

**THE BUILT ENVIRONMENT AND CRIME: A COMPARATIVE STUDY OF
DETROIT AND PHILADELPHIA**

by

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A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Arts in Sociology

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You are not allowed to quit. You may only quit after you've done it to the best of your ability and decided to. Otherwise it's not quitting. It's failing.

Kick its ass. Then decide that you don't want it. Don't let it decide it doesn't want you.

- *James Pickens Jr. as Richard Webber (Grey's Anatomy)*

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TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
ABSTRACT	ix

Chapter

1	INTRODUCTION	1
	Philadelphia.....	3
	Detroit	4
	Significance of the Current Study.....	6
2	THEORETICAL UNDERPINNINGS.....	8
	Social Disorganization	8
	Routine Activities Theory	8
	Conceptualizing the Built Environment.....	9
	Review of Literature: Physical Environment.....	9
	Businesses	10
	Alcohol Establishment Density.....	11
	Parks.....	12
3	DATA	15
	Statistical Methods.....	15
4	RESULTS	18
	Descriptives.....	18
	Philadelphia.....	18
	Detroit	19
	Hypothesis One.....	21
	Philadelphia.....	21
	Detroit	22
	Research Question and Hypothesis Two	24
	Philadelphia.....	25

Park Coverage.....	26
Family Disruption.....	26
Detroit.....	26
Park Coverage.....	27
Female Headed Household.....	27
Economic Deprivation.....	27
5 DISCUSSION AND CONCLUSION.....	31
Limitations and Future Directions.....	33
REFERENCES.....	37
Appendix	
A DATA DEFINITIONS AND SOURCES.....	47
Data definitions.....	47
B FIGURES.....	50

LIST OF TABLES

Table 1	Descriptive Statistics.....	20
Table 2	Factor Analysis	23
Table 3	Correlation Matrix	24
Table 4	Regression Coefficients	29

LIST OF FIGURES

Figure 1	Park Coverage in Philadelphia.....	50
Figure 2	People in Poverty in Philadelphia	51
Figure 3	Park Coverage in Detroit	52
Figure 4	People in Poverty in Detroit.....	53

ABSTRACT

Previous research of urban crime and urban disadvantage has suggested that urban crime is exacerbated by poverty (Kirvo & Peterson, 1996; Hsieh & Pugh 1993; Ludwig et al, 2001; Patterson, 1991; Steffensmeier & Haynie, 2000) that urban crime is a reflection of culture (Garland, 2000; Hall & Winlow 2005; Neuberger, 1993) and due to class differences (Hagedorn & Macon, 1988; Van Dusen et al, 1983; White & Cunneen, 2006). Studies have even suggested that community structure is conducive to crime (Hipp, 2007; Sampson & Groves, 1989; Veysey & Messner, 1999). Few studies have focused on how the environment in which these social phenomena take place may play a role in maintaining cycles of disadvantage and crime in urban low-income neighborhoods. The built environment, similar to crime generators and attractors, is a distinct yet related concept where land use influences various aspects of life on a sociological level. The built environment can be thought of in three ways theoretically – communities and neighborhoods, physical spaces such as street segments, and nonresidential establishments such as businesses or recreational spaces such as parks. The purpose of this study is to determine if physical or environmental characteristics of places has an effect on crime when social characteristics of the population are also considered. Results suggest that park coverage maintains an effect on crime when traditional social factors are considered. Three key findings are: 1) park coverage is used as a measure of the built environment and is statistically significant for both Philadelphia and Detroit at the census tract level, 2) parks are a characteristic of urban neighborhoods separate of structural indicators of disadvantage, 3) park coverage has a significant and negative affect on violent crime independent of traditional structural factors.

Chapter 1

INTRODUCTION

There is a reason that traditional social characteristics of a population are persistently indicative of disadvantage and crime. Previous research has found that social factors do matter, particularly, poverty (Kirvo & Peterson, 1996; Hsieh & Pugh 1993; Ludwig et al, 2001; Patterson, 1991; Steffensmeier & Haynie, 2000), family disruption (Messner & Sampson, 1991; Sampson, 1987, 1989; Shihadeh & Steffensmeier, 1994; Veysey & Messner, 1999), and racial segregation (Peterson & Krivo, 1993; Rugh & Massey, 2010; Sampson & Wilson, 1995; Shihadeh & Flynn, 1996). However, the environment in which these social factors are being measured also likely matters.

Few recent studies have focused on how the built environment may play a role in maintaining cycles of poverty and crime in urban low-income neighborhoods. However, the idea that crime is associated with the physical environment in which it occurs is not new (Brantingham & Brantingham, 1993; Kinney et al, 2008; Stucky & Ottensmann, 2009). Consideration of the relationship between land use and crime has a long history in criminological research, which dates back to at least early studies in the Chicago School (Burgess, 1916; Shaw and McKay, 1972 [1942]). Land uses are discussed in several lines of research that include Jacobs' (1961) and Newman's (1971) early work on urban landscapes and crime, Brantingham and Brantingham's (1981) crime pattern theory, routine activity/opportunity theories (Cohen and Felson, 1979; Kennedy and Forde, 1990), hot spots research (Loukaitou-Sideris, 1999; Sherman,

Gartin, and Buerger, 1989; Weisburd et al., 2004), and research on crime prevention through environmental design (Eck, 2003; Felson, 2002; Jeffery, 1976, 1977; Lab, 1992; Plaster-Carter, Carter, and Dannenberg, 2003).

Despite this long-standing, periodic attention to land use (Duffala, 1976; Fowler, 1987; Greenberg, Rohe, and Williams, 1982; Greenberg and Rohe, 1984; Ley and Cybriwsky, 1996; Lockwood, 2007; Smith, Frazee, and Davison, 2000; White, 1932; Wilcox et al., 2004), it has not figured prominently in research. Thus, land use is seemingly absent from ecological tests of crime.

The goal of this thesis is to consider the role of built environment on crime in two urban cities while also accounting for structural factors of place, specifically the focus is on park coverage for this study. The built environment can be considered in one of three ways theoretically: 1) communities and neighborhoods (social disorganization theory), 2) physical spaces such as street segments (routine activities theory), 3) nonresidential establishments such as businesses or recreational spaces such as parks (crime generators and attractors). Social disorganization theory established that neighborhood/community context matters when measuring crime (Shaw & McKay, 1942; Sampson & Groves, 1989). Routine activities theory (RAT) went a step further and suggested that not only does place matter but so too does micro-place (Felson, 1994; Miethe & Meier, 1994; Eck, 1995; Groff & Lockwood, 2013). In a similar vein as rational choice theory, Kinney et al (2008) consider businesses and other non-residential establishments crime attractors/generators and detractors, which establishes the importance of the built environment in ecological analyses of crime. I cover the significance of this study in the context of two cities, Philadelphia and Detroit. Then I offer the results of the study, followed by key findings.

Philadelphia

The national poverty rate in 2016 (the most recent data available) was 12.7 percent (US Census, 2016). In comparison, of the 1.5 million people living in Philadelphia, 25.7 percent live below the poverty line, double the national rate (US Census, 2016). In fact, Philadelphia's poverty rate is the highest among U.S. big cities. The U.S. Census American Community Survey shows the city's poverty rate remained stagnant at approximately 25 percent in 2016, even as poverty generally declined across the country, leaving Philadelphia the poorest of the 10 most populated cities in the U.S. (Romero, 2017; The US Census, 2016). For this reason, Philadelphia is considered America's poorest big city (Lubrano, 2017; Philadelphia Research Initiative, 2017; Romero, 2017; Trinacria, 2017). Philadelphia's poverty has been studied and has persisted over time (Levenstein, 2009; Kasandra, 1993; Alexander, 1980; Nash, 1976).

