both of the specified distances on crime densities within the park environs, an indirect test of crime symbiosis between on-site and off-site alcohol outlets and park environs. There were a total of 17 off-site alcohol outlets within 500 feet of the park environs, and 13 on-site outlets within 500 feet. For the buffer distance of 500 to 1,000 feet surrounding the park environs, there were 53 off-site outlets and 24 on-site outlets.

Concentrated Disadvantage Variables

Based upon the aforementioned predictive power of the concentrated disadvantage in the criminological literature, specific variables from the American Community Survey's 2005-2009 5-year estimates were selected for the analysis as proxies of concentrated disadvantage. Five year estimates were used due to the lack of availability of 2010 Census data at the block group level. Recent changes in data collection by the United States Census Bureau required the use of estimates instead of

complete counts because economic variables were not released at geographic units smaller than Census tracts.

Multiple studies have previously used selected sociodemographic variables in an index representing concentrated disadvantage to examine violent crime (Morenoff et al., 2001; Sampson et al., 1997; Warner, 2003). The variables indicative of concentrated disadvantage include percent of female headed households with children under age 18, percent of unemployed households, percent of families below the poverty line, percent of households receiving public assistance, and percent Black (Morenoff et al., 2001; Sampson et al., 1997; Warner, 2003). The limited statistical power of only having 59 units of analyses and the theoretical literature suggested the use of factor analysis to identify unidimensional measures to be used in an index. As shown in Table 1, measures indicative of disadvantage were combined into a composite index identified as the *concentrated disadvantage index*. The creation of the index was a data reduction technique which greatly reduced the number of neighborhood-level variables used in the multivariate analysis.

The construction of measurement indices is important to maintain validity and reliability of measures within a research study (Warner, 2008). The use of principal component analysis provided the ability to derive a small number of components that account for the variability found in the otherwise large number of measures (Curran, 2000; DeCoster, 1998). Factor analysis is utilized to determine if a group of measures are explaining the concept they are intended to measure by statistically demonstrating how well each individual measure fits into a specific group of measures.

Sample sizes must be considered prior to performing factor analysis. A minimum sample size of 48 cases has been shown acceptable by Barrett and Kline (1981) to be sufficient to perform factor analysis. Guadagnoli and Velicer (1988) had also argued that a factor with four or more loadings greater than 0.6 are reliable, regardless of sample size. The sample size of 59 in the present study is above the minimum number of cases for factor analysis suggested by Barrett and Kline (1981), and with four final factors and a minimum loading of 0.67, the factor analysis performed is considered reliable by Guadagnoli and Velicer's (1988) standards.

Initially, the measure of percent Black was included in the principal component analysis, but a scree plot of eigenvalues suggested only the measures of the percent of female headed households with children under age 18, percent of unemployed households, percent of families below the poverty line, and percent of households receiving public assistance should be extracted. Following the removal of the measure percent Black, the principal component analysis showed the four factors accounted for 63% of variance in the variable concentrated disadvantage. It should be noted that the small sample size is a limitation of the factor analysis but results are acceptable as noted above. Varimax rotation was utilized to simplify the factor structure, allowing an easier interpretation and more reliability of the measure (Cattell, 1978; Thurstone, 1947).

The construction of the composite index began by calculating standardized z scores for each of the extracted measures of concentrated disadvantage. The z scores were then summed to create a simple unit-weighted composite that corresponded to each factor. Table 1 displays the results of the factor analysis conducted for the measures of concentrated disadvantage.

Table 1

Concentrated disadvantage factor analysis*

Variable	Factor Loading
% Below Poverty Level	0.91
% Female Headed Households	0.85
% Received Public Assistance	0.73
% Unemployed (No Earnings)	0.67

*data from 2005-2009 American Community Survey 5-year estimates

The variable representing the percentage of Blacks in the population was computed to be used in the analysis. Previous studies which used concentrated disadvantage as a variable in multivariate analyses have created indices for concentrated disadvantage and have also tested the influence of race separately (Maggard, 2006; Morenoff et al., 2001; Parker & McCall, 1999; Parker & Reckenwald, 2008; Sampson et al., 1997; Warner, 2003). The inclusion of the percent Black variable in the analysis allows a more conclusive explanation when interpreting the findings.

The concentrated disadvantage measures were applied to the park environs by identifying which Census block group each park environ was located in. A spatial join was again used in GIS to combine the concentrated disadvantage index and percent Black variables to their respectful park environs. The process resulted in each park environ containing the sociodemographic data of the block group in which it resides.

Analysis Plan

This section of the chapter will depict precisely how the data was analyzed in the present study. Descriptive statistics of the dependent and independent variables will be presented. Next, a bivariate analysis will show the relationship between the independent

variables and park environ crime density. Lastly, the multivariate analysis consisting of five ordinary least squares (OLS) regression models, are presented and analyzed.

The first multivariate model includes only the dependent variable, violent crime density, and the predictor variables of the concentrated disadvantage index and percent Black. The model examines the impact of the concentrated disadvantage and race on violent crime density in the park environs.

The second model consists of an OLS regression equation containing the following independent variables: the number of off-site alcohol outlets within 500 feet of park environs, the concentrated disadvantage index and percent Black. The model investigates if there is a significant statistical relationship between the number of off-site alcohol outlets within 500 feet of park environs and violent crime, net the impact of concentrated disadvantage and percent Black.

