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Physical Environment and Crime in Milwaukee Neighborhoods

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PHYSICAL ENVIRONMENT AND CRIME IN MILWAUKEE NEIGHBORHOODS

by

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ABSTRACT

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Neighborhood physical condition and crime is a topic that has been heavily debated since Wilson and Kelling's (1982) famous broken windows theory article. While previous research has identified a positive link between disorder, certain land uses, and crime, the direction and magnitude of the effect may vary depending on neighborhood characteristics such as socioeconomic status (Teh, 2008; Greenberg et al., 1982) or informal social control (Gault & Silver, 2008; Sampson & Raudenbush, 1999). The following study uses data from Milwaukee census tracts (*N*=210) to test the effect of neighborhood physical condition variables on violent crime, and also test for interaction effects between physical environment variables and social disorganization variables. Results of interaction models illustrated that the magnitude and direction of the effect of physical environment variables on violent crime often changed dramatically for neighborhoods with different levels of social disorganization, specifically the socioeconomic status and racial composition of a neighborhood.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

From broken windows theory (Wilson & Kelling, 1982; Zimbardo, 1969) to crime prevention through environmental design (CPTED) strategies (Jeffery, 1977), the role of the physical environment in relation to crime continues to pique the interest of urban planners, community organizations, and the public. What aspects and characteristics of a place determines its relationship to crime? Previous research has examined the relationship between the physical environment and crime using broken windows theory (e.g. Wilson & Kelling, 1982; Zimbardo, 1969) and opportunity theory (Lee & Alshalan, 2005; Cohen & Felson, 1979; Jeffery, 1977). While broken windows theory posits that disorder is a signal to criminals that social control in the area is weak and consequently invites further crime, opportunity theory posits that certain characteristics of the physical environment foster opportunities for committing crime. Although both theories examine the physical environment, they have different underlying mechanisms.

Previous research has found that the effects of land-use variables on crime depends on the socioeconomic characteristics of a neighborhood (Teh, 2008), and that more tests are needed to integrate the effects of land use, control, and disorder while controlling for social-structural characteristics (Wilcox, Quisenberry, Cabrera, & Jones, 2004). Therefore, the following study uses Milwaukee neighborhoods as the unit of analysis to test broken windows theory and crime opportunity theory as well as their interaction with social disorganization variables. The current study seeks to not only specify and further refine the effects of physical environment variables on violent crime, but also provide a fuller picture of crime that considers the social-structural characteristics of neighborhoods. As one of the most segregated cities in the United States (Logan & Stults, 2011; Baer, 2016), Milwaukee has extreme variation in its neighborhoods, including crime. Given that violent crime in Milwaukee increased 8% from

2013 to 2014 (Kertscher, 2016), research on the effects of physical environment variables on violent crime isimportant for residents of Milwaukee but it also moves the existing literature forward by incorporating interactions with social disorganization variables.

It is important to determine whether the physical environment in conjunction with the social environment affects violent crime. Research on one or the other is helpful, but combining them as interactions dives deeper and allows for more targeted solutions. Cities with similar histories such as Cleveland, Detroit, and Chicago face many of the same past and current problems as Milwaukee; poverty, unemployment, and rising vacancy rates. The current study can hopefully inform and inspire further research on other cities, especially as cities such as Dayton, Ohio act to demolish or land-bank their housing stock to match their lost population (Williams, Weinheimer, & Brooks, 2011). In the aftermath of the Great Recession and foreclosure crisis, it is important now more than ever to study these consequences of vacant land and demolished or boarded-up properties on crime. Research that attempts to uncover the underlying structure behind violent crime can better inform policymakers, programs, and police by helping to shed light on which factors of cities may need more attention than others in the quest to reduce violent crime and its causes.

Literature Review

Broken Windows Theory and Previous Findings

Research on disorder and crime often cites broken windows theory (Wilson & Kelling, 1982; Zimbardo, 1969; Hinkle & Yang, 2014; Weisburd et al., 2015; Welsh, Braga, & Bruinsma, 2015). Broken windows theory posits that “a broken window left unrepaired will soon lead to the breaking of all other windows in a building” (Welsh et al., 2015, p. 449). However, broken windows theory should not be interpreted to mean that disorder causes crime;

rather, it is a chain of events whereby disorder causes low social control and social withdrawal which then leads to crime (Wilson & Kelling, 1982; Gault & Silver, 2008). Disorder causes fear and flight out of the area, and as a result, the increased anonymity and low informal social control attracts offenders and crime (Welsh et al., 2015). Signs of disorder are a signal to criminals that social control in the area is weak, which invites further crime (Gault & Silver, 2008). Previous research has identified a positive relationship between disorder and robbery and homicide (Rosenfeld et al., 2007).

Disorder may refer to physical disorder, social disorder, or a combination of both. Conceptualizing disorder often depends on the study purpose or setting (Skogan, 2015). Disorder can be used as a dependent variable or an independent variable, and is often used in policy- related studies (Skogan, 2015). Operationalizing and measuring disorder provides a vast array of options, from calls to police (Boggess & Maskaly, 2014) to observations of public spaces (Sampson & Raudenbush, 1999; Mair, Diez Roux, & Morenoff, 2010). Calls to police, hotlines, or emergency numbers also have the added benefit of providing location, time, and date information which allows researchers to examine the "extent or distribution of disorder" (Skogan, 2015, p. 472), such as if there are seasonal or day-night differences. Administrative records, such as licenses, building code violations, vacant/abandoned buildings, surveys of residents, and systematic observation and checklists are other examples of measuring disorder (Skogan, 2015; Sampson & Raudenbush, 1999).

Using administrative data such as ordinance violations provides an objective way to measure disorder that does not rely on an individual researcher's viewpoint or perspective on what constitutes disorder. Since previous research has indicated differences in the interpretation of disorder among individuals, such as between researchers and residents

(Hinkle & Yang, 2014), using an objective measurement of disorder is imperative. Conceptualizing disorder as violations of public ordinances is one way to do this (Gault & Silver, 2008; Rosenfeld, Fornango, & Rengifo, 2007). Signs of disorder such as graffiti, smashed windows, and drug vials are "evidence either of crimes…or ordinance violations" (Sampson & Raudenbush, 1999, p. 608). Ordinance violations, such as excessive noise, are a breach of public order and have been used in previous research as measures of disorder (Rosenfeld et al., 2007).

These ordinance violations not only signal law-breaking behavior, but also send a message that social control in the area may be weak if laws are broken in that area, which may invite further crime. Keizer, Lindenberg, & Steg (2008) found that people who observed ordinance violations were more likely to violate other ordinance violations themselves. Their field experiments provide empirical evidence of the broken windows theory process, where signals of law-breaking behavior lead to further law-breaking behavior. Moreover, research that conceptualizes disorder as ordinance violations needs to consider neighborhood characteristics. Previous research that examined order-maintenance policing over time found that violations of city ordinances increased more in disadvantaged areas and areas that had larger percentages of black residents (Rosenfeld et al., 2007).