It also of importance to note that with regard to inequality and disparity, studies have found, in Philadelphia specifically, that majority minority neighborhoods are negatively disposed toward police and that this is grounded in the lived experience of negative encounters with law enforcement (Carr et al, 2007). Also, police response to the sexual assault of black women in Philadelphia in general, and lower-class black women in particular, has been shown to be less than optimal (Irving, 2008). Over policing of certain crimes and under policing of others helps to create disparity and maintain crime in poverty-stricken neighborhoods. That is, lack of trust in police fosters a distrust in the criminal justice system in general. Lack of trust also very likely prevents crime reporting. In short, this is illustrative of how many different aspects help construct complex social hierarchies that in turn structure communities.

The correlation between poverty and crime in urban settings has been well documented (Arvanites, 2014; Graif, Gladfelter, & Matthews, 2014; Hsieh & Pugh,

1993; Ludwig, Duncan & Hirschfield, 2001). Therefore, it is no surprise that the overall violent crime count for Philadelphia in 2014 (the most recent government data available) was 15, 925 with a rate of 1,021.4 per 100,000 (Uniform Crime Report, 2014). That rate is mostly comprised of robbery (447.1) and aggravated assault (481.1). Also, Trace, an independent nonprofit news organization, ranked Philadelphia as one of the more crime prone cities in America, their focus being homicide rates. Trace based its rankings on an analysis of official FBI crime data from the Uniform Crime Report (Trace, 2017). Though not number one on their list, Philadelphia still has a high rate of crime relative to its population, suggesting that the correlation between poverty and crime in urban settings is still relevant and requires further consideration.

Figure 1 shows a map of park coverage in Philadelphia.¹ Note that park coverage appears to be highly concentrated (Figure 1). That is, most park coverage in Philadelphia appears to be relegated to certain areas of the city. Figure 2 shows a map of people in poverty in Philadelphia. Note that poverty appears to also be more heavily concentrated in certain areas of the city.

Detroit

Similarly, Detroit is well known for its poverty and crime. According to the US Census (2016) roughly 39.4 percent of Detroit's population (673,104) lives in poverty. That is over triple the national average of 12.7 percent and is nearly double Philadelphia's average of 25.7 percent (US Census, 2016). The overall violent crime

¹ Maps of poverty for both Philadelphia and Detroit were created using 5 years of the most recent data available from the US Census. This was done to create the most accurate, current picture of poverty for both cities.

count for Detroit in 2014 was 13,622 with a rate of 1,989.5 per 100,000 (Uniform Crime Report, 2014), nearly double that of Philadelphia. Also, like Philadelphia that rate is most comprised of robbery (521.8) and aggravated assault (1,342.8). True to the literature, for the year 2014, Detroit had more poverty than Philadelphia and thus more crime.²

Given the statistics above, it comes as no surprise that Detroit was ranked number one on Forbe's List of America's Most Dangerous Cities (Fisher, 2015). Trace ranked it number two in the nation for homicide (Trace, 2017). Detroit's violent crime stats relative to its poverty suggests that the correlation between poverty and crime in urban settings is still pertinent. Both Detroit and Philadelphia's high rates of violent crime relative to the cities' population, strongly suggest that the correlation between poverty and crime in the urban setting is still relevant and requires further consideration.

However, Detroit's maps of park coverage (Figure 3) and poverty (Figure 4) do not necessarily resemble Philadelphia's. Figure 3 shows that Detroit's park coverage is far more scattered than concentrated and park coverage is sparse in general. Figure 4 shows that, like Philadelphia, poverty is heavily concentrated in certain areas of Detroit.

That said, Detroit and Philadelphia prove good cases for study not only because of their similarities but because of their differences as well (namely their difference in economic development). The economic history and development of wealth disparities of each city is different yet equally of importance. For example, concentrated poverty in Detroit has mainly been attributed to the industrial decline and uneven economic growth (Grengs, 2007; Kasarda, 1993; Wilson, 1992), which ultimately left Detroit a

² This trend also appears to maintain within aggregated years of violent crime data. See table 1.

majority hegemonic city ravaged with poverty as a whole. On the other hand, Philadelphia's persistent concentrated poverty has mostly been attributed to residential segregation (Massey, 1993; Roisman, 1994) and discriminatory economic policies (Wilson, 2008) which left Philadelphia more diverse but also highly racially segregated with most of the disadvantage concentrated in non-white neighborhoods and communities. This is mostly important in that a city's physical environment is likely shaped by its disparities, which are shaped by the economic history and development of said city. Given that Detroit is overall an impoverished city more so than a city with a large wealth gap like Philadelphia, park coverage and the physical environment in general is bound to look different for each city. Thus, an analysis these two cities with similar social issues but different histories of disadvantaged development would provide an important contribution to the literature, which brings me to the overall significance of this study.³

Significance of the Current Study

Studies have documented that parks have positive effect in communities. They have been shown to promote stronger mental health (Sturm & Cohen, 2014; McDonald, 2015), more physical activity (Cohen et al, 2007), and – as a space where people in the community can gather – have the ability to promote collective efficacy (social cohesion

³ Future studies of parks should look into what is considered park space in urban communities. I would assume that in such a poor city many of the spaces that are considered parks are possibly little more than a concrete slab with a basketball hoop and a bench. This assumption comes from the fact that various studies have documented the difference in community quality and access relative to the income of its inhabitants (see Fernandez & Rogerson, 1993; Hendrickson et al, 2006; Nagpal & Bhartia; Fox et al, 2007).

amongst neighbors), which has been shown to reduce crime (Sampson et al, 1997; Browning et al, 2004; Hipp & Wo, 2015). There is a gap in the literature concerning the relationship between parks as they relate to the physical environment and violent crime. Thus, this study seeks to discover what affect the physical environment, park coverage in particular, has on crime in the urban setting. Specifically, this paper seeks to answer the question – In census tracts where there is crime does the built environment, park coverage in this case, affect crime? – and test two hypotheses; 1) *the physical environment is distinct empirically from traditional structural factors* 2) *In census tracts where there is crime, park coverage will have a negative correlation to crime.*

Chapter 2

THEORETICAL UNDERPINNINGS

Social Disorganization

The neighborhood context of crime is a well-researched social problem. Ecological perspectives highlighting the importance of place, space, and crime appeared in the work of Park, Burgess, and McKenzie (1925) and continue to be relevant (Sampson, 2012). Social disorganization is a prominent theoretical framework, which underscores the importance of neighborhood level social correlates of crime, particularly residential instability, racial and cultural heterogeneity, and poverty (Shaw & McKay, 1942). The communities and crime literature has played a large role in shaping our understanding of variation in crime across diverse macro-social units of analysis. The focus on larger units of analysis within the empirical literature has however been largely a result of data availability as opposed to theoretical relevance. To assist in a more comprehensive development of our understanding of variations in crime across contextual environments there has been a push within the extant literature for a focus on micro-units (Weisburd, Groff, & Yang, 2012), which has included investigations of routine activities theory (RAT).

Routine Activities Theory

A number of researchers have suggested that routine activities theory (RAT) is a micro-level theory with macro-level implications (Eck, 1995; Groff, 2007). That is, Weisburd et al. (2012) found that crime patterns present at the micro-place (i.e. street segment) help explain variation in criminal opportunities within a larger aggregate unit of analysis. Cohen and Felson (1979) developed RAT to explain the relation between crime rate trends and the type of activities people encounter throughout

days/weeks/months. Cohen and Felson (1979) proffered that individuals have broad areas in which routine activities occur: home, work, and other activities away from their home, creating varying opportunities for crime. As individuals increase time spent on outside activities, capable guardianship naturally fluctuates, leading to variation in their suitability as a criminal target.

Kennedy and Forde (1990), for example, found young males whose activity routinely involved drinking establishments, restaurants, and sporting events experienced higher victimization rates. These findings suggest that place matters for ecological analysis of crime. More importantly the findings suggest that in addition to place, the type of business or nonresidential establishment matters and attracts both victims and offenders, which generates criminal opportunities and, in turn, increases victimization.