The third model consists of an OLS regression equation containing the following variables: the number of off-site alcohol outlets located from 500 to 1,000 feet of park environs, the concentrated disadvantage index, percent Black, and off-site alcohol outlets within 500 feet of park environs. The model investigates if there is a significant relationship between the number of off-site alcohol outlets from 500 to 1,000 feet of park environs and violent crime, net the impact of concentrated disadvantage, percent Black, and off-site outlets within 500 feet of the park environs.

The fourth model consists of an OLS regression equation containing the following independent variables: the number of on-site alcohol outlets within 500 feet of park environs, the concentrated disadvantage index and percent Black. The model investigates if there is a significant statistical relationship between the number of on-site alcohol

outlets within 500 feet of park environs and violent crime, net the impact of concentrated disadvantage and percent Black.

The fifth model consists of an OLS regression equation containing the following variables: the number of on-site alcohol outlets located from 500 to 1,000 feet of park environs, the concentrated disadvantage index, percent Black, and on-site alcohol outlets within 500 feet of park environs. The model examines if there is a statistically significant relationship between the number of on-site alcohol outlets located from 500 to 1,000 feet of park environs, net the impact of concentrated disadvantage, percent Black, and on-site alcohol outlets within 500 feet of park environs.

The OLS regression models are used to reveal the relationships between the independent variables (the number of on-site and off-site alcohol outlets within 500 feet of park environs and from 500 to 1,000 feet of park environs) and the dependent variable (violent crime density) while considering the influence of predictors of concentrated disadvantage and percent Black. The analyses provides an indirect test of crime symbiosis as significant findings between alcohol outlets and violent crime density in park environs would show support for the existence of a possible symbiotic relationship between the two land uses.

This chapter has presented the specific variables used in the analysis and explained how they were identified, operationalized, and analyzed. The next chapter explains the results of the analyses.

CHAPTER FOUR RESULTS

This chapter presents the results of the analysis, and begins with descriptive statistics and then presents bivariate correlations. The chapter ends with the regression models that specifically examine the stated hypotheses. The analyses were conducted using SPSS (version 19). The regression models were additionally ran using GeoDa software in order to perform LaGrange multiplier examinations which were used to assess if a spatial lag or spatial error needed to be added to provide a complete model, as well as to diagnose any multicollinearity issues in the residuals of the regression models.

Further analysis of the dependent variable identified an extreme outlier. The skewed and kurtotic nature of the dependent variable prompted the removal of one of the park environs from the study. *Baxter Square Park* was found to have substantially higher crime densities than any of the other 59 park environs in the study. The increased crime density for this particular park environ can be attributed to the location of the park, which was situated in the center of a city-block and public housing apartment buildings, invisible to pedestrians or passers-by on the surrounding streets. Previous research has documented the impact of public housing on crime in surrounding areas (Holloway & McNulty, 2003; McNulty & Holloway, 2000; Roncek, Bell, & Francik, 1981). After the removal of the park, *Baxter Square*, the skewness and kurtosis of the dependent variables

was within acceptable ranges (see Table 2). After this step of data processing, a population of 59 neighborhood parks was identified.

A Global Moran's I was utilized to test the dependent variable for spatial autocorrelation, which is the clustering of like dependent variables among neighboring units of analysis (Chainey & Ratcliffe, 2005). The results revealed no evidence of spatial autocorrelation for violent crime density (Moran's I coefficient: 0.0027; p-value: 0.080; mean: -0.0174; SD: 0.0194; 999 permutations). The results indicate a spatial lag is not needed in the regression models.

Descriptive Statistics

Table 2 reports the descriptive statistics for the dependent variable and each of the independent and concentrated disadvantage (C.D.) variables. As shown, the density of violent crimes per park environ varied significantly with 26 individual park environs having violent crime densities of zero, and the highest having a density of 1.65 violent crimes per 10,000 square feet. Values for independent variables also range significantly.

The variable *On-site Alcohol Outlets (0-500 feet)* was skewed and kurtotic suggesting a statistical transformation would better fit the models. However, the variable was naturally logged and the multivariate analysis yielded nearly identical results, therefore, the findings reported are based on the non-transformed variable in order to provide more interpretable results.³

³ Results of OLS regression models which included the naturally logged transformed variable, *on-site outlets from 0-500ft.*: On-site outlets from 0-500 ft.: Violent crime density: $R^2=0.179$, R^2 (adj)=0.134, F-Value=3.990, $t=-0.680$, $\beta=-0.084$, $B=-0.085$; On-site outlets from 500-1,000 ft. (controlling for on-site outlets 0-500 ft.): Violent crime density: $R^2=0.183$, R^2 (adj)=0.123, F-Value=3.030, $t=-0.549$, $\beta=-0.076$, $B=-0.039$.

Two-tailed tests of significance: ** $p<.01$; * $p<.05$

Table 2Descriptive statistics

	Mean	SD	Min.	Max.	Skewness	Kurtosis
Dependent Variable						
Violent Crime Density (x10,000 ft. ²)	0.21	0.34	0.00	1.65	2.66	8.01
Independent Variables						
On-site Alcohol Outlets (0-500 ft)	0.22	0.85	0.00	6.00	5.78	37.70
Off-site Alcohol Outlets (0-500 ft)	0.29	0.62	0.00	3.00	2.46	6.60
On-site Alcohol Outlets (500-1,000 ft)	0.42	0.68	0.00	2.00	1.33	0.51
Off-site Alcohol Outlets (500-1,000 ft)	0.98	1.03	0.00	4.00	0.83	0.03
C.D. Variables						
% Black	30.18	32.60	0.00	97.51	0.96	-0.53
Concentrated Disadvantage Index	0.00	0.79	-1.08	2.08	0.86	-0.01

Bivariate Analysis

Table 3 displays Pearson correlations between all variables. The density of violent crime is shown to be positively and significantly correlated with off-site alcohol outlets within 500 feet of park environs, off-site alcohol outlets from 500-1,000 feet of park environs, the concentrated disadvantage index, and percent Black. Interestingly, a stronger relationship was found in the correlation between violent crime density and off-site outlets in the second block (500-1000ft.) surrounding park environs than in the immediate adjacent block (0-500ft.).