Disorder is cyclical, self-reinforcing, and has cumulative effects (Skogan, 2015; Steenbeek & Hipp, 2011). Keizer et al. (2008) illustrated that disorder can lead to further violations of norms and rules. Furthermore, if disorder causes residents to move out of a neighborhood, this increased residential mobility may result in less people acting to improve a neighborhood (Skogan, 2015; Steenbeek & Hipp, 2011). Given that the level of collective efficacy in a neighborhood mediates the effect of disorder on crime (Gault & Silver, 2008;

Sampson & Raudenbush, 1999), further research is needed that considers the level of social disorganization in neighborhoods.

Opportunity Theory and Previous Findings

Another major theory in criminology that considers the physical environment in relation to crime is opportunity theory. This theory has been tested many ways, from routine activities theory (Cohen & Felson, 1979) to crime prevention through environmental design (Jeffery, 1977). Opportunity theory often focuses on aspects of routine activities theory such as motivated offenders, suitable targets, and the absence of capable guardians (Cohen & Felson, 1979). Crime prevention through environmental design (CPTED) strategies use routine activities theory to examine aspects of the built environment such as surveillance, access, and territory (Jeffery, 1977). The underlying mechanism behind opportunity theory is that aspects of the environment foster opportunities for crime.

One approach to testing opportunity theory is to examine specific types of places that create opportunities for crime, such as bars, subway stations, halfway houses, drug treatment centers (Groff & Lockwood, 2014; McCord & Ratcliffe, 2007), parks (Lockwood, 2007; Groff & McCord, 2011; Wilcox et al., 2004), and schools and malls (LaGrange, 1999). The specific characteristics and functions of a place can encourage and provide opportunities for crime; these facilities may serve as “crime generators and attractors” (McCord & Ratcliffe, 2007, p. 48). Focusing on land-use structures provides a way of examining the physical environment and its effect on crime by investigating how different facilities and land-uses may provide varied opportunities for crime. It is imperative to examine specific land-use structures, rather than relying on broad categorization of land use such as “nonresidential”, to further and refine theory investigating the specific underlying mechanisms between place and crime (Kurtz, Koons, &

Taylor, 1998; Wilcox et al., 2004). Combining different land uses, some of which influence crime and some do not, into one category such as "mixed land use" may yield questionable results because different types of land-use may have opposite effects on crime which cancel each other out (Stucky & Ottensmann, 2009).

Vacant land is a land-use variable that is positively associated with crime (Stucky & Ottensmann, 2009; Greenberg, Rohe, & Williams, 1982; Ley & Cybriwsky, 1974). One study found that vacant properties (including vacant lots and land) were the strongest predictor of aggravated assault, even when considering demographic and socioeconomic variables (Branas, Rubin, & Guo, 2012). Branas et al. (2011) examined a vacant lot greening program in Philadelphia from 1999 to 2008 and found that vacant lot greening was associated with a decrease in gun assaults. Greening vacant lots is theorized to signal care and guardianship. Vacant lots may also act as places to store or dispose of illegal guns (Branas et al., 2011). Previous research has emphasized the role of context when examining the relationship between vacant land and crime. Stucky & Ottensmann (2009) argued that vacant land in a brand-new subdivision is different than vacant land surrounded by boarded-up buildings, and the consequences for violent crime may be different (Stucky & Ottensmann, 2009, p. 1242). This suggests that guardianship and neighborhood characteristics have different implications for the effect of vacant land on crime. For example, in their study of paired neighborhoods in Atlanta, Greenberg et al. (1982) found higher proportions of vacant land in lower-income areas, and vacant land was more prevalent in high crime areas than in low crime areas.

Alcohol outlets and bars are land-use variables that also have a positive association with crime (Groff & Lockwood, 2014; Snowden & Freiburger, 2015; Lipton & Gruenewald, 2002; Gorman et al., 2001; Scribner et al., 1995). One explanation is that liquor stores attract people who are under the influence of alcohol, who in turn may become violent or may be less able to defend themselves (Stewart, 2008). Thus, land use involving alcohol may “draw larger numbers of victims, offenders, or both” (Kurtz et al., 1998). Kurtz et al. (1998) write how blocks with bars have higher crime rates and victimization rates. Bars and clubs may also serve as robbery crime attractors due to the large amount of cash transactions (Bernasco & Block, 2011). Another explanation is that bars demonstrate a loss of informal social control mechanisms and social order, similar to broken windows theory (Gorman et al., 2001; Bennett, Diiulio, Jr., & Walters, 1996). Disorderly behavior and public drunkenness may send a signal that there is weak social order in that area, which may invite further crime (Kurtz et al., 1998). Much like vacant land and crime, the effect of alcohol outlets on violent crime can vary depending on neighborhood characteristics. For example, Teh (2008) found that the effects of liquor store outlets opening in a neighborhood led to an increase in violent and property crimes but the effects were smaller for high socioeconomic neighborhoods than for low socioeconomic neighborhoods. These findings illustrate that opportunity theory needs to take into account characteristics of neighborhoods.

Previous research has uncovered a positive association between parks and crime (Lockwood, 2007; Groff & McCord, 2011; Wilcox et al., 2004), and has found that crime clusters near parks (Groff & McCord, 2011). Because parks are “publically owned” and “at the same time everyone’s and no one’s” (Groff & McCord, 2011, p. 1), they may be at risk for crime due to lack of social controls. The public nature of parks means that parks “must contend with more strangers” (Wilcox et al., 2004) which affects social control and crime opportunities. Moreover, the role of parks and their effect on neighborhoods, such as housing values, is linked to the level of crime in that area. Troy and Grove (2008) found that the relationship between parks and housing values depended on the level of crime in a neighborhood. Proximity to a park was associated with high property values when robbery and rape rates were below a certain threshold; when crime is above that threshold, proximity to a park is associated with lower property values (Troy & Grove, 2008). Their findings add to the literature on the association between parks and crime, and illustrates the need for more research on how this link may vary for different neighborhood characteristics.

Although this discussion of the previous literature has established clear associations between certain land-use structures and crime, some land-use variables need further research due to mixed findings. One example is the prevalence of faith-based organizations in a community. Lee (2006) found that violent crime rates in rural areas were lower in areas with more churches. Other research has not found a statistically significant relationship between churches and crime (Willits, Broidy, Gonzales, & Denman, 2011). Churches may have a negative relationship with crime because many of their congregants know each other and have social ties which provide informal social control (Willits et al., 2011). However, churches may also serve the homeless and felons which may increase crime because they promote the "convergence of these populations in time and space" (Willits et al., 2011, p. 31). Other land-use variables that may have a religious component are halfway houses and homeless shelters. Halfway houses and homeless shelters are thought to be associated with increased crime due to its population of ex-offenders and drug users (Groff & Lockwood, 2014; McCord & Ratcliffe, 2007; Gelberg, Linn, & Leake, 1988). However, the research findings are mixed. Previous research found that halfway houses within 1,200 feet of a street segment were associated with a decrease in violent crime, but they were associated with an increase in disorder crime (Groff &

Lockwood, 2014). Furthermore, street segments that were within 400 feet of a halfway house were not significantly associated with violent crime at all; the authors hypothesize that the presence of counselors and administrative personnel close to the halfway house may act as "sources of informal social control for criminal behavior" (Groff & Lockwood, 2014, p. 302). Given the current study's focus, these mixed results regarding violent crime versus disorder for a land-use variable are of interest and warrant further testing.