One theory, social disorganization, is a community-based theory that examines how structural characteristics pattern behavior like crime. The other theory, routine activities, focuses more on physical spaces and how they impact the opportunities for crime or victimization. Together, they allow for analysis of community level/community-based crime (social disorganization) while considering the physical aspects of the community (routine activities). It is the combination of both social disorganization and routine activities that provide a theoretical foundation to analyze the built environment.

Conceptualizing the Built Environment

Review of Literature: Physical Environment

The idea that the physical environment influences criminal behavior is not new (Brantingham & Brantingham, 1993; Kinney et al, 2008; Stucky & Ottensmann, 2009).

Crime has long been thought to be associated with the physical environment. Past theoretical and empirical developments demonstrate that the relationship between crime and the physical environment is complex and varies at different levels of spatial analysis (Brantingham & Brantingham, 1993). Enrico Ferri (1896), a positive school criminologist, summed up much of this belief when he argued that: ‘High roads, railways, and tramways dispersed predatory bands in rural districts, just as wide streets and large and airy dwellings with public lighting and the destruction of slums prevent robbery with violence, concealment of stolen food, and indecent assaults’ (Ferri, 1896, p. 123). Research on the distribution of property crime in time and space resonates with research on the target selection processes of offenders to suggest that crime is strongly related to aggregate elements of the perceived physical environment (Eck, 2003; Felson, 2002; Jeffery, 1976, 1977; Lab, 1992; Plaster-Carter, Carter, and Dannenberg, 2003). The most notable connection between crime and perceived physical environment in current literature is the relationship between crime generators, attractors and detractors.

Crime attractors, generators and detractors (Brantingham & Brantingham, 1993; Stucky & Ottensmann, 2009) were originally proposed to be distinct yet related concepts referencing how nonresidential land use influences crime. Victims may be attracted to a business for the type of products or services offered by the establishment, and offenders may be attracted to the location for the same reason or because of the type of patrons who frequent that area whom are identified as potentially attractive and suitable victims.

Businesses

Businesses such as check-cashing stores and pawn shops offer quick cash transactions for patrons but become attractive locations for robberies, especially if their

physical location may be viewed as conducive to a lack of surveillance or facilitative of a quick exit. Offenders target such businesses and their customers because there are more potential targets and they are perceived to be more lucrative (i.e. carrying cash or displaying jewelry) (Wright & Decker, 1996). Prior studies suggest bars are another crime generator and attractor that influences the level of crime in the surrounding area (Groff, 2011; Ratcliffe, 2012). These findings suggest that alcohol consumption influences the prevalence of suitable targets and motivated offenders while the nature of the environment facilitates decreased guardianship due to individuals' unwillingness to supervise or intervene. Drawve, Thomas, & Walker (2014) developed a complimentary argument in an examination of arrests suggesting intoxicated patrons may be suitable targets while intoxicated offenders may act impulsively rather than rationally assessing a criminal opportunity.

Alcohol Establishment Density

Also, Parker and McCaffree (2013) suggest that there is a positive relationship between alcohol outlet density and violent crime. With relevance to poverty and disadvantage, it is of note that studies have found that alcohol availability and advertising are disproportionately concentrated in racial/ethnic minority communities (Alaniz, 1998; Scribner et al., 2000; Parker et al., 2011). In fact, evidence shows a relationship between minority concentration, alcohol outlet density, and alcohol related problems (Parker and McCaffree, 2013), which allows for the connection between certain types of nonresidential businesses/establishments, crime and disadvantage.

Parks

Similarly, parks have also been studied as crime generators and attractors (Groff & McCord, 2012; Groff & Lockwood, 2013; Knutsson, 1997; McCord & Houser, 2017). Parks are publicly owned; however, they are at the same time everyone's and no one's, effectively marking them as a nonresidential space. As public resources they have little to no intrinsic guardianship and thus are susceptible to being taken over for undesirable activities –living spaces for the homeless, markets for drug deals and delinquent behavior magnets for juveniles (Burgess et al, 1988; Groff & McCord, 2012; Hilborn, 2009). On the other hand parks in urban areas have the ability to reduce crime in the same way that they attract it.

First, neighborhood parks and recreation centers are important public health resources (Bedimo-Rung, 2005; Maller, 2002; Wilhelm, 2010). A sizable proportion of the urban population's physical activity is accrued in neighborhood parks (Cohen et al, 2007; McCormack et al, 2010). In particular, parks in high-poverty neighborhoods are valuable public resources because of the population's limited incomes and access to private health clubs (Estabrooks, 2003; Gordon-Larsen, 2006). Public parks typically provide free access to recreational facilities like playgrounds, basketball and tennis courts, and sports fields (Kaczynski et al, 2007). Furthermore, most urban residents living in the U.S. have relatively easy access to neighborhood parks (Maroko et al, 2009; West, 1989).

Besides that, parks contribute to the urban environment with diverse functions and values that are beneficial to the well-being of urban inhabitants and quality of life. Parks also provide aesthetic experiences, outdoor recreational opportunities, and chances to get close to nature and wildlife. They can mitigate stress ameliorate exhaustion and mental fatigue, enhance social interaction, and nurture social cohesion

(Bowler, Buyung-Ali, Knight, & Pullin, 2010; Jim & Chen, 2006; Parsons & Daniel, 2002; Peters, Elands, & Buijs, 2010; Rasidi, Jamirsah, & Said, 2012; Ulrich, 1984).

Third, parks have become an important focus of new environmental strategies for cities (Madge, 1997). Urban parks offer inhabitants an opportunity to experience nature, history and culture, to learn about biodiversity and the environment, and to take part in social activities in the outdoor ambience. Such an experience is essential for the quality of life and well-being of urban dwellers (Hobden, Laughton, & Morgan, 2004).

However, previous studies have reported that parks in high-poverty neighborhoods are used significantly less than in low-poverty neighborhoods. Concerns about personal safety have often been speculated as a possible factor negatively affecting park use in low-income neighborhoods. Crimes may lead to feelings of being unsafe and thus affect adults' willingness to go outside and visit parks near crime sites. Yet, findings in the literature have been inconclusive. Perceived park safety was a strong predictor of self-reported park use but was not significantly related to observed park use or park-based physical activity. One study found that perception of neighborhood crime was associated with physical inactivity and obesity among older adults (Trost et al, 2002). Some previous research found safety concerns and fear of crime as self-reported barriers to park use among women (Hoehner et al, 2005). Another study, however, showed that objective crime measures were unrelated to the participation in leisure-time physical activity among older adults in a southern European city (Foster & Giles-Corti, 2008). A study of Hispanic caregivers showed that objective crime data was correlated with perception of crime, but not with the physical activity outcome (Wen & Cacioppo, 2006). Mixed results in a systematic review were reported between crime-related safety and physical activity among youth, where most reviewed

studies did not find significant correlations. Furthermore, a review for adults' physical activity also noted that various safety factors demonstrated few associations with physical activity among adults (Humpel et al, 2002).⁴

Also, in previous studies, proxies (e.g., perception of safety, poverty, environmental incivilities, perception of crimes) rather than objective public crime measures were used. In most studies, park use and park-based physical activity were either self-reports or based on time-limited observations (e.g., one week) and from a small sample of parks. The authors consider that the lack of precision and accuracy in both predictors and outcomes may have hindered the identification of the true relationship between crime and park use.⁵ Park usage is important and should be studied further. However, the purpose of this study is to show how parks (park coverage in particular) as part of the built environment has an effect on crime in a distinctly different way that other factors do not account for. Park usage is different from park coverage and though possibly related is a different study altogether.

Few studies examining parks and crime have specifically focused on violent crime. However, it can be inferred from previous studies that a community is not only affected by aggregated characteristics of the population but also by the nonresidential spaces that make up and contribute to the physical environment of said community. Also, parks have been studied mainly as crime generators but not nearly as much as crime disinters.