The variable *On-site (0-500 ft.)* displayed a significant positive correlation with on-site outlets from 500 to 1,000 feet of park environs. On-site and off-site outlets were not significantly correlated with each other. This non-significant finding is important because it explains the counts of one type of outlet do not influence the counts of the other. This makes the interpretations of the following multivariate models more powerful

in that there is no evidence of a significant relationship between the two types of outlets that are not controlled for in the regression models.

These correlations do not control for other external factors; therefore, they are of limited use in understanding the impact of alcohol outlets and concentrated disadvantage factors on violent crime densities. These correlations do provide information about the types of opportunity alcohol outlets and sociodemographics indicative of concentrated disadvantage create in park environs. The correlations do little in identifying cause and effect relationships, but the story they reveal is still valuable when examining the proposed crime symbiosis between the selected land uses. Next, the Pearson correlations between each specific alcohol outlet category and the variables of concentrated disadvantage and percent Black are identified. As before, I only discuss significant findings.

As displayed in Table 3, the two concentrated disadvantage variables, measured by the concentrated disadvantage index and percent Black, were positively and significantly correlated with each other. The concentrated disadvantage index was additionally, positively and significantly correlated with off-site alcohol outlets from 500-1,000 feet of park environs and violent crime density. The variable, percent Black, was also shown to be positively and significantly correlated with violent crime density and off-site outlets from 500-1,000 feet of park environs. Percent Black displayed the only observed significant negative correlation with on-site alcohol outlets from 500-1,000 feet of park environs.

The findings suggest that park environs with a greater percentage of Blacks will also display higher levels of concentrated disadvantage. They also suggest that higher

counts of off-site alcohol outlets from 500 to 1,000 feet of park environs are found surrounding park environs with higher levels of concentrated disadvantage, than those with lower levels. Park environs with higher levels of concentrated disadvantage also showed higher violent crime densities, overall. On-site outlets from 500 to 1,000 feet of park environs were significantly negatively correlated with the percent Black.

The higher strength of the Pearson correlation coefficients for off-site alcohol outlets suggests that off-site outlets may be more influential on crime densities than on-site alcohol outlets. Additionally, the previously mentioned routine activities associated with on-site alcohol outlets and the criminal opportunities present in park environs, suggest off-site alcohol outlets will have a greater impact violent crime densities. The correlations also suggest that the factors of concentrated disadvantage and percent Black play an important role in increasing violent crime density of park environs and counts of on-site and off-site alcohol outlets surrounding the park environs.

The results of the bivariate analysis indicate no problematic correlations between each of the explanatory variables, suggesting no issues of multicollinearity. The following section presents the results of the multivariate analysis.

Table 3Pearson bivariate correlations (N=59)

Variables	1.	2.	3.	4.	5.	6.	7.
1. Violent Density	1.00						
2. On-site (0-500ft)	-0.127	1.00					
3. Off-site (0-500 ft.)	0.288*	-0.057	1.00				
4. On-site (500-1,000 ft.)	-0.178	0.374**	-0.091	1.00			
5. Off-site (500-1,000 ft.)	0.496***	-0.075	0.062	-0.064	1.00		
6. C.D. Index	0.369**	-0.151	-0.043	-0.090	0.349**	1.00	
7. % Black	0.378**	0.205	0.205	-0.291*	0.332**	0.628***	1.00

Two-tailed tests of significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Multivariate Analysis

The analysis now turns to the results of multiple multivariate models that were used to test the study's hypotheses. Pre and post hoc statistical tests were performed to insure all assumptions of OLS models were met. Pearson correlations and tolerance/variation inflation factor (VIF) statistics were used for testing multicollinearity among the data. Linearity and homoscedasticity assumptions were tested by inspecting the descriptive statistics (min, max, and standard deviations) and using scatter plots which revealed no evidence of extreme heteroscedasticity or non-linearity. Diagnosis of residuals was performed using the Lagrange Multiplier (LM) test (Anselin, Bera, Florax, & Yoon, 1996). None of the LM-Lag, LM-Error, and LM-SARMA model fit statistics were significant in any of the models indicating that the results of the OLS regression models can be accepted as there is no indication of spatial autocorrelation or multicollinearity in the residuals.

The first model examines the power of the measures of concentrated disadvantage and percent Black, as predictors of violent crime density in park environs (Table 4). The OLS model was significant but failed to find the measures of concentrated disadvantage or percent Black significant predictors of violent crime density in park environs. The standard LaGrange multipliers for lag (0.088), error (0.42), and SARMA (1.32) were not significant, indicating no spatial autocorrelation or multicollinearity in the residuals of the model. The tolerances and variance inflation factors (VIF) were also examined to ensure levels of multicollinearity are within acceptable ranges. Tolerance values of 0.605 and VIF values of 1.652 are considered acceptable, as the tolerance is above 0.10 (Cohen, Cohen, West & Aiken, 2003), and the VIF is below 10 (Gujarati & Porter, 2009).