Social Disorganization: Controls and Interactions

Neighborhood studies on crime almost always control for social disorganization variables, so tests of the physical environment and crime link must incorporate these variables as controls. Social disorganization theory examines the effect of macrosocial, structural forces on neighborhoods and their crime rates. The theory "refers primarily to institutions and only secondarily to men" (Thomas & Znaniecki, 1927, p. 1127). Specifically, social disorganization occurs when "the stability of group institutions" is threatened and "processes of disorganization can no longer be checked by any attempts to reinforce the existing rules" (Thomas & Znaniecki, 1927, p. 1130). The literature on social disorganization is vast and varied, and many researchers disagree about how to best conceptualize, measure, and test the theory (Bursik, 1986; Kubrin & Weitzer, 2003; Sampson & Groves, 1989; Veysey & Messner, 1999). However, social disorganization theory generally employs measures of ethnic heterogeneity, residential mobility, and socioeconomic variables such as the unemployment rate or poverty rate.

Much like crime hotspots, social disorganization can also be concentrated in specific spots (Park & Burgess, 1925; Shaw & McKay, 1942). The role of both physical place as well as social and moral norms was echoed by Park and Burgess (1925). They proposed the idea of concentric circles of the city representing zones with differing characteristics. These zones have different effects on individuals: "these areas tend to accentuate certain traits, to attract and develop their kind of individuals, and so to become further differentiated" (Park & Burgess, 1925, p. 56). Physical characteristics of neighborhoods may be able to shed light on this phenomenon. Stucky and Ottensmann (2009) pointed out how in Shaw and McKay's (1942) research, neighborhood delinquency rates were stable even when the population changed over time. They suggested that the physical environment or structure may play a role, and needs to be incorporated into theories of social disorganization (Stucky & Ottensmann, 2009).

Interactions. This literature review has shown that the link between disorder and land-use variables and crime often depends on neighborhood characteristics (Gault & Silver, 2008; Sampson & Raudenbush, 1999; Teh, 2008; Lee, 2006; Greenberg et al., 1982). For example, previous research has discovered varying effects of physical environment variables on crime depending on a neighborhood's socioeconomic status (Teh, 2008; Greenberg et al., 1982) or level of collective efficacy (Gault & Silver, 2008; Sampson & Raudenbush, 1999). Teh (2008) explains the varying effects of alcohol outlets on violent crime for high-SES versus low-SES neighborhoods in terms of neighborhood characteristics; the customers of alcohol outlets in high-SES neighborhoods are typically families and wine connoisseurs. The effect of disorder and land-use variables on crime depends on "the willingness and/or capacity of occupants in an area to exercise social control, which are also likely to vary based on the relative advantage or disadvantage of a neighborhood" (Stucky & Ottensmann, 2009, p. 1224-1225). If a neighborhood has a high level of social disorganization, it may be less likely to employ informal control in the area which can result in crime. The case of zoning is one example where the level of social disorganization or disadvantage in a neighborhood may affect whether it can rally to fight or speak up regarding land use (Stucky & Ottensmann, 2009).

Thus, the level of social disorganization needs to be considered in studies on the physical environment and crime because socioeconomic disadvantage or advantage can play a moderating role in this relationship. Since neighborhood characteristics and the level of social disorganization can affect the magnitude of a physical environment variable's effect on crime, social disorganization variables need to be examined as potential moderators of this relationship. This requires an examination of whether there are interactions between physical environment variables and social disorganization variables. Statistically, an interaction occurs when "the effect of one explanatory variable depends on the particular level or value of another explanatory variable" (Fitzmaurice, 2000, p. 313). Therefore, social disorganization variables are necessary in neighborhood studies of crime not only as controls, but also as moderators of the effect of disorder and land-use structures on crime.

The present study tests the relationship between characteristics of the physical environment and crime, initially using social characteristics of neighborhoods as control variables and then subsequently as part of interaction terms. Controlling for social characteristics of neighborhoods is important for two reasons. First, there is extremely large variation in neighborhood social-structural characteristics in the city of Milwaukee; for example, the unemployment rate ranges from 1.2% to 45% (American Community Survey, 2014). Second, the effects of the physical environment variables on crime may depend on the social-structural characteristics of the neighborhood. For example, Teh's (2008) study showed that the effect of physical environment variables varied depending on the level of socioeconomic status of the neighborhood, which illustrates an interaction effect. Thus, employing social-structural characteristics is imperative to parsing out the specific effects of physical environment variables on crime.

Given these previous research findings on broken windows theory, opportunity theory, social disorganization theory, and violent crime, the following three hypotheses are proposed:

Hypothesis 1: Disorder in neighborhoods is positively associated with violent crime rates in neighborhoods.
Hypothesis 2: Land-use opportunity variables that are crime attractors and generators are positively associated with violent crime rates.
Hypothesis 3: The positive effects of disorder and crime generator variables on violent crime rates will be larger for more socially disorganized neighborhoods.

Significance

As this literature review shows, research on the physical environment and crime mainly focuses on broken windows theory or opportunity theory. However, the effect of the physical environment on crime can depend on the social characteristics of an area. Wilcox et al. (2004) argue that more tests are needed to integrate the effects of land use, control, and disorder while controlling for social-structural characteristics. Stucky and Ottensmann (2009) emphasize the need to integrate routine activities theory and social disorganization theory because merging the situational and the ecological provides a "fuller explanation of crime" (p. 1253). This research examines interaction effects between physical environment variables and the level of social disorganization in neighborhoods.

Data and Methods

This sample uses a collection of data from the city of Milwaukee, with census tracts serving as the unit of analysis and providing approximations of neighborhoods. Data from census tracts in the city of Milwaukee during 2014 were compiled from the City of Milwaukee website and the 2014 American Community Survey (see Table 1 for descriptive statistics). Variables were selected from the Community Mapping and Analysis for Safety Strategies

(COMPASS) project on the City of Milwaukee website using Census Tract Report Card reports. Milwaukee had 213 census tracts in 2014, but three census tracts were dropped from the analysis (census tract numbers 200400, 470201, and 980000) because they did not contain any residents. A closer look at a map of the city of Milwaukee census tracts showed that these tracts were small and do not have any residents (for example, tract number 980000 consists of Lake Park and greenspace along Lake Michigan in which no homes are located).