⁴ Note that previous studies examining parks and crime have not specifically examine disadvantaged areas.

⁵ The current study is both concerned with areas of disadvantage and utilizes official data.

Chapter 3

DATA

The conceptual basis for ecological analysis requires community-level analyses for adequate tests of the hypotheses. First, there are two sources of data in this study. Violent crime data was obtained from the Philadelphia Police Department (PPD) via Open Data Philly and from the Detroit Police Department (DPD) via Open Data Detroit for years 2011 through 2015. Second, violent crime data were merged with Census information for 2015 (five-year estimates) obtained from the American Community Survey (ACS). Also, data for park coverage maps comes from Open Data Philly and Open Data Detroit, while data for maps of poverty and disadvantage comes from ACS via the mapping program Policy Map.

The data are compiled of tract-level official crime data for violent crime index offenses with sociodemographic information obtained from the ACS and information about park coverage from Open Data sites. Data were compiled in this manner because previous studies of urban crime and disadvantage have had success utilizing tract-level demographic and crime data in tandem with ecological predictors to investigate at the community level (Krivo & Peterson, 1996; Krivo, Peterson, & Kuhl, 2009).⁶

Statistical Methods

When calculating the effect of covariates on crime, population size is one of the main determinates of method of analysis. That is, as population size grows smaller, the

⁶ Tracts were excluded if no crime data were reported for that tract. For PPD data n = 384 and for DPD data n = 297 (see Table 1).

crime rate becomes less precise and its distribution becomes increasingly skewed and discrete (Osgood & Chambers, 2000). The posited solution to this issue is a Poisson based model (Land et al, 1996; Osgood & Chambers, 2000). Also, Poisson models are appropriate for predicting rare events and are able to predict nonnegative expected counts (Land et al, 1996; Osgood & Chambers, 2000). Statistical analyses reveal significant overdispersion, which violate the Poisson model assumption of equal mean and variance of the dependent variables (Kriveo et al., 2009; Raudenbush & Bryk, 2002; see Appendix III for outputs). As such, I utilized negative binomial regression, which extends the Poisson model by allowing for overdispersion and by not assuming independence among outcome events (Long, 1997). I specify the model with tract-level population as the explanatory (exposure) variable for crimes.

A correlation analysis showed some predictors to be highly collinear (see table 3). For good measure, principal component analysis was applied to the structural covariates of the analysis to ascertain how many independent sources of variation exist among the covariates (Land et al, 1990). Varimax rotation with Kaiser normalization is used to simplify and maximize the variances of the loadings. Though analysis results show multiple variables clustering, park coverage was shown to be an independent source of variation (see table 2). Otherwise, unemployment, poverty, female headed household, and education clustered for Philadelphia; unemployment, poverty, and education clustered for Detroit. Thus, I opted to create a variable of disadvantage from unemployment, poverty, and education given that those variables loaded for both cities.⁷ I created an economic deprivation index, calculated by multiplying factor

⁷ Park coverage, family disruption, and female headed household are ran individually in the models.

outcomes by each variable respectively (see table 2). It should also be noted that variance inflation factors for all variables for both cities were low, suggesting no issues with multicollinearity.

Chapter 4

RESULTS

Descriptives

Table 1 displays the descriptive statistics for the outcome measure and for the dependent variable (violent crime) and covariates of interest.⁸

Philadelphia

The mean violent crime count for Philadelphia is roughly 205 per tract. The mean of tract-level park coverage is 6.2 percent (twice that of Detroit). The proportion of the population who is divorced (family disruption) has an average that falls just above 9 percent. The proportion of the population with less than a high school education is an average of 15 percent. The percent of female headed households averages 7 percent. The population per census tract averages 4,049. Finally, measures of economic deprivation show notable variation. Economic deprivation overall is roughly an average of 50 percent. The breakdown of the proportion of the population that is economically disadvantaged is as follows: the proportion of the population that is unemployed is a tract-level average of 14 percent, families living below the poverty line is a tract-level average of 20 percent, and the percentage of less than high school education is an average of about 15 percent.

⁸ Variables for both Philadelphia and Detroit are skewed to some degree, which is not uncommon when dealing with variables of economic deprivation and disadvantage. This is especially expected in cities that are known for their poverty (see Land et al, 1996).

Detroit

Detroit's mean violent crime count per tract is 253. The mean of tract-level park coverage is 2.9 percent. The proportion of the population who is divorced averages 12 percent (11.97 percent exactly). The percent of female headed households averages 10 percent. The population per census tract averages 2,323. Last, economic deprivation is an average of 74 percent. The breakdown of economic deprivation is as follows: the proportion of the population that is unemployed is a tract-level average of 25 percent, families living below the poverty line is a tract-level average of 36 percent, and the percentage of less than high school education is an average of 24 percent. Ultimately, despite having half of Philadelphia's population, Detroit has nearly double the poverty and economic disadvantage. True to the literature, Detroit also has more violent crime, which is associated with high levels of disadvantage (see Peterson et al, 2000; Sampson et al, 1997). Both cities in general have high levels of disadvantage and high percentages (at the tract-level) of social factors associated with violent crime. However, it should be noted that Philadelphia has double the average park coverage that Detroit has and also nearly half the average disadvantage, which suggests support for my second hypothesis that park coverage has a negative effect on violent crime.

Table 1 Descriptive Statistics

Table I. Descriptive Statistics for Dependent and Independent Variables				
	M	SD	Minimum	Maximum
Philadelphia				
Dependent Variables (n = 384)				
Violent Crime, 2011 - 2015	205.06	157.71	3	996
Independent Variables (n =384)				
Park Coverage	6.21	12.5	0	100
Family Disruption	9.05	3.62	0	26.7
Total Population	4049.66	1786.96	0	9510
<i>Economic Deprivation Index</i>	<i>50.90</i>	<i>32.54</i>	<i>0</i>	<i>122.95</i>
Unemployment	14.25	8.85	0	77.3
Poverty	20.02	15	0	66.7
Education	15.03	13.16	0	64.8
Female Headed Household	7.2	4.24	0	20.38
Detroit				
Dependent Variables (n = 297)				
Violent Crime, 2011 - 2015	253.39	130.78	5	713
Independent Variables (n =297)				
Park Coverage	2.95	7.78	0	61.19
Family Disruption	11.97	4.25	0	29.1
Female Headed Household	10.2	4.12	0	19.82
Total Population	2323.48	1120.96	0	5806
<i>Economic Deprivation Index</i>	<i>74.87</i>	<i>22.15</i>	<i>0</i>	<i>102.47</i>
Unemployment	25.25	9.71	0	54.8
Poverty	36.22	14.62	0	81
Education	24.15	15.94	0	77.8

Hypothesis One

H1: The physical environment is distinct empirically from traditional structural factors.

In order to test hypothesis one I employed principal component analysis with varimax rotation and Kaiser normalization and correlation matrices.⁹ Factor analytic procedures are statistical methods used for examining the relationships within a group of observed variables, as measured through questions or items (Beavers et al, 2013). Examination of factors, or dimensions, is most often applied in the development and validation of measures such as scales and indices (Schonrock-Adema, Heijne-Penninga, Van Hell & Cohen-Schotanus, 2009). Generally, correlations exceeding .50 provide enough evidence to indicate that there is enough commonality to justify comprising factors (Tabachnick & Fidell, 2001).

Similarly, a correlation matrix is a statistical method that shows correlation coefficients between sets of variables. Each random variable in the correlation table is correlated with each of the other values in the table, which shows which pairs have the highest correlation. Again, correlations exceeding .50 are considered enough evidence to indicate that there is enough commonality.