Table 4Model 1. OLS regression: Concentrated disadvantage index and percent black (N=59)

Variables	Violent Crime Density				
	B	S.E.	beta	Tolerance	VIF
C.D. Index	0.094	0.067	0.218	0.605	1.652
% Black	0.003	0.002	0.242	0.605	1.652
R ²	0.172				
R ² (adj)	0.142				
F-Value	5.810**				

Two-tailed tests of significance: *p< 0.05; **p< 0.01; ***p< 0.001

The second model of the analysis tests for a crime symbiosis between off-site alcohol outlets within 500 feet of park environs and park environs (Table 5). The regression analysis of Model 2 revealed the number of off-site alcohol outlets within 500 feet of park environs to be a significant predictor of violent crime density in the park environs. The positive unstandardized coefficient indicates that for each additional off-site alcohol outlet within 500 feet (one city block) of park environs, violent crime density per 10,000 ft² will increase by 0.151. The average sized park environ of 5.32 acres would have a violent crime density increase of 71.9%, as calculated by dividing the unstandardized coefficient by the mean violent crime density per 10,000 ft² (i.e., the mean counts of violent crime divided by the mean area of park environs). The measure of concentrated disadvantage and percent Black failed to reach statistical significance.

Post hoc tests were conducted to ensure the model produced unbiased estimators. Upon the inclusion of the land use variable the adjusted R² of Model 2 slightly increased from Model 1, from 0.142 to 0.198, signifying a marginal increase in model fit. The

standard LaGrange multipliers for lag (0.08), error (0.36), and SARMA (1.05) were not significant, indicating no spatial autocorrelation or multicollinearity in the residuals of the model. The tolerances and variance inflation factors (VIF) indicate levels of multicollinearity are within acceptable ranges. Having met the assumptions of OLS regression, the estimator can be considered unbiased, which allows for the acceptance of the findings indicating a crime symbiosis between off-site alcohol outlets within 500 feet of park environs and park environs.

Table 5

Model 2. OLS regression: Off-site alcohol outlets from 0-500 feet of park environs (N=59)

Variables	Violent Crime Density				
	B	S.E.	beta	Tolerance	VIF
Off-site Outlets 0-500ft.	0.151*	0.068	0.273	0.909	1.100
C.D. Index	0.127	0.067	0.295	0.574	1.741
% Black	0.001	0.002	0.137	0.551	1.815
R ²	0.239				
R ² (adj)	0.198				
F-Value	5.773**				

Two-tailed tests of significance: *p< 0.05; **p< 0.01; ***p< 0.001

The third model of the analysis tests for a crime symbiosis between off-site alcohol outlets located within 500 to 1,000 feet of park environs (Table 6). Mirroring results of the previous model, the regression model for off-site alcohol outlets from 500 to 1,000 feet of park environs revealed the off-site alcohol outlets to be a highly

significant predictor of increased violent crime density in the park environs. The positive unstandardized coefficient for off-site outlets from 500 to 1,000 feet of park environs indicates that for each additional off-site alcohol outlet within the second city block surrounding park environs, violent crime density per 10,000 ft² will increase by 0.129. The average sized park environ of 5.32 acres would have a violent crime density increase of 61.4%, The measure of concentrated disadvantage and percent Black failed to reach statistical significance.

The control variable of *off-site outlets (0-500 ft.)* remained a significant predictor of violent crime density and possessed higher predictability power than the variable being tested ($B = 0.129, p, 0.05$), *off-site outlets (500-1,000 ft.)* ($B = 0.143, p, 0.01$). Each additional off-site alcohol outlet within 500 feet of park environs will continue to impact violent crime density in conjunction with the number of off-site outlets in the second surrounding block. The positive unstandardized coefficient for off-site outlets within 500 feet of park environs indicates that every 1 additional off-site outlet within 500 feet increases violent crime density per 10,000 ft² by 68.1% in the average sized park environ. The examination of the control variable provides additional support for the role of off-site alcohol outlets as predictors of violent crime density in park environs. Additionally, these results are stronger than those of the previous model because the model is controlling for the off-site outlets in the neighboring block. The results of the previous model (Model 2) may be inflated by counts of off-site outlets in the 500-1,000 zone, or the second surrounding block, that were not accounted for in that model.

Additional post hoc tests were conducted to ensure the model produced unbiased estimators. The inclusion of a second land use variable further increased the adjusted R²

of Model 3 from Model 2, from 0.198 to 0.320, signifying a much better model fit. The standard LaGrange multipliers for lag (0.12), error (0.48), and SARMA (0.86) were not significant, indicating no spatial autocorrelation or multicollinearity in the residuals of the model. The tolerances and variance inflation factors (VIF) were also examined to ensure levels of multicollinearity are within acceptable ranges. Having met the assumptions of OLS regression, the estimator can be considered unbiased, which allows for the acceptance of the findings indicating a crime symbiosis between off-site alcohol outlets from 500 to 1,000 feet of park environs and park environs.

Table 6

Model 3. OLS regression: Off-site alcohol outlets from 500-1,000 feet of park environs (N=59)

Variables	Violent Crime Density				
	B	S.E.	beta	Tolerance	VIF
Off-site Outlets 500-1000ft.	0.129**	0.039	0.386	0.856	1.169
C.D. Index	0.087	0.063	0.201	0.552	1.810
% Black	0.001	0.002	0.071	0.541	1.849
Off-site Outlets 0-500ft.	0.143*	0.063	0.258	0.908	1.102
R ²	0.367				
R ² (adj)	0.320				
F-Value	7.829***				

Two-tailed tests of significance: *p< 0.05; **p< 0.01; ***p< 0.001

The fourth model of the analysis tests for a crime symbiosis between on-site alcohol outlets within 500 feet of park environs and park environs (Table 7). The regression analysis of Model 4, although a statistically significant model, revealed the

number of on-site alcohol outlets within 500 feet of park environs was not a significant predictor of increased violent crime density in the park environs. The measure of concentrated disadvantage and percent Black also failed to reach statistical significance.