Dropping the missing cases, the sample consists of 210 census tracts (*N*=210). A multivariate regression analysis using maximum likelihood estimation and tests of spatial autocorrelation were conducted in Stata 14 (StataCorp, 2015). Autocorrelation occurs when "variables taking values, at pairs of locations a certain distance apart, that are more similar (positive autocorrelation) or less similar (negative autocorrelation) than expected for randomly associated pairs of observations" (Legendre, 1993, p. 1659). Spatial autocorrelation, where nearby units such as neighborhoods are correlated in certain values, is a concern in this study due to the potential for similar observations across neighborhoods (Legendre, 1993). Therefore, testing for evidence of spatial autocorrelation is imperative for presenting unbiased estimators, and is especially crucial in research involving crime (Kubrin & Weitzer, 2003). Tests of spatial autocorrelation are conducted and addressed in all analyses.

Dependent Variable

Following previous research on disorder, land use, and social disorganization, this study uses violent crime as the dependent variable (Sampson & Raudenbush, 2004; Gorman, Speer, Gruenewald, & Labouvie, 2001; Scribner, MacKinnon, & Dwyer, 1995). A three-year average (2013, 2014, and 2015) of violent crime in the city of Milwaukee was used instead of a single year due to potential yearly fluctuations in crime rates (Lockwood, 2007). Aggravated assault rates, robbery rates, sex offense rates, and homicide rates in 2013, 2014, and 2015 were compiled from the City of Milwaukee Census Tract Report Card report for each census tract in the city of Milwaukee. The report contains the number of aggravated assaults, robberies, sex offenses, and homicides per 1,000 residents in 2013, 2014, and 2015 for each census tract in the city of Milwaukee. The information on this report is obtained from the Milwaukee Police Department, which provides a Wisconsin Incident Based Report (WIBR) for specific group A offenses for every census tract in the city of Milwaukee. The aggravated assault rates, robbery rates, sex offense rates, and homicide rates were then averaged into an overall violent crime rate. Cronbach's alpha of the averaged violent crime rate indicated high interitem reliability ($\alpha=.8659$), illustrating that the aggravated assault, robbery, sex offense, and homicide rates are highly associated with one another and thus provide a reliable measure of violent crime (Schutt, 2015).

Broken Windows Theory Independent Variables

Counts of nuisance vehicle violations, boarded-up property violations, and the criminal damage rate are the three broken windows theory variables used to measure physical disorder. The number of nuisance vehicle violations and boarded-up property violations in 2014 were obtained for each census tract in the city of Milwaukee (Milwaukee Census Tract Report Card, 2014). This conceptualization of disorder as violations of public ordinances follows previous research on disorder and crime (Gault & Silver, 2008; Sampson & Raudenbush, 1999). The criminal damage rate specifically refers to criminal damage to property, and is defined in the report as "willfully injuring, damaging, mutilating, defacing, destroying, or substantially impairing the use of any property in which another has an interest without the consent of such other person" (Milwaukee Census Tract Report Card, 2014). The criminal damage rate was obtained from the Milwaukee Census Tract Report Card and comes from the Milwaukee Police Department's Wisconsin Incident Based Report (WIBR); this report provides the number of criminal damages per 1,000 residents in 2014 for each census tract in the city of Milwaukee.

Opportunity Theory Independent Variables

The proportion of vacant land and the number of parks, faith-based organizations, and alcohol outlets are the land-use variables used for opportunity theory. Vacant land is measured as the percent vacant land in 2014 for each city of Milwaukee census tract. The number of alcohol-related outlets was approximated with the number of liquor licenses. The number of parks, faith-based organizations, and liquor licenses in 2014 were obtained for each city of Milwaukee census tract (Milwaukee Census Tract Report Card, 2014). Parks were defined as "open space set aside for public use" and faith-based organizations were defined as "places of worship" (Milwaukee Census Tract Report Card, 2014). Using faith-based organizations as a test of opportunity theory is an attempt to clarify the mixed findings regarding churches and crime (Willits et al., 2011; Lee, 2006). While Lee (2006) found that rural violent crime rates were lower in places with more churches, Willits et al. (2011) did not find a statistically significant difference between churches and crime in a city (Albuquerque, New Mexico). Churches in cities may yield different results because they may offer more outreach services or programs to those in need than rural areas, and may have larger populations of ex-offenders, drug users, or homeless individuals. Using faith-based organizations as an opportunity theory variable in the current study serves to further investigate the relationship between churches and violent crime.

Control Variables and Interaction Terms

Social disorganization variables (ethnic heterogeneity, residential instability, unemployment rate, and median household income) measure the overall social characteristics of neighborhoods and serve as controls and interaction terms with the physical environment variables. The social disorganization variables come from the 2014 American Community Survey and the City of Milwaukee COMPASS website. Ethnic heterogeneity was measured as the percent black in 2014 in each city of Milwaukee census tract. Residential instability is measured as the percentage of occupied housing units that were renter-occupied in 2014 in each city of Milwaukee census tract. Unemployment rate is the percent of the population 16 years and over that was unemployed in 2014 in each Milwaukee census tract (American Community Survey, 2014). Median household income was measured as the 2014 median household income in the past 12 months in 2014 inflation-adjusted dollars (ACS, 2014).

The current study includes three additional variables as controls. The first is the total population of each city of Milwaukee census tract in 2014 (measured in units of 1,000). One methodological issue encountered in data collection was that the census tract population from the 2014 American Community Survey differed from that of the Milwaukee COMPASS data. The query for 2014 data on the Milwaukee COMPASS website was from January 1, 2014 to December 31, 2014; perhaps if different dates were used the population counts would be different. It is possible that the population numbers don't match up to ACS because of the dates. This might be due to when the counts are performed. The correlation between the two population measures is .978 ($p < .001$), illustrating that the small differences between population counts is a minor concern.

Another control variable is the level of urbanization, a variable Sampson and Groves (1989) use in their test of social disorganization theory. Urbanization is measured as the number of persons per square mile in each city of Milwaukee census tract in 2014, in units of 1,000.

Young male population is the last control variable, consistent with criminological literature and Sampson and Groves's (1989) findings regarding unsupervised street-corner teen peer groups in their test of social disorganization theory. Young male population is measured as the percentage of the total population in each census tract in 2014 that are males between the ages of 18 and 24 (ACS, 2014). Interaction effects are estimated between all physical environment variables (nuisance vehicle violations, boarded-up property violations, criminal damage rate, percent vacant land, number of parks, faith-based organizations, and liquor licenses) and social disorganization variables (percent black population, percent renter-occupied housing units, unemployment rate, and median household income).