Philadelphia

Table 2 shows factor loadings for chosen covariates for both Philadelphia and Detroit. In Philadelphia nearly all covariates of interest load together. That is, unemployment, poverty, female headed household and education all load at .50 or higher. Similarly, unemployment, poverty and education are correlated highly enough to suggest commonality in the correlation matrix (see table 3). In addition, economic

⁹ Factors were rotated for clarity and simplification of the analysis.

deprivation is highly correlated with unemployment, education, poverty and female headed households. Note that park coverage does not load with other variables under factor one in table 2 and does not show comonality with other variables in table 3.¹⁰

Detroit

In Detroit unemployment, poverty and education load at .50 or higher (see table 2). Also, unemployment, economic deprivation, poverty and education are implicated to have comonality in the correlation matrix (see table 3). Again, note that park coverage does not load with other variables under factor one in table 2 and does not show comonality with other variables in table 3.

Thus, given that park coverage does not load with other predictors in the principal component analysis (table 2) nor shows comonality with other variables in the correlation matrix (table 3) for either city, the null hypothesis (park coverage is not distinct empirically from traditional structural factors) can be rejected. Park coverage as part of the physical environment is shown to be distinct from traditional structural factors.

¹⁰ Park coverage and family disruption cluster under factor 2 for both cites, however the variables are kept as standalone coefficients because neither their loadings in the correlation matrix or VIF values suggest strong commonality.

Table 2 Factor Analysis

Table II. Factor Analysis (Rotated Factor Matrix) Coefficients for Philadelphia and Detroit

Variables	Philadelphia (n = 384)		Detroit (n = 297)	
	1	2	1	2
Park Coverage		0.82		0.64
Unemployment	0.81		0.79	
Poverty	0.82		0.79	
Female Headed Household	0.80			
Family Disruption		0.55		0.68
Education	0.71		0.60	
Eigenvalue	2.71	1.02	1.70	1.17
% Variance Explained	45%	17%	28%	20%

Note: only factor loadings greater than 0.5000 are reported

Table 3 Correlation Matrix

Table III. Correlation Matrix of Variables for Philadelphia and Detroit

Philadelphia (n = 384)

Philadelphia	<i>Percent Park</i>	<i>Unemployment</i>	<i>Poverty</i>	<i>Female Headed Household</i>	<i>Economic Deprivation</i>	<i>Family Disruption</i>	<i>Education</i>
Percent Park	1.0000						
Unemployment	-0.1299	1.0000					
Poverty	-0.1535	0.6180	1.0000				
Female Headed Household	-0.1372	0.5318	0.5974	1.0000			
Economic Deprivation	-0.1440	0.5845	0.6531	0.9960	1.0000		
Family Disruption	0.0093	0.2029	0.1831	0.2492	0.2595	1.0000	
Education	-0.0823	0.4808	0.4480	0.4361	0.4917	0.2545	1.0000

Detroit (n = 297)

	<i>Percent Park</i>	<i>Unemployment</i>	<i>Poverty</i>	<i>Female Headed Household</i>	<i>Economic Deprivation</i>	<i>Family Disruption</i>	<i>Education</i>
Percent Park	1.0000						
Unemployment	-0.0410	1.0000					
Poverty	-0.0413	0.4944	1.0000				
Female Headed Household	0.0460	0.1627	0.0219	1.0000			
Economic Deprivation	-0.0458	0.7355	0.8250	0.0879	1.0000		
Family Disruption	0.1003	0.1600	0.0262	0.0610	0.0802	1.0000	
Education	-0.0206	0.2576	0.2551	0.0411	0.6696	0.0205	1.0000

Research Question and Hypothesis Two

RQ: In census tracts where there is crime does the built environment, park coverage in this case, affect crime? H2: In census tracts where there is crime park coverage will have a negative effect on crime.

When the population size of an aggregate unit is small relative to the offense rate, crime rates must be computed from a small number of offenses. Such data are ill-

suited to least-squares analysis (see Osgood 2000; Osgood & Chambers, 2000).

Poisson-based regression models of counts of offenses are preferable because they are built on assumptions about error distributions that are consistent with the nature of event counts (Osgood, 2000). Specifically, negative binomial regression model is the best known and most widely available Poisson-based regression model that allows for overdispersion (Osgood, 2000). Given that the unit of analysis is census tracts with high rates of crime relative to the population, negative binomial regression model is the best fit for analysis of the research question and hypothesis two.

Table 4 displays four models, two for each city, all calculated with the STATA statistical package (version 15). The first model under each city (model 1) only accounts for classical structural factors.¹¹ This is the baseline regression model, which is compared to the second model to show the effect of park coverage. The second model under each city (models 2) introduces park coverage in addition to classical factors. Examining across model effects allows assessment of the effect of park coverage on census tract violent crime levels while accounting for measures of structural disadvantage.

Philadelphia

For Philadelphia (table 4) only family disruption is statistically significant (for both model 1 and model 2) and is shown to negatively impact violent crime. In model 2, all covariates with the exception of economic deprivation are negative. This however is not an unheard-of phenomenon. Theoretically important structural factors have been

¹¹ Spatial weight variables were created to account for spatial lag, however they were left out of the models due to insignificance.

shown to have weaker or odd statistical effects on violent crime when disadvantage is particularly wide-spread, which is further discussed in the discussion of this analysis (see Krivo & Peterson, 2000; Pratt & Cullen, 2005). By the conventional 0.05 standard of statistical significance, the negative binomial analysis indicates that violent crime in Philadelphia is associated with park coverage and family disruption (see table 4).

Park Coverage

More park coverage, as indexed by the proportion of park space per census tract, was negatively associated with violent crime. Given the coefficient of $-.193$, an increase in park coverage would produce a decrease in violent crime (see table 4, model 2).

Family Disruption

Higher levels of family disruption, as indexed by the proportion of divorced persons aged 15 and older, were negatively associated with violent crime for both model 1 and model 2. Given the coefficient of $-.150$ for model 1 and $-.146$ for model 2, an increase in family disruption would produce a decrease in violent crime.¹²

Detroit

Park coverage, female headed household, and economic deprivation were statistically significant for Detroit. By the conventional 0.05 standard of statistical significance, the negative binomial analysis indicates that violent crime in Detroit is

¹² Again, theoretically important structural factors have been shown to have weaker or odd statistical effects on violent crime when disadvantage is particularly wide-spread (see Krivo & Peterson, 2000; Pratt & Cullen, 2005).

associated with park coverage, percentage of female headed households and economic deprivation (see table 4).

Park Coverage

More park coverage was negatively associated with violent crime. Given the coefficient of $-.047$, an increase in park coverage would produce a decrease in violent crime (see table 4, model 2).

Female Headed Household

Female headed household, was negatively associated with violent crime for both model 1 and model 2. Given the coefficient of $-.001$ for model 1 and model 2, a decrease in family disruption would produce an increase in violent crime. Note that female headed household showed strong significance for both models. Tests of community-based theories of crime (social disorganization, collective efficacy, etc.) have typically found that single parent households are positively associated with crime (see Bellair, 2000; Markowitz et al, 2001; Sampson et al, 1997, Sampson & Groves, 1989) except when there are extreme levels of disadvantage (see Krivo & Peterson, 2000; Pratt & Cullen, 2005). Though posited in the opposite direction of previous studies, female headed household having a strong relationship with violent crime is still consistent with previous analyses of disadvantage and crime.

Economic Deprivation

Economic deprivation was positively associated with violent crime but is only statistically significant in model 2 once park coverage is introduced to the model. Maintaining consistency with previous studies that have examined the effect of covariates of disadvantage on crime, given the coefficient $.005$ for model 2, an increase

in economic deprivation would produce a significant increase in violent crime. Note that economic deprivation is strongly associated with violent crime.