Additional post hoc tests were conducted to ensure the model produced unbiased estimators. Upon the inclusion of the land use variable the adjusted R^2 of Model 4 slightly decreased from Model 1, from 0.142 to 0.130, signifying a marginal decrease of model fit. The standard LaGrange multipliers for lag (0.08), error (0.42), and SARMA (1.49) were not significant, indicating no spatial autocorrelation or multicollinearity in the residuals of the model. The tolerances and variance inflation factors (VIF) were also examined to ensure levels of multicollinearity are within acceptable ranges. Having met the assumptions of OLS regression, the estimator can be considered unbiased, which allows for the acceptance of the findings indicating a lack of support for a crime symbiosis between on-site alcohol outlets within 500 feet of park environs and park environs.

Table 7

Model 4. OLS regression: On-site alcohol outlets from 0-500 feet of park environs (N=59)

Variables	Violent Crime Density				
	B	S.E.	beta	Tolerance	VIF
On-site Outlets 0-500ft.	-0.023	0.050	-0.059	0.971	1.029
C.D. Index	0.091	0.068	0.212	0.602	1.661
% Black	0.002	0.002	0.236	0.602	1.662
R ²	0.175				
R ² (adj)	0.130				
F-Value	3.894**				

Two-tailed tests of significance: *p< 0.05; **p< 0.01; ***p< 0.001

The fifth and final model of the analysis tests for a crime symbiosis between on-site alcohol outlets from 500 to 1,000 feet of park environs (Table 8). Mirroring results of the previous model, the statistically significant regression model revealed that on-site alcohol outlets from 500 to 1,000 feet of park environs were not significant predictors of violent crime density at the park environs. The measures of concentrated disadvantage and percent Black also failed to reach statistical significance. The control of *on-site outlets (0-500 ft.)*, remained a non-significant predictor of violent crime density.

Additional post hoc tests were conducted to ensure the model produced unbiased estimators. The inclusion of a second land use variable further decreased the adjusted R² of Model 5 from Model 4, from 0.130 to 0.120, signifying a decreased model fit. The standard LaGrange multipliers for lag (0.05), error (0.37), and SARMA (1.85) were not significant, indicating no spatial autocorrelation or multicollinearity in the residuals of the

model. The tolerances and variance inflation factors (VIF) were also examined to ensure levels of multicollinearity are within acceptable ranges. Having met the assumptions of OLS regression, the estimator can be considered unbiased, which allows for the acceptance of the findings indicating a lack of a crime symbiosis between on-site alcohol outlets from 500 to 1,000 feet of park environs and park environs.

Table 8

Model 5. OLS regression: On-site alcohol outlets from 500-1,000 feet of park environs (N=59)

Variables	Violent Crime Density				
	B	S.E.	beta	Tolerance	VIF
On-site Outlets 500-1000ft.	-0.044	0.070	-0.087	0.783	1.277
C.D. Index	0.098	0.069	0.228	0.587	1.705
% Black	0.002	0.002	0.205	0.549	1.822
On-site Outlets 0-500ft.	-0.011	0.054	-0.028	0.845	1.184
R ²	0.181				
R ² (adj)	0.120				
F-Value	2.986*				

Two-tailed tests of significance: *p< 0.05; **p< 0.01; ***p< 0.001

Concluding Remarks

This chapter performed data analysis consisting of two parts: descriptive and inferential. The descriptive statistics summarized the attributes of the dependent, independent and concentrated disadvantage variables of interest. The inferential statistics were presented through a bivariate analysis in order to examine the relationships between the dependent and predictor variables, as well as through various OLS regression models

used to test the hypotheses of interest. The results of OLS regression analysis revealed that among the selected predictor variables, only off-site alcohol outlets were a significant predictor in explaining the variance in violent crime densities in park environs. The remaining independent variables, on-site outlets located in both zones, were not significant predictors according to the OLS regression results. In other words, the predictors which were not shown to be significant predictors of crime densities failed to contribute significantly to the OLS models.

Table 9

Hypothesis testing at a glance

	<i>Hypotheses</i>	<i>Results</i>
H ₁	Neighborhood park environs with a larger number of off-site alcohol outlets within 500 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.	Supported
H ₂	Neighborhood park environs with a larger number of off-site alcohol outlets from 500 to 1,000 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.	Supported
H ₃	Neighborhood park environs with a larger number of on-site alcohol outlets within 500 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.	Not Supported
H ₄	Neighborhood park environs with a larger number of on-site alcohol outlets from 500 to 1,000 feet will have higher violent crime levels, net the effects of sociodemographic indicators of concentrated disadvantage.	Not Supported

A comparison between the Pearson correlations and OLS regression results shows the importance of controlling for external variables. For instance, the dependent variable of

violent crime density was highly significantly correlated with the concentrated disadvantage index and percent Black, but when controlling for one another, or off-site or on-site alcohol outlets, the measure of concentrated disadvantage and percent Black were no longer significant. Results illustrate the environmental variables related to opportunity were stronger predictors of crime densities in the park environs than the neighborhood sociodemographic measures examined.

In the next chapter, a summary and discussion of the results introduced in this chapter are presented with a general summary of the present study. In addition, policy implications are discussed. To conclude, limitations of the present study and recommendations for future research are identified and explained.