Table 1 contains the descriptive statistics for all variables. The mean violent crime rate was 6.16 per 1,000 residents (see also Figure 1 for a histogram of the violent crime rate). The majority (67%) of census tracts had violent crime rates between 0 and 8 per 1,000 residents; however, two census tracts had the highest violent crime rates of 18.14 and 18.41 per 1,000 residents. The social disorganization variables had the largest range out of any of the variables, which reflects the large variation in Milwaukee neighborhoods. For example, median household

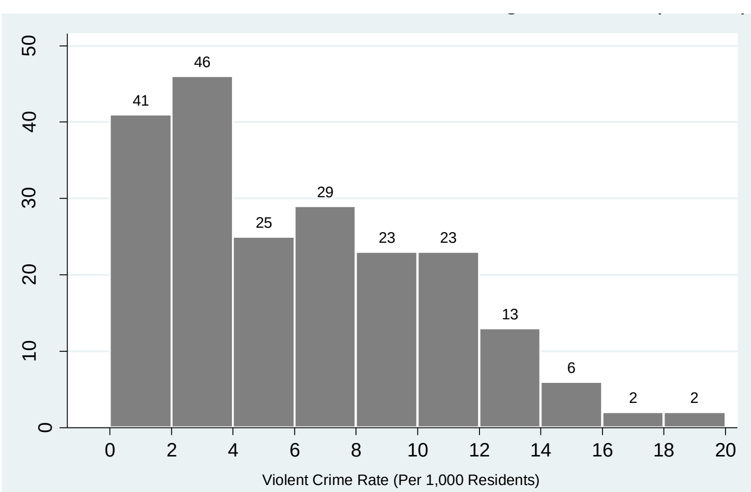

Figure 1. Violent crime rates in Milwaukee neighborhoods (*N*=210).

Table 1: **Descriptive Statistics (*N*=210)**

	Mean	*SD*	*Min*	*Max*
Dependent Variable				
Violent crime rate (per 1,000 residents)	6.16	4.27	0.00	18.41
Broken Windows Theory Variables				
Nuisance vehicle violations	4.79	5.80	0.00	26.00
Boarded-up property violations	6.43	7.91	0.00	37.00
Criminal damage rate (per 1,000 residents)	7.60	4.05	0.00	22.92
Opportunity Theory Variables				
Vacant land (%)	5.60	7.69	0.00	50.00
Number of parks	2.32	3.24	0.00	19.00
Number of faith-based organizations	3.40	3.10	0.00	16.00
Number of liquor licenses	6.10	8.63	0.00	65.00
Social Disorganization Variables				
Black population (%)	4.74	35.99	0.73	95.73
Renter-occupied housing units (%)	57.91	19.49	6.63	10.00
Unemployment rate (%)	14.76	9.06	1.20	45.00
Median household income ($1,000)	36.97	15.83	1.32	105.63
	Mean	*SD*	*Min*	*Max*
Control Variables				
Total population (1,000)	2.86	1.12	1.07	6.53
Urbanization (1,000)	10.20	10.20	0.73	130.56
Young male population (%)	13.20	11.42	1.00	76.00

income ranged from $10,321 to $105,625 and the percent black population ranged from 0.73% to 95.73%, indicating the extreme income inequality and racial segregation among Milwaukee neighborhoods. The maximum value for young male population (76%) reflects the census tracts containing a university. Correlation analysis (not shown) between all independent variables did not reveal any multicollinearity problems. The highest correlation was between median household income and renter-occupied housing units ($r = -.72$), with variance inflation factors of less than 4.[1]

To determine whether spatial autocorrelation was present in the data, a spatial weight matrix was constructed using UCINET VI (Borgatti, Everett, & Freeman, 2002) using nearest neighbor matching. Tests of spatial autocorrelation were conducted in Stata 14 (StataCorp, 2015) using the *spatwmat, spatgsa*, and *spatlsa* commands (Pisati, 2012), and revealed evidence of both global and local spatial autocorrelation ($p<.001$). To address this evidence, all multivariate regression analyses using maximum likelihood estimation analyses used the *spatreg* command to estimate spatial error models, which indicate correlation among the error terms and not the independent variables (Pisati, 2012; Kubrin & Weitzer, 2003).

Maximum likelihood estimation consisted of two main models, then subsequently tested for interaction effects. The first model contains the broken windows theory and opportunity theory variables, and the second model adds social disorganization variables. Interaction terms were created between all physical environment variables and social disorganization variables. To address interaction terms that were highly correlated with their

[1] Results of analyses excluding the renter-occupied variable yielded virtually identical results, apart from median household income which had a negative, statistically significant effect on violent crime (controlling for other variables). All statistically significant interaction terms had identical magnitudes and directions, although the faith-based organizations and median household income interaction term attained statistical significance at the $p < .05$ level instead of at the $p < .10$ level.

main effect or original variables, mean-centering was used for both the interaction terms and the original component variables. Interaction terms were added one at a time to the full model, which consists of all variables (broken windows theory variables, opportunity theory variables, social disorganization variables, and control variables). All models contain the control variables.

Results

Table 2 contains the results of the two maximum likelihood estimation models.[2] Likelihood ratio tests comparing model fit using Akaike's information criterion (AIC) and Bayesian information criterion (BIC) show "very strong" evidence favoring the full model (broken windows variables, opportunity variables, and social disorganization variables) over the model without social disorganization variables (Long & Freese, 2014; Raftery, 1995). The relationship between all disorder/broken windows theory variables and violent crime is statistically significant and in the predicted positive direction ($p < .01$). Nuisance vehicle violations, boarded-up property violations, and criminal damage rate all had a positive, statistically significant effect on violent crime, controlling for other variables ($p < .01$).

Per Model 1, predicted violent crime increases .07 per 1,000 residents as nuisance vehicle violations increase by one violation, holding other variables constant ($p < .01$). Based on the descriptive statistics of nuisance vehicle violations (mean=4.79, SD=5.80, min=0, max=26), an increase of one nuisance vehicle violation is meaningful. However, based on the descriptive statistics of violent crime (mean=6.16, SD=4.27, min=0.00, max=18.41), an increase of .07 in

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[2] Maximum likelihood estimation models conducted for mediation analysis (not shown) indicated that percent black, unemployment rate, and percent renter-occupied all had statistically significant effects on disorder variables ($p < .05$). This provides support for including social disorganization variables as control variables and for testing them as potential mediators or moderators between physical environment variables and crime.

Table 2: Results of Maximum Likelihood Estimation Models (*N*=210)

	Model 1 Broken Windows + Opportunity	**Model 2** Broken Windows + Opportunity + Social Disorganization
Broken Windows Theory Variables		
Nuisance vehicle violations	.07**	.06*
	(.03)	(.02)
Boarded-up property violations	.10***	.08**
	(.03)	(.02)
Criminal damage rate	.28***	.18***
	(.04)	(.04)
Opportunity Theory Variables		
Vacant land (%)	.11***	.07**
	(.03)	(.02)
Parks	-.02	-.02
	(.04)	(.03)
Faith-based organizations	-.0003	-.02
	(.04)	(.04)
Liquor licenses	.04*	.06***
	(.02)	(.02)
Social Disorganization Theory Variables		
Black (%)	--	.06***
		(.01)
Renter-occupied (%)	--	.02
		(.01)
Unemployment rate (%)	--	.01
		(.02)
Median household income	--	-.02
		(.01)
Control Variables		
Total population	-.30*	-.39***
	(.14)	(.12)
Urbanization	-.03*	-.02
	(.02)	(.01)
Young male population	-.03	-.03*
	(.02)	(.01)
AIC	858.96	783.49
BIC	902.47	840.39

Standard errors in parentheses
***p < .001, two-tailed. **p < .01, two-tailed. *p < .05, two-tailed.

violent crime is not large enough to have an impact. So, although nuisance vehicle violations have a positive, statistically significant effect on violent crime, this effect is small.