Table 4 Regression Coefficients

Table IV. Negative Binomial Regression Coefficients (SEs) Estimating Park Coverage and Social Factors on Tract-Level Violent Crimes 2011-2015

	Philadelphia		Detroit	
	Model 1 (n = 377)	Model 2 (n = 278)	Model 1 (n = 293)	Model 2 (n = 197)
Park Coverage	-	-.193** (.062)	-	-.047* (.022)
Family Disruption	-.150* (.074)	-.146** (.059)	-.004 (.011)	-.004 (.008)
Female Headed Household (a)	-	-	-.001*** (.000)	-.001*** (.000)
Economic Deprivation	.000 (.001)	.001 (.001)	.003 (.002)	.005** (.001)
Pseudo- R ²	0.0308	0.0459	0.0061	0.0107
Log likelihood	-2525.95	-1867.86	-1803.79	-1199.84

Note. Estimated regression coefficients (with robust SEs in parentheses).

All models use logarithmic exposure (population) as an offset

* $p < .05$; ** $p < .01$; *** $p < .001$

(a) Female Headed Household is included in Economic Deprivation for Philadelphia due to high commonality with other predictors.

To conclude, park coverage is negatively associated with violent crime for both Philadelphia and Detroit. An increase in park coverage indicates a decrease in violent crime, which answers my research question and allows rejection of the null hypothesis two. The negative binomial analysis indicates that park coverage as part of the physical environment has an effect on crime, specifically park coverage reduces violent crime. Also note that adding park coverage improved model fit. For both cities, adding the variable park coverage to the model improved overall model fit (see table 4). Also, consistent with previous studies of disadvantage and crime, economic deprivation is

positively associated with violent crime across models for both cities. However, economic deprivation is only statistically significant for model 2 in Detroit. An increase in economic deprivation indicates an increase in violent crime. Furthermore, though not posited in the direction of previous studies (positively correlated rather than negatively correlated) female headed household is also strongly associated with violent crime for Detroit. Finally, family disruption is only significant for Philadelphia, however it is significant across models, and shows that a decrease would produce an increase in violent crime.

Chapter 5

DISCUSSION AND CONCLUSION

The goal of this thesis was to do two things. The first was to incorporate the built environment into the study of structural characteristics of crime. In doing so I conceptualized the built environment, came up with a measure of the built environment, then proposed that the relationship between the built environment and violent crime would be negative. My findings indicate that the physical environment (park coverage) is associated with violent crime opposite the ways in which structural factors of deprivation have typically been associated with violent crime. I find that park coverage is uncorrelated with traditional structural characteristics and the built environment is empirically and conceptually distinct from those structural characteristics.

Second, I established the relationship between parks and crime in two cities, Detroit and Philadelphia, while controlling for traditional structural characteristics of cities. It is important for parks to be looked at as distinct because parks contribute to the urban environment in ways that are beneficial to the well-being of urban inhabitants and their quality of life. They have been shown to reduce stress, help with exhaustion and mental fatigue, enhance social interaction, and nurture social cohesion (Bowler, Buyung-Ali, Knight, & Pullin, 2010; Jim & Chen, 2006; Parsons & Daniel, 2002; Peters, Elands, & Buijs, 2010; Rasidi, Jamirsah, & Said, 2012; Ulrich, 1984). Also, it is important to incorporate the physical environment into studies of crime in general because theories of place and their subsequent analyses (i.e. routine activities) have found that physical environment influences criminal behavior (see (Brantingham & Brantingham, 1993; Eck, 2003; Felson, 2002; Groff, 2011; Jeffery, 1976, 1977; Lab,

1992; Plaster-Carter et al, 2003; Ratcliffe, 2012; Stucky & Ottensmann, 2009; Wright & Decker, 1996).

Furthermore, I found that park coverage reduces crime in Philadelphia and Detroit when controlling for structural characteristics. In fact, findings show that park coverage can have a negative impact on crime even when those characteristics are high. Philadelphia and Detroit both exhibit high levels poverty and deprivation, with Philadelphia having a poverty rate twice that of the national average and Detroit's rate being triple the national average and nearly double Philadelphia's average. The strength and consistency of my findings show that park coverage (for both cities) and economic deprivation (for Detroit) are especially critical elements of analysis in urban environments. In these two cities, violent crime is significantly and consistently associated with park coverage. I think that this should be tested on a larger scale with many more cities for certainty and greater accuracy, though I do believe that this analysis is basis for further empirical testing of the physical environment as it relates to disadvantage and crime.

My results diverge from the standard findings for urban areas with regard to family disruption, female headed households (for Detroit) and economic deprivation (for Philadelphia). That is, empirical analysis of crime theories in urban space have typically found that family disruption, female headed household and economic deprivation are positively associated with crime (see Bellair, 2000; Markowitz et al, 2001; Sampson et al, 1997, Sampson & Groves, 1989) except when there are extreme levels of disadvantage (see Krivo & Peterson, 2000; Pratt & Cullen, 2005). Here, family disruption and female headed household are negatively associated rather than positively as has been found in previous studies. Additionally, economic deprivation is not

statistically significant for Philadelphia. However, as suggested earlier, this is not necessarily an unprecedented phenomenon.

In fact, Krivo and Peterson (2005) hypothesized that disadvantage has a substantial and positive effect on homicide rates when disadvantage is low to moderate, but that this association levels off under conditions of extreme disadvantage. Most studies draw from structural theories that assume that the same social conditions are at the root of violent crime for all racial groups (Sampson and Wilson 1995). Yet within-race analyses challenge this assumption; they demonstrate important differences between blacks and whites in the effects of various structural predictors of crime (Harer and Steffensmeier 1992; LaFree and Drass 1996; LaFree, Drass, and O'Day 1992; Messner and Golden 1992; Parker and McCall 1999; Shihadeh and Ousey 1996).

Philadelphia and Detroit possess remarkably high levels of poverty and disadvantage, which may explain the leveling off of classical structural factors of crime. Furthermore, both cities have large black populations. In the majority of U.S. urban areas, Black Americans have extremely high levels of poverty and other disadvantages such that there may be little effect on violent crime of variation in these conditions (Krivo and Peterson, 2005).

Limitations and Future Directions

First, investigations of local units are necessary because they help establish the strength of relationships found at larger ecological units. Limitations of the current study are sample size which affects generalizability. Also, though the data set was constructed from various sources specifically for this analysis it is still secondary data, which comes with a plethora of limitations. Official statistics may reflect biases – creating limitations for what phenomenon can be analyzed. Official statistics – the way

things are measured may change over time, making historical comparisons difficult (as with crime statistics, the definition of crime keeps changing). Representativeness can also be an issue as data may not be representative of the wider population, which has especially been a continued issue with government collected data. Not to mention a lot of data does not survive because it is not stored or recorded, and other data tends to get lost with time. Also, some data is withheld from researchers and the public gaze, and therefore does not become available.

Second, it should be noted that, the policy implications of my analysis are similar to those established by other scholars—that is, ties to social activities that establish collective efficacy and encourage the assumption of common goals are essential to restraining criminal activities (e.g., Messner & Rosenfeld, 2007; Morenoff et al., 2001; Sampson et al., 1997; Wilson, 2009). Policies that reinforce individuals' ties to local neighborhood and political organizations may encourage institutional engagement for individuals and the communities in which they live.

That said, it is also important to consider the environment in which such bonds and ties are expected to flourish. It is unlikely that any amount of collective efficacy or social ties or bonds can combat spaces that are conducive to high rates of poverty and disadvantage or continued racial segregation. On nearly all measures of risk – poverty, family structure, unemployment, and adult education levels – blacks face significantly higher risks (Fluke et al., 2010; Hines, Lee, Osterling, & Drabble, 2007; Osterling, D'Andrade, & Austin, 2008). Studies have found that the prison system in contemporary accounts of racial inequality across a host of social, health, economic, and political domains. This mainly happens in majority black impoverished areas (Lyons & Pettit, 2014).

Furthermore, future analyses of the built environment should consider the racial composition of neighborhoods and communities given the rapid growth of more diverse populations in the U.S. According to the U.S. Census (2018), The non-Hispanic White-alone population is projected to shrink over the coming decades, from 199 million in 2020 to 179 million in 2060 — even as the U.S. population continues to grow. Thus, including racial analysis in future research is critical. The current analysis leaves out race due to statistical instability across cities and models.