CHAPTER FIVE

SUMMARY AND CONCLUSION

This final chapter begins with a discussion of the findings reported in the preceding chapter. Possible implications for policy makers are also offered. The chapter also discusses the limitations of the study and the issues that should be addressed by future studies.

Discussion of Findings

The results of OLS regression analysis indicate that off-site alcohol outlets within 500 feet of park environs are significant predictors of violent crime density, meaning as the number of off-site outlets within 500 feet, or one city-block increase, violent crime density within the park environs will also increase. The reason that the off-site alcohol outlets located within the immediate surrounding block of park environs is related to higher violent crime density within the park environs is likely due to a crime symbiosis between the two land uses. The interaction between the daily, routine activities of each land use results in more crime opportunity and therefore, increased violent crime levels in the nearby park environs.

The independent variable, *off-site outlets (500-1,000 ft.)*, is also positively related to violent crime density, meaning as the number of off-site alcohol outlets located within 500 to 1,000 feet, or the second block adjacent to park environs increases, violent crime

density within the park environs will also increase. The significant findings at this distance align closely to the presented literature which showed alcohol outlets impact crime out to a distance of two blocks away (Block & Block, 1995; Loukaitou-Sideris, 1999; Loukaitou-Sideris et al., 2002; Rengert et al., 2005; Roncek & Maier, 1991).

The statistically significant positive relationship between both categories of off-site alcohol outlets and violent crime density also provide support to the previous spatial research studying crime's relationship with specific land uses (Block & Block, 1995; Felson, 2008; Groff & McCord, 2012; Kurtz et al., 1998; LaGrange, 1999; Loukaitou-Sideris, 1999; Loukaitou-Sideris et al., 2002; Rengert et al., 2005; Roncek & Maier, 1991). The findings contribute to gaps in the current body of literature, as mentioned in the literature review as being a lack of empirical spatial research connecting parks and crime, and an examination of the effects of off-site and on-site alcohol outlets separately concerning their effects on crime. The study is also one of the first tests of crime symbiosis, and identifying it as such.

The significant findings of off-site outlets provide support for the theoretical argument of off-site alcohol outlets having a symbiotic relationship with park environs. By examining the counts of off-site alcohol outlets and the density of violent crime in park environs, an indirect test of the interaction between the land uses was accomplished. The significant relationship of off-site outlets with violent crime density within park environs illustrates that a relationship exists between these two land uses. The findings suggest offenders were likely drawn from the liquor stores, convenience stores, or gas stations to the park environs due to some perceived crime opportunity, theoretically created by the low levels of guardianship at these locations. The opportunities could

range from a suitable location to consume alcohol in public which was recently purchased without harassment by others, to a location that is more suited for a murder, robbery, rape, or assault. Acting as an attractor of motivated offenders, the off-site alcohol outlets increase the concentrations of motivated offenders in the neighborhood parks. The legitimate routine activities and low levels of guardianship associated with park environs provided crime opportunities to motivated offenders.

The on-site alcohol outlets were not associated with violent crime in the park environs. On-site alcohol outlets located within the first or second city-block of park environs may have not contributed to violent crime density for multiple reasons. The two possible reasons were mentioned in chapter 3, as on-site outlets provide a more controlled social environment, with active, responsible place managers controlling individual's amount of drinking, and due to on-site establishments not allowing consumers into public with bottles or other alcohol containers which can potentially be used as weapons. The influence of alcohol on aggression and lowered inhibitions has been documented and outlined in chapter 2. Finally, alcohol at on-site locations typically costs more as patrons incur overhead costs imposed by the establishment. The increased costs are likely to deter drinking, intoxication levels, and possibly motivated offenders.

A reduced number of motivated offenders in the area around park environs, lower levels of highly intoxicated targets or offenders, and a higher percentage of unarmed offenders will theoretically result in reduced densities of violent crime in park environs. The indirect, statistical tests which measured the previous statement found support for these theoretical assumptions.

The current study's findings are consistent with the observations expressed in Knutsson's (1997) study. In his study, Knutsson observed the activities of two parks that were known for violent and property crime and disorder problems. In one of his findings, he noted observing individuals exiting a nearby liquor store and entering the park. While in the park, the individuals congregated and consumed alcohol and often took part in drug use, activities which incited fights among the alcohol/drug users and other rowdy, unruly behavior. The activities of the group deterred legitimate users from those areas, and at times, from the entire park. The combination of alcohol use and low guardianship created the opportunities for violent crime to occur. To combat the problems, an increased police presence around the parks and a specialized task force worked within the parks to dramatically reduce those congregations, the public consumption of alcohol and drug use, and reduce legitimate users fear of crime of the parks. The police actions provided and allowed for increased guardianship of the parks. Knutsson's (1997) study was the inspiration to explain the interactions between the routine activities associated with two different land uses (alcohol outlets and parks) through the concept of crime symbiosis and to examine the relationship empirically through the present research.

The sociodemographic variables of percent Black and the concentrated disadvantage index failed to reach significance in all regression models. The lack of predictive power of these two variables is likely due to one reason, the unit of analysis, that is, a place instead of an area. The majority of the area of the unit of analysis, the park environ, is the park itself, with the remainder comprised of bordering streets and sidewalks. The precise nature of the unit of analysis reduces the predictive power of the sociodemographic variables, which otherwise are commonly shown to be of significance

in studies of neighborhoods, block groups, or larger units of analyses (Gruenewald et al., 2006; Loukaitou-Sideris et al., 2002; Roncek, 1981; 1991; Roncek & Maier, 1991; Scribner et al., 1999).