Regarding the second disorder variable of boarded-up property violations, Model 1 shows that predicted violent crime increases .10 per 1,000 residents as boarded-up property violations increase by one violation ($p < .001$). Based on the descriptive statistics of boarded-up property violations (mean=6.43, SD=7.91, min=0.00, max=37.00), an increase of one boarded-up property violation is not large enough to have an impact. An increase of three boarded-up property violations is more meaningful. Looking at the descriptive statistics of violent crime, an increase of .30 (.10*3) in violent crime is still not large enough to have an impact. Boarded-up property violations have a positive, statistically significant effect on violent crime, but this effect is small and does not have substantive significance.

Regarding the criminal damage rate in Model 1, predicted violent crime increases .28 per 1,000 residents as the criminal damage rate increases one per 1,000 residents, holding other variables constant ($p < .001$). Based on the descriptive statistics of criminal damage rate (mean=7.60, SD=4.05, min=0.00, max=22.92), a one per 1,000 residents increase in the criminal damage rate is large enough. However, when looking at the descriptive statistics of violent crime, an increase of .28 in violent crime is small. Like nuisance vehicle violations and boarded-up property violations, the criminal damage rate has a positive, statistically significant effect on violent crime but the effect is small. These overall findings for disorder variables are similar when social disorganization variables are added in Model 2. Although effect sizes are small, these results provide support for Hypothesis 1, that disorder in neighborhoods is positively associated with violent crime rates in neighborhoods.

Among the land-use opportunity variables, vacant land and liquor licenses both had positive, statistically significant effects on violent crime, controlling for other variables ($p <$ .05). Model 1 shows that predicted violent crime increases .11 per 1,000 residents as the percent vacant land in a neighborhood increases one percent, holding other variables constant ($p < .001$). Based on the descriptive statistics of vacant land (mean=5.60, SD=7.69, min=0.00, max=50.00), a one-percent increase in vacant land is not large enough but a five-percent increase is more impactful. Looking at the descriptive statistics of violent crime (mean=6.16, SD=4.27, min=0.00, max=18.41), a .55 (.11*5) increase in violent crime is large enough to have an impact. Vacant land has a positive, statistically and substantively significant effect on violent crime, controlling for other variables.

Liquor licenses had a positive, statistically significant effect on violent crime, controlling for other variables ($p < .05$). Per Model 1, predicted violent crime increases .04 per 1,000 residents as the number of liquor licenses increase by one liquor license, controlling for other variables ($p < .05$). An increase of one liquor license is not large enough based on the descriptive statistics for liquor licenses (mean=6.10, SD=8.63, min=0.00, max=65.00); an increase of five liquor licenses is more meaningful. However, a .20 (.04*5) increase in the violent crime rate as the number of liquor licenses increases by five licenses is not large enough to have an impact based on the descriptive statistics of violent crime. Therefore, liquor licenses have a positive, statistically significant effect on violent crime but the effect is small. These overall findings regarding the effect of vacant land and liquor licenses on violent crime remain the same when social disorganization variables are added in Model 2. These results provide some support for Hypothesis 2 (land-use opportunity variables that are crime attractors and generators are positively associated with violent crime rates), but other land-use variables (parks and faith-based organizations) did not have a statistically significant association with violent crime.

Out of the social disorganization variables, ethnic heterogeneity (measured as percent black population) is the only variable that has a statistically significant effect on violent crime. Per Model 2, predicted violent crime increases .06 as the percent black population in a neighborhood increases one percent, holding other variables constant ($p < .001$). Based on the descriptive statistics of percent black population (mean=4.74, SD=35.99, min=0.73, max=95.73), a one-percent increase in the percent black population is too small but a ten-percent increase in percent black is plausible. An increase of .60 (.06*10) in predicted violent crime as the percent black population increases by ten percent is large enough to have an impact, based on the descriptive statistics of violent crime (mean=6.16, SD=4.27, min=0.00, max=18.41). Percent black population has a positive, statistically and substantively significant effect on violent crime, controlling for other variables. Residential instability, unemployment rate, and median household income did not have statistically significant effects on violent crime rates, holding other variables constant.

Apart from total population, the results for the control variables are different in Model 1 versus Model 2. In both models, total population had a negative, statistically significant effect on violent crime rates ($p < .05$). Predicted violent crime decreases .30 per 1,000 residents as total population increases by 1,000, holding other variables constant ($p < .05$), an effect which is too small to have substantive significance based on the descriptive statistics of violent crime. Urbanization has a negative, statistically significant effect on violent crime in Model 1 only ($p < .05$), but this effect is too small to have a real-world impact. Young male population has a negative, statistically significant effect on violent crime in Model 2 only ($p < .05$). Predicted violent crime decreases .03 as the young male population increases by one young male, but this effect is also too small to have substantive significance (based on the descriptive statistics of both young male population and violent crime).

The next step was to test for interaction effects between physical environment variables and social disorganization variables. Results of interaction models indicated that two interaction terms had statistically significant effects on violent crime, while two interaction terms had borderline statistically significant effects (see Table 3). Two of these interaction terms contained disorder variables, while the other two interaction terms contained land-use variables. Table 3 shows an interaction between criminal damage rate

Table 3: Interaction Terms Between Physical Environment Variables and Social Disorganization Variables (*N*=210)

	Interaction Model
Criminal damage rate	.164**
	(.037)
Black population	.058**
	(.008)
Criminal damage rate × Black population	.002*
	(.001)
Criminal damage rate	.160**
	(.038)
Median household income	-.030*
	(.014)
Criminal damage rate × Median household income	-.003+
	(.001)
Faith-based organizations	.011
	(.042)
Median household income	-.021
	(.013)
Faith-based organizations × Median household income	.005+
	(.003)
Liquor licenses	.079**
	(.017)
Median household income	-.016
	(.013)
Liquor licenses × Median household income	-.002**
	(.001)

Note: Standard errors in parentheses. Mean-centering was used for all interaction terms.
***p* <.01, two-tailed. **p* <.05, two-tailed. +*p* <.10, two-tailed.

and percent black population had a positive, statistically significant effect on violent crime. The effect of the criminal damage rate on violent crime increases .002 per 1,000 residents as the percent black in a neighborhood increases one percent, controlling for other variables ($p < .05$). Although the effect size of the interaction term is small, these findings provide some support for Hypothesis 3 (the positive effect of physical environment variables on violent crime rates will be larger for more socially disorganized neighborhoods), since the positive effect of the criminal damage rate on violent crime increases as the level of social disorganization (here, measured as ethnic heterogeneity) increases.