Third, the built environment, particularly in more impoverished neighborhoods should be paid closer attention. For example, cities all over the world are ripping up highways to create a safer more efficient urban environment. In fact, the US Department of Transportation recently introduced an initiative that focuses on repairing the inequality that urban freeways institutionalized so many years ago (transportation.gov, 2016). Highway construction is notorious for the displacement of ethnic communities. Examining data on the types of properties demolished to make way for highways shows trend in substantial displacement of the poor and people of color. If you add urban renewal projects—misguided “slum removal” programs that leveled low-income housing in many cities during the 1960s and ‘70s—about two-thirds of the urban displacement happening over the last half of the 20th century targeted the poorest Americans (Biglin, 2010).

Also, there are other ways to capture the built environment. Future research should consider looking into other aspects of the physical environment such as alcohol establishments, financial institutions (check cashing, pawn shops, and payday loan lenders/whether or not there is the presence of banks), physical characteristics of parks and recreational spaces (e.g. whether or not a park is a concrete slab with a park bench

and is full or broken glass or is it a lush green oasis with spaces for recreation), or physical boundaries that divide the city such as rail road tracks, highways, waterways, etc. Studies should seek to empirically analyze the effect that these places have on crime in urban spaces, even in the most disadvantaged areas. Future studies should also take into account the physical characteristics of these places given that access does not necessarily mean equity. For example, access to a grocery store does not mean much if that grocery store mainly carries subpar food (carry-over from nicer stores such as nearly expired foods and produce or mostly nonperishable, high sodium/sugar items) or having access to a place to cash one's check and/or take out high interest advances (payday lenders) versus having a place to do those things and save money/seek better financial literacy (banks).

Finally, future studies of social structure and institutional engagement should investigate and further demonstrate the importance of the physical environment in conjunction with institutional engagement for various types of policy regulation. Criminology does a disservice by not acknowledging the role of policy and history in the creation and maintenance of crime ridden despairingly impoverished communities. Black Americans in particular have traditionally faced many barriers that limit their access to and choice of housing (Ross and Turner, 2005). Over time this has helped create and maintain ever present segregated neighborhoods with varying levels of disadvantage and resource deprivation, which has been linked to crime (see Krivo & Peterson, 2000; Pratt & Cullen, 2005). Future research should keep this caveat in mind when studying these communities and neighborhoods.

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Appendix A

DATA DEFINITIONS AND SOURCES

The data source from which covariates were collected is the American Community Survey (2015 five-year estimates). Park coverage data were collected from open data sources for each city (Open Data Philly and Open Data Detroit). Violent crime data comes from the Philadelphia Police Department and the Detroit Police Department via open data sources (2011-2015) and is comprised of aggravated assaults, robberies, and homicides. Descriptions of how variables for this study were constructed are below.

Data definitions

Dependent variable

In remaining consistent with prior studies of structural covariates and aggregated crime, the dependent variable is the 5-year sums of the number of violent crimes occurring between 2011 and 2015 at the tract level. The 5-year sum serves to reduce annual fluctuations of rare events as crime is rare in general and is especially rare when measured at the tract level (Krivo, Peterson, & Kuhl, 2009; Peterson & Krivo, 2009, 2005).

Tract-level covariates

Park coverage: the percentage of park coverage per census tract. Note that park coverage is logged in an attempt to fix skewness and is shown to be significant for both cities after being logged.

Economic Deprivation:

Philadelphia: is composed of percent family poverty per census tract, unemployment (for population 16 and over), percent female headed households per census tract, and percent of population with less than a high school education.

Detroit: is composed of percent family poverty per census tract, unemployment (for population 16 and over, and percent of population with less than a high school education.

Family disruption: is measured as the percentage of divorced persons aged 15 and older

Education: is measured as the percent of people with less than high school education. Schools, colleges, and other educational institutions (e.g., for blind, deaf, and other handicapped individuals), and educational programs for adults, veterans, and other special classes. State institutions of higher education includes activities of institutions operated by the state, except that agricultural extension services and experiment stations are classified under Natural resources and hospitals serving the public are classified under Hospitals.

Female Headed Household: proportion of households where a female is maintaining a household with no husband present.

Unemployment: All civilians 16 years old and over are classified as unemployed if they (1) were neither "at work" nor "with a job but not at work" during the reference week, and (2) were actively looking for work during the last 4 weeks, and (3) were available to accept a job. Also included as unemployed are civilians who did not work at all during the reference week, were waiting to be called back to a job from which they had been laid off and were available for work except for temporary illness.

Poverty: is measured as the percent of families in poverty per census tract. The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If the total income for a family or unrelated individual fall below the relevant poverty threshold, then the family (and every individual in it) or unrelated individual is considered in poverty.

These measures were selected because they are often cited as the best measures suited for ecological measurement, particularly in regard to violent criminal offending (e.g. Peterson & Krivo 2009; Sampson, Morenoff, & Gannon-Rowley, 2002; Sampson & Groves, 1989).