The sociodemographic variable's lack of significance may also be explained by other spatial research which has identified land uses, and characteristics thereof, to be stronger predictors of crime than the sociodemographics of the study area (Madensen, 2007; Schmerler et al., 2009). Madensen (2007) compared the predictive power of a characteristic of bars, place management, to the impact of sociodemographic variables of the neighborhoods which contained the bars. The study found support for both to be influential on violence at bars, but it was also shown that high violence bars were located in very close proximity to low violence bars. This later negates the impact of neighborhood sociodemographics as both establishments are in the same neighborhood, leading one to understand that place management, or some other untested feature of the location, has more of an influence over increases or decreases in violence. Schmerler et al. (2009) had similar findings when examining budget motels in Chula Vista, California. Motels with high numbers of annual calls for service were located across the street or in close proximity to those with low numbers of annual calls for service, again identifying place management, not sociodemographics, as a contributor to the increase or decrease in calls for service. Concentrated disadvantage is shown to be a neighborhood process which may not apply at places with all of their particular characteristics and how they are managed.

In terms of the generalizability of the findings of this study, the generalizability is unknown until further research is able to replicate the methodology and findings. The

results of those studies, coupled with findings from this study and the limited research currently available in relation to parks and crime, creates the generalizability needed to apply a generic solution to a widespread issue. The data used in this study was representative of only one city, but consisted of all neighborhood parks in the study area which were widely dispersed from the concentrated downtown areas to the more suburban settings within the Louisville Metro area. The parks were also located in areas varying in levels of concentrated disadvantage and percent Black. Unlike studies completed which examined parks only in a dense urban setting, the examination of parks in Louisville Metro allows for more generalizable results.

Policy Implications

The findings of this study suggest that a crime symbiosis may exist between parks and nearby off-site alcohol outlets. The findings provide knowledge that should be utilized in conjunction with future research to inform policy which would be focused towards the prevention of crimes in park environs. The first implication concerns itself with urban planning and land use regulation. The city government is responsible for the health, safety, and welfare of the public (Cullingworth & Caves, 2003). Local governments possess great power to control the environments within a city by regulating the placement and utilization of land use. Cities can utilize this power and reduce crime through zoning and business license regulations and city ordinances. Nolan and Salkin (2006) explain that legally, local governments must provide a reasonable connection between a proposed regulatory action, the nuisance land use, and the effects that the nuisance land use has on crime in order to justify new rules and regulations to a court of

law. Criminological studies are accepted by the courts to provide such a connection, displaying the importance of this research and others of similar nature.

Government entities could use the findings of this particular study to inform reviews of liquor licensing requests, including new licenses and renewals. These reviews could include information concerning the potential crime impacts of the establishments on nearby land uses, such as parks. City governments may also address crime prevention through environmental design (CPTED) within parks that are near alcohol outlets, particularly, off-site outlets. Park design should focus on sightlines, tree-trimming, lighting, and the overall design and placement of park amenities to attract and increase surveillance and guardianship by legitimate users of the park. Based on the results of the present study, additional recommendations include the closures of entrances/exits that are near, or face in the direction of off-site alcohol outlets to create a boundary to disrupt pathways between the two land uses, and additional analysis of 'high problem' park environs to create a basis for problem oriented policing (POP) projects and the innovative problem solving they produce (Clarke & Eck, 2003).

The establishment of a neighborhood watch in park neighborhoods may also be a practical way to improve the level of guardianship in neighborhood park environs. Previous studies showed crime opportunities in neighborhood parks are likely created due to a lack of guardianship at the locations (Groff & McCord, 2012; Denton et al., 2011). Therefore, by improving the level of guardianship, opportunities for crime will be reduced. The reduction in crime opportunity should theoretically reduce the crime symbiosis observed between off-site alcohol outlets and parks. Future research should

evaluate the effectiveness of all programs or policies implemented to respond to a crime symbiosis between land uses.

Knowledge obtained from this study and others that identify a specific crime symbiosis between neighboring land uses are especially useful to police departments. Policing techniques, including problem-oriented policing—which emphasizes the identification and analysis of hot spots of crime, attempts to discover and understand the underlying issues that cause the crime problems, and respond with focused and innovative tactics in order to reduce crime levels (Clarke & Eck, 2003)—can greatly benefit from the knowledge obtained of symbiotic relationships between land uses to improve the effectiveness of the techniques. The effectiveness can be best improved by using the knowledge of crime symbiosis when examining the underlying causes of crime problems in hot spots. Hot spot identification and analysis has become an integral part of modern policing, but the understanding of the underlying conditions often requires more knowledge about crime, opportunity theories, as well as a glossary of criminogenic land uses. Criminological studies, as this one, have not added to the growing list of criminogenic land uses, but have begun to identify criminogenic land use interactions, which are likely to become an ever-expanding tool for police department’s problem solving and hot spot policing strategies.

Limitations

The small number of units of analyses in the regression analysis is an obvious limitation of the study. The use of only 59 park environs, thus having limited statistical power, allowed only a small number of predictor variables in the regression models. As a data reduction technique, factor analysis was utilized to reduce the number of

sociodemographic variables indicative of concentrated disadvantage into a composite index.

The lack of statistical power also prevented the inclusion of additional variables that relate to parks characteristics (e.g., the presence of picnic tables, benches, restrooms, water fountains, athletic fields, pavilions) which have been shown to impact crime in neighborhood parks (Groff & McCord, 2012). The inclusion of those park characteristics could aid in further explanation of what it is about the park environs that appeal to motivated offenders. Additional variables for other land uses neighboring park environs, which too may impact the number and types of crimes committed in the park environs would have also been considered, given greater statistical power. The land uses which should be considered can be found in the growing body of spatial criminological literature that has began compiling common land uses that have been shown to increase certain types of crimes in their surroundings (Brantingham & Brantingham, 1995; Groff & McCord, 2012; Roncek & Bell, 1981; Roncek & Maier, 1991).