Given that Milwaukee neighborhoods have large variation in their percent black population (ranging from 0.73% to 95.73%), it is important to examine the effects of criminal damage on violent crime for neighborhoods with both small and large black populations. For example, 40% of Milwaukee neighborhoods have black populations of less than 1.73%. For neighborhoods with small black populations such as the East Side (using for example East side neighborhood census tract 10800 which is 6.16% black), the effect of criminal damage on violent crime is .09 per 1,000 residents[3], controlling for other variables. On the other hand, approximately one in five Milwaukee census tracts have a large black population (greater than 8.73%). For neighborhoods with a large black population such as Harambee (using for example Harambee census tract 185700 which is 9.21% black), the effect of the criminal damage rate on violent crime is .26 per 1,000 residents[4], controlling for other variables. Thus, the effect of criminal damage on violent crime for primarily black neighborhoods is three times larger than it is for primarily non-black neighborhoods, although the effects are small in both neighborhoods.

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[3] .164 + .002*(6.16-40.74) = .09

[4] .164 + .002*(90.21-40.74) = .26

Another interaction term that had a statistically significant effect on violent crime is between liquor licenses and median household income (see Table 3). The effect of the number of liquor licenses on violent crime decreases .002 as median household income increases $1,000 ($p$ < .01), holding other variables constant. Based on the descriptive statistics of liquor licenses (mean=6.10, SD=8.63, min=0.00, max=65.00), a one-unit increase in the number of liquor licenses is not large enough. An increase of five liquor licenses is more meaningful. But based on the descriptive statistics of violent crime (mean=6.16, SD=4.27, min=0.00, max=18.41), a decrease of .01 (.002*5) in the violent crime rate is small.

Since the median household income varies greatly among Milwaukee neighborhoods (ranging from $10,321 to $105,625), it is important to examine if the effect of liquor licenses on violent crime differs for low-income versus high-income neighborhoods. For low-income neighborhoods, such as the inner city of downtown Milwaukee (for example, census tract 14600 with a median income of $10,321), the effect of liquor licenses on violent crime is .13[5], controlling for other variables. For high-income neighborhoods with a median income of $105,625, the effect of liquor licenses on violent crime is -.06[6], holding other variables constant. Although effects of liquor licenses on violent crime are larger for more socially disorganized neighborhoods which is consistent with Hypothesis 3, the findings do not support this hypothesis because the direction of the relationship between liquor licenses and violent crime changes from positive for low-income neighborhoods to negative for high-income neighborhoods. One explanation is that alcohol outlet customers in high-income neighborhoods are typically families and wine connoisseurs who are less likely to commit violent crime (Teh, 2008). Liquor licenses in high-income neighborhoods may belong to upscale restaurants or

[5] .079 + -.002*(10.321-36.967) = .13
[6] .079 + -.002*(105.625-36.967) = -.06

establishments that discourage disorderly behavior and public drunkenness, and consequently have higher levels of social order and less crime. Thus, examining the interaction between land-use variables and neighborhood characteristics is imperative because the effects on crime can be not only different in magnitude but also in direction.

Two interaction terms had borderline statistically significant effects on violent crime at the $p < .05$ level (see Table 3). First, an interaction between criminal damage rate and median household income is borderline statistically significant at the .05 level ($p < .052$). The effect of criminal damage rate on violent crime decreases .003 per 1,000 residents as median household income increases $1,000, holding other variables constant ($p < .10$; see Table 3). For low-income neighborhoods, such as the inner city of downtown Milwaukee (for example, census tract 14600 with a median household income of $10,321), the effect of criminal damage on violent crime is .24[7], holding other variables constant. For high-income neighborhoods, such as those along Lake Michigan (for example, census tract 7500 which has a median income of $84,459), the effect of criminal damage on violent crime drops to .02[8], holding other variables constant. These findings provide some support for Hypothesis 3 (the positive effect of physical environment variables on violent crime rates will be larger for more socially disorganized neighborhoods) since the positive effect of criminal damage on violent crime is larger for lower-income neighborhoods than for high-income neighborhoods, but these effect sizes are small. One possible explanation for this finding is that richer neighborhoods may be more likely to report criminal damage than poorer neighborhoods, and they also may have more resources than low-income neighborhoods to repair or replace damaged property and consequently reduce the appearance of disorder.

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[7] $.160 + -.003*(10.321-36.967) = .24$
[8] $.160 + -.003*(84.459-36.967) = .02$

Another interaction term that had a borderline statistically significant effect on violent crime at the .05 level ($p < .059$) was between faith-based organizations and median household income. Table 3 shows that the effect of faith-based organizations on violent crime increases as the median household income in a neighborhood increases, controlling for other variables. The effect of faith-based organizations on violent crime increases .005 as median household income increases $1,000, controlling for other variables ($p < .10$; see Table 3). For low-income neighborhoods (median household income of $10,321), the effect of faith-based organizations on violent crime is -.12[9], controlling for other variables. For high-income neighborhoods (median household income of $84,459), the effect of faith-based organizations on violent crime is .25[10], holding other variables constant.

At first glance, these results do not provide support for Hypothesis 3 (the positive effect of physical environment variables on violent crime rates will be larger for more socially disorganized neighborhoods) because the effect of faith-based organizations on violent crime is larger for *less* socially disorganized neighborhoods. Also, while faith-based organizations have a negative effect on violent crime in low-income neighborhoods, they have a positive effect on violent crime in high-income neighborhoods. These results illustrate that the direction of the association between churches and crime depends on the income level of a neighborhood. One possible explanation lies in the social ties and familiarity among congregants, which provides informal social control (Willits et al., 2011). Poor and/or minority neighborhoods often have higher levels of church activity (Skogan, 1990). Therefore, congregants in low-income neighborhoods may have more familiarity and social ties with one another due to frequent attendance and involvement in their church (and thus exhibit greater informal social control)

[9] .011 + .005*(10.321-36.967) = -.12
[10] .011 + .005*(84.459-36.967) = .25

than congregants in high-income neighborhoods. Another explanation is that churches play an important role in low-income neighborhoods, providing necessary food, medical care, and services to those in need. Churches may help residents who might otherwise turn to crime to deal with needs or issues. On the other hand, residents of high-income neighborhoods may attend church less frequently or not at all; combined with less outreach and services, there may be less surveillance and "eyes on the street" if churches are only used once a week in these neighborhoods.

The current study's results may help explain the mixed findings in the previous literature on churches and crime. While Lee (2006) found a negative association between churches and crime, Willits et al. (2011) did not find a statistically significant relationship between churches and crime. This study separated out the effects of churches on crime for low-income and high-income neighborhoods. Churches had a negative relationship with crime in low-income neighborhoods but a positive relationship with crime in high-income neighborhoods. These negative and positive effects on crime may cancel each other out, making it appear that churches do not have a statistically significant effect on crime. This is evident in the current study, as faith-based organizations did not have a statistically significant effect on crime in the non-interaction models (see Table 2). These findings provide a possible explanation for the mixed findings in the previous literature on churches and crime, and highlight the importance of including interaction terms with neighborhood characteristics in studies on the physical environment and crime.