Appendix B

FIGURES

Figure 1 Park Coverage in Philadelphia

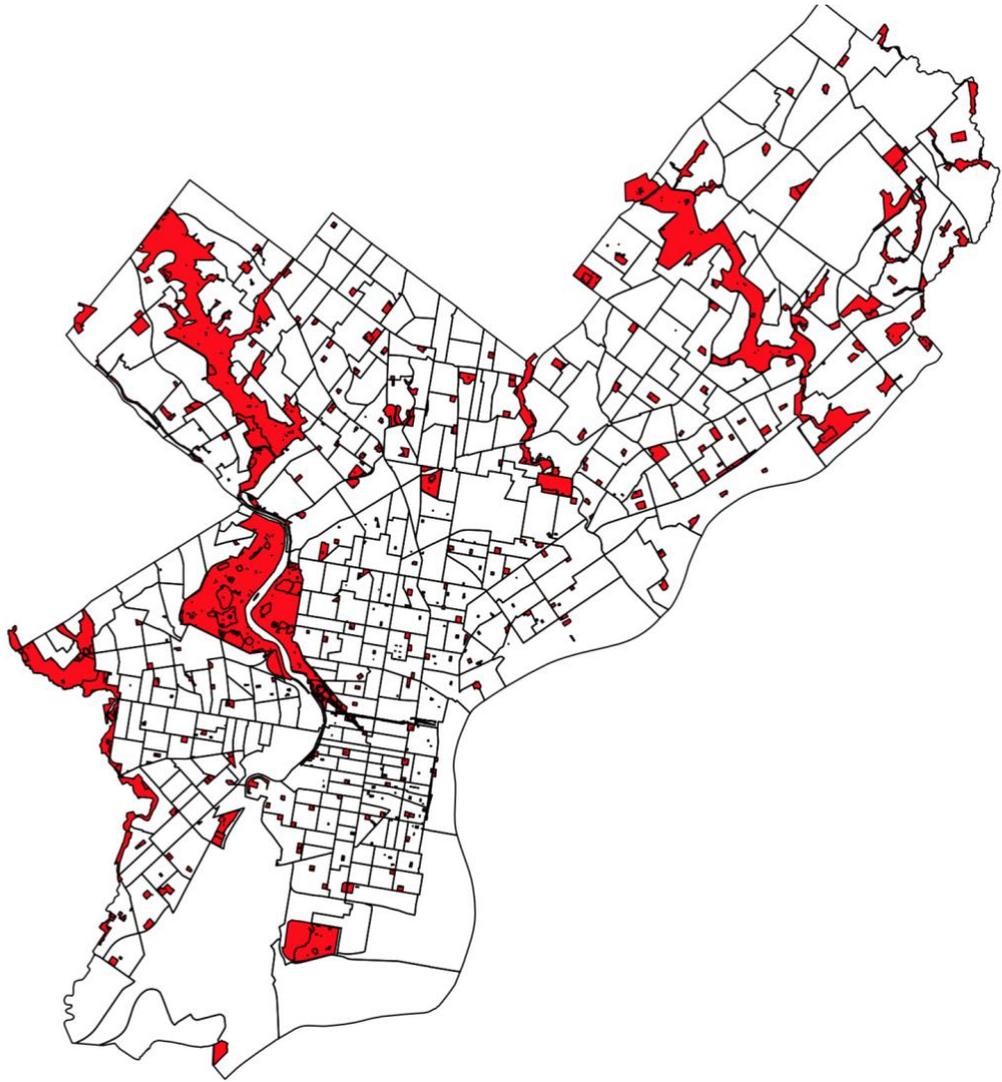


Figure 2 People in Poverty in Philadelphia

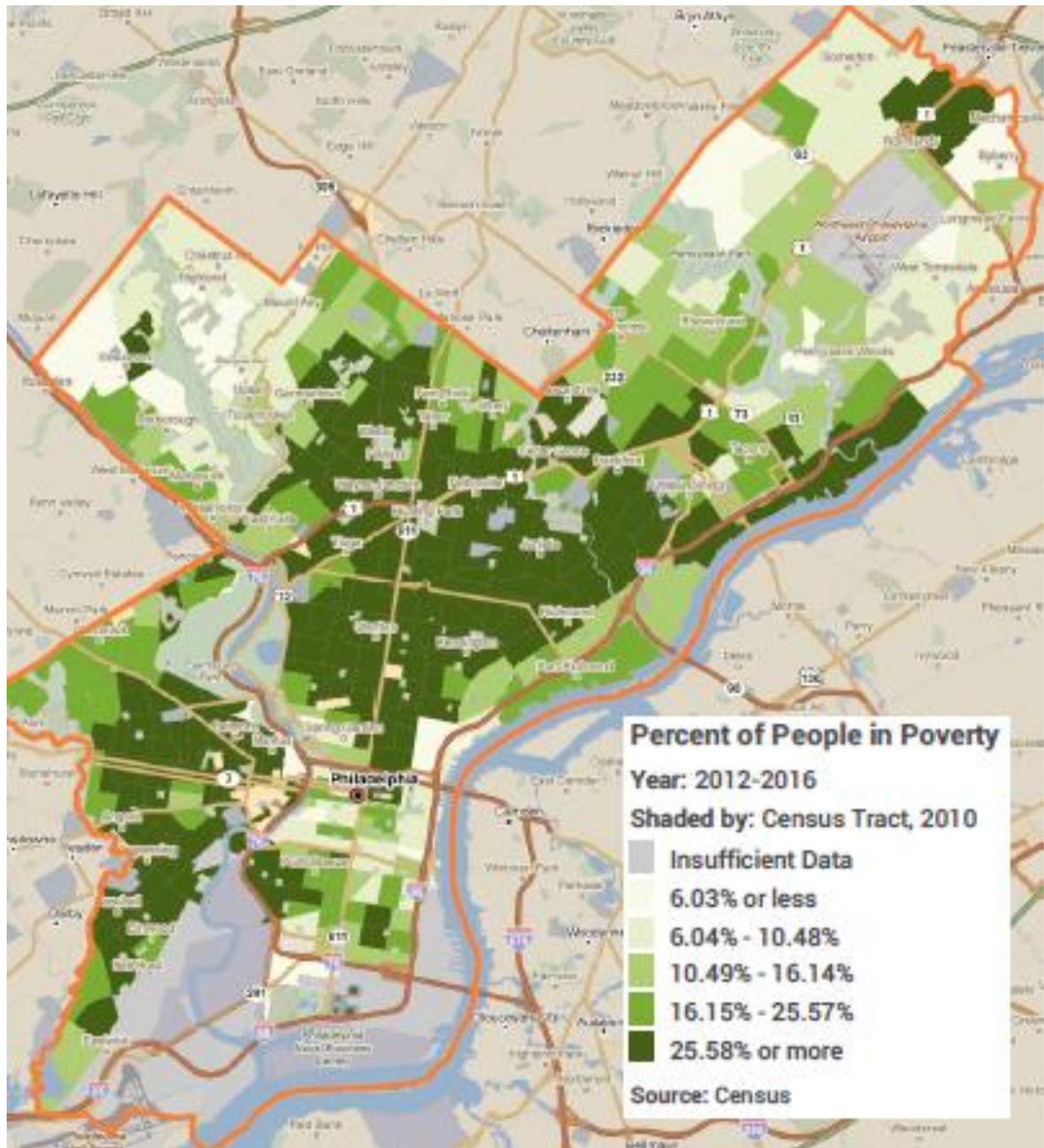


Figure 3 Park Coverage in Detroit

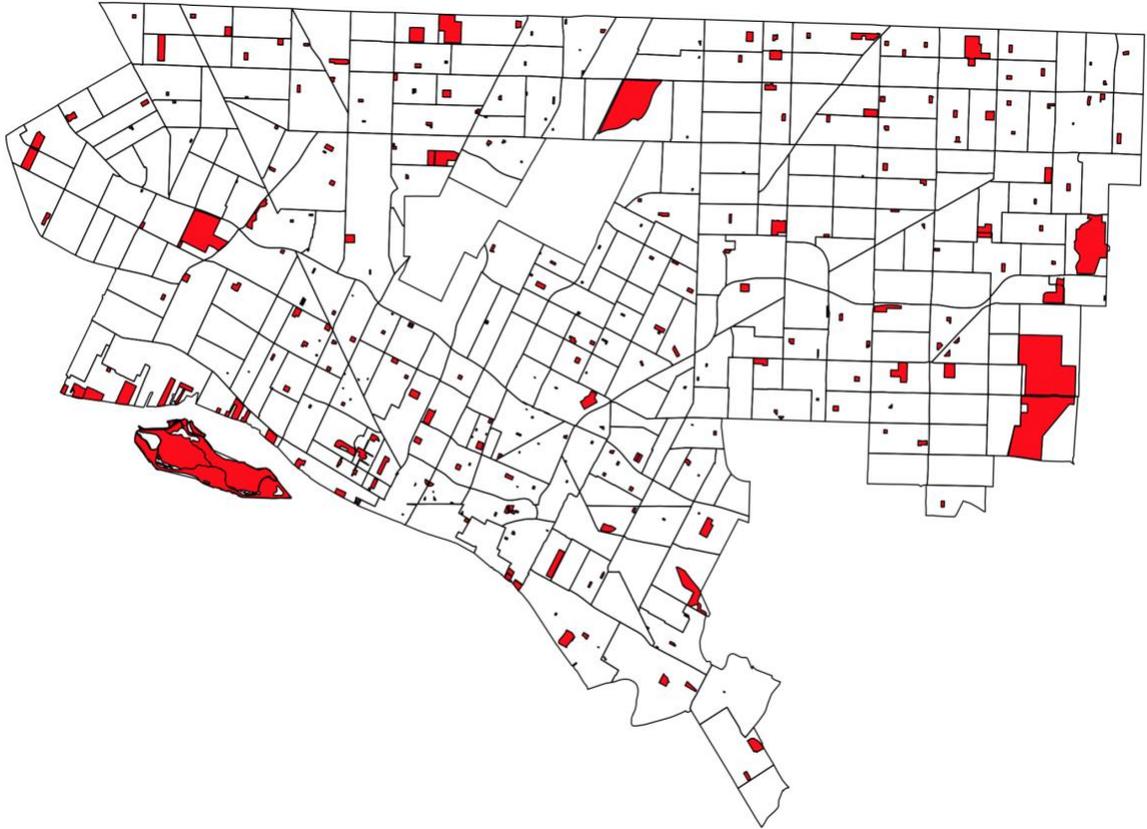


Figure 4 People in Poverty in Detroit