The study only examined violent crime due to the current empirical research which has identified strong relationships between alcohol outlets and violent crimes, and due to its increased accuracy of reporting. Additional analysis of other crime types including property and disorder crimes could provide an additional understanding of the symbiotic relationship found to exist between off-site alcohol outlets and neighborhood parks.

Chainey and Ratcliffe (2005) identified several inaccuracies that can occur with geocoded data, including, but not limited to, address errors in data files, improper geocoding acceptance levels, and the nature of estimating address placement on the

street-line segments that electronic mapping uses when placing crime incidents on a map. As this study used geocoded police data, some of these inaccuracies may have been present. To eliminate and moderate the remaining affects of these inaccuracies, great attention was paid to the data which was to be geocoded, the geocoding process, and in the selection of analytic methods. The study used all reported violent crime incidents, spanning three years. Substantial amounts of time were used to clean addresses of the crime data prior to geocoding, then to rematch as many possible addresses that failed to successfully geocode. The use of the park environ further eliminated possible data or geocoding inaccuracies by not only including crime incidents from an exact address, but within a 50 foot buffer extending from the neighborhood parks, which included adjacent street intersections and addresses that could have been used to document the location of crimes. The geocoding hit rates of 94% for the crime data and 100% for the alcohol outlets, clearly exceeded the empirically derived standard of 85% by Ratcliffe (2001, 2004), and the 90% required for mapping by Bichler and Balchak (2007).

The present study conducted only an indirect test of crime symbiosis between alcohol outlets and neighborhood parks by testing the significance of the counts of a neighboring land use, off-site or on-site alcohol outlets, on violent crime density in the neighborhood park environs. Significant results provided support for a crime symbiosis because the off-site alcohol outlets were shown to be a statistically significant predictor of crime within the park environs. Future research testing for more proof of a crime symbiosis is essential and would require the researchers to physically observe offenders leaving on-site or off-site alcohol outlets and travel to nearby neighborhood parks to commit a crime. Future studies may also survey or interview offenders who had

committed a crime in a park environ and ask questions concerning their routine activities and if they visited an alcohol outlet prior to committing their crime(s).

Lastly, OLS regression cannot identify causal order with cross sectional data. OLS cannot say which came first, it can only identify if a relationship exists between 'x' variables while controlling for 'y' variables. Different analytic methods can be used in conjunction with longitudinal data to provide answers of causality that this study could not provide. It is recommended for future research to test for causality in a crime symbiosis to provide stronger support for the relationship between multiple land uses.

The study has multiple strengths which should alleviate some of the concerns about limitations. First, a very diverse city, both geographically and socioeconomically, was selected for the study. Second, the data included all reported incidents of violent crime over a three year period to ensure the analysis controlled for yearly and seasonal fluctuations. Third, the methodology utilized includes sociodemographic factors of concentrated disadvantage as controls which have been previously shown in impact violent crime levels (Sampson et al., 1997; Warner, 2003). Fourth, OLS regression models were appropriately selected and used to model violent crime density data. Fifth, the selection of the examined land uses and theoretical basis was based on prior research.

Future Research

Future research should attempt to eliminate the limitations identified in the present study by adhering to guidance set forth in the previous section. The results of the current study suggest a standardized methodology is necessary to fully understand crime at a place, or at the neighborhood level. Research at this level must have statistical models that include both land use and sociodemographic variables.

Additional research is needed to identify specific types of criminogenic land uses and how those land uses may interact with others through a crime symbiosis. During the course of this study, multiple ideas for future research were acquired. For instance, an examination of the impact of public housing on crime in neighborhood park environs would seem useful since the park, *Baxter Square*, had to be excluded from this study due to being an outlier because of its unusually high density of crime and the fact that it was completely surrounded by a public housing complex. Qualitative research, similar to Knutsson's (1997) study, using observations to study the physical relationships between alcohol outlets in park environs would greatly add to the findings of the present study, as the current data only allows a theorized relationship. Qualitative observations would provide the evidence needed to directly state the proposed relationship between the two land uses. Survey or interview research of offenders who committed offenses within park environs would likely reveal precisely what features about the park environs made them suitable places to commit crimes. An examination of high crime bars versus low crime bars and an evaluation of their impact on crime densities in park environs would reveal if it is just the type of establishment that impacts crime, or can place management negate the effects of establishment use. A study which further examines on-site outlets may possibly find particular types to be predictors of crime in park environs. Lastly, an interaction between crime symbiosis and concentrated disadvantage may exist. Future research should include methodology which tests for interactions between the sociodemographics indicative of concentrated disadvantage and land use variables.

Conclusion

The current research posed the following research question: Is there evidence that crime symbiosis exists between alcohol outlets and neighboring parks? The findings

explicitly answered the question by testing the developed hypotheses. The results showed that off-site alcohol outlets were the only alcohol related predictor significantly related to violent crime density in nearby park environs. These results were found significant at both distances examined by the study; within the immediate adjacent block of park environs (0-500 feet) and in the second surrounding block (500-1,000 feet). These findings show support for a crime symbiosis between off-site alcohol outlets and neighborhood parks. The findings also support the importance of understanding crime in neighborhoods as a product of land use, and land use interactions. It also has important implications for public policy and crime response/prevention efforts.

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