Lastly, results of likelihood ratio tests comparing interaction models to non-interaction models indicate that the interaction models are a better fit to the data than the models without the interaction terms. All interaction models had smaller Akaike's information criterion (AIC) values than the non-interaction models. Models with smaller AIC values are a better fit to the data (Long & Freese, 2014). The Bayesian information criterion (BIC) statistics show positive evidence of favoring the liquor license and median household income interaction model over the non-interaction model, but only weak evidence of favoring the other interaction terms over the non-interaction terms models (Raftery, 1995; Long & Freese, 2014).

Discussion and Conclusion

The goal of this study was to investigate the relationship between physical environment variables and violent crime. Results show that all disorder variables (nuisance vehicle violations, boarded-up property violations, and criminal damage rate), and two land-use opportunity variables (percent vacant land and number of liquor licenses) had positive, statistically significant effects on violent crime even after controlling for social disorganization variables. Although these effects were small (except for percent vacant land), they still provide some support for broken window theory and opportunity theory. The findings regarding the positive relationship between vacant land and violent crime yield important evidence that may be used for targeted policy or public intervention efforts, such as lot-greening. Given that homicides in Milwaukee in 2015 were the highest since 1993 (Luthern, 2016), and previous research findings on lot-greening and decrease in gun assaults (Branas et al., 2011), this connection between vacant land and violent crime and possible solutions is illuminating, particularly for Milwaukee but also for other cities that may be facing rising vacancy rates and abandoned lots due to the foreclosure crisis.

This research has also attempted to fill a gap in the literature by integrating social disorganization interaction terms into studies on the physical environment and crime. The results of interaction models indicated that the effect of physical environment variables on violent crime depended on neighborhood socioeconomic status and racial composition. The effect of disorder (specifically, criminal damage rate) and the effect of land-use (specifically, liquor licenses) on violent crime decreased as the median household income increased, although these effects were small. Moreover, the effects of criminal damage and liquor licenses on violent crime were larger for low-income neighborhoods than for high-income neighborhoods which is consistent with previous research (Teh, 2008). Results from the current study showed that the effect of liquor licenses on violent crime changed direction depending on neighborhood income level. Liquor licenses had a positive effect on violent crime in low-income neighborhoods, and a negative effect on violent crime in high-income neighborhoods. Liquor licenses in high-income neighborhoods may belong to upscale restaurants and establishments that discourage disorderly behavior and public drunkenness, resulting in less crime. These findings indicate the large role that place has in shaping norms, behaviors, and social interactions. It is essential to integrate the level of neighborhood social disorganization into studies of the physical environment and crime because the magnitude and direction of the effect on crime can vary immensely for different neighborhoods.

This is particularly true in the case of faith-based organizations. While faith-based organizations had a negative effect on violent crime in low-income neighborhoods, they had a positive effect on violent crime in high-income neighborhoods. Also, the effect of faith-based organizations on violent crime was larger for high-income neighborhoods than for low-income neighborhoods. These findings provide a possible explanation of why there has been mixed findings in previous research on churches and crime: the direction of the relationship between churches on crime may depend on neighborhood socioeconomic status. Thus, results of previous research (Willits et al., 2011) and the current study that did not find a statistically significant association between churches and crime may be because these positive and negative effects are cancelling each other out.

Possible reasons for these findings may rest in the role of churches in neighborhoods. There is more church activity in poor and/or minority neighborhoods (Skogan, 1990). Residents in these neighborhoods may have more familiarity and social ties to each other due to church attendance and involvement with church activities, which can provide informal social control in a community (Willits et al., 2011). Furthermore, churches act as a "significant political force" in inner-city neighborhoods (Skogan, 1990, p. 196). Poorer neighborhoods may use churches to mobilize efforts and obtain resources, and at the same time may also offer food or services to those in need. It is possible that the negative relationship between churches and crime in low-income neighborhoods is due to the outreach services that churches can provide such as food, medical care, employment, and referral to other agencies and organizations.

Parks and faith-based organizations are two land-use variables that did not have a statistically significant effect on violent crime rates (although an interaction term between faith-based organizations and median household income had a borderline statistically significant effect on violent crime at the $p<.05$ level, which is discussed in the previous paragraph). Data limitations may need to be considered in this study, since The Census Tract Report Card only contains data on the number of parks and faith-based organizations, not the type of usage (for example, parks used for organized sports). Future research needs to consider the characteristics and usage of parks, a statement supported by Groff & McCord's (2011) findings. Faith-based organizations require similar delineation. In their examination of churches and crime, Willits et al. (2011) used a dummy variable (church or no church) but faced the same challenge where there was no indicator of usage of the church or its involvement with the community. Future research that considers usage of land-use variables may help to shed light on the underlying mechanisms between land use and crime.

Due to the highly-segregated nature of Milwaukee neighborhoods, another limitation in this study is the use of percent black population as a measure of ethnic heterogeneity. This extreme racial segregation of neighborhoods is evidenced in the descriptive statistics for percent black population, ranging from 0.73% to 95.73%. Some neighborhoods may have little to no ethnic heterogeneity, which is a limitation of this study. Despite this limitation, percent black population still had a positive, statistically and substantively significant effect on violent crime even after controlling for physical environment and social disorganization variables. Furthermore, an interaction between criminal damage rate and percent black population illustrated a positive, statistically significant effect on violent crime, although this effect was small. The effect of criminal damage on violent crime for neighborhoods with large black populations was three times the effect for neighborhoods with smaller black populations. This finding illustrates that differences in violent crime between black and white neighborhoods exist, even after considering the physical and social characteristics of neighborhoods. Although the current study cannot address the reason for the difference, one possibility is that black neighborhoods may be policed more than non-black neighborhoods. Further research that seeks to uncover the reason for this difference is necessary.

The level of policing in neighborhoods may also affect other aspects of studies on neighborhoods and crime, particularly disorder variables. While using ordinance violations as a proxy for disorder is typical in the disorder literature, they can be viewed as both a strength and a limitation in this study. Violations can be considered a strength in that they require no researcher interpretation of disorder, which can vary depending on individual background or life experience. However, using violations or the criminal damage rate may also be a limitation of this study because it may reflect differences in policing among neighborhoods. Certain neighborhoods may be policed more heavily than others, resulting in a larger number of violations. This is especially relevant considering recent findings of racial disparities in traffic stops in Milwaukee; black Milwaukee drivers are seven times more likely to be stopped by police than white Milwaukee drivers (Poston, 2011). Policies that draw on broken windows theory, especially those involving the police, must be careful in their implementation. Hinkle and Weisburd (2008) found that reducing disorder lowered citizens' fear of crime, but increases in policing and crackdowns raised fear of crime.

Problem-solving strategies, where police work with community residents and businesses, are more effective than aggressive order-maintenance strategies such as zero-tolerance policing (Welsh et al., 2015). However, there is also a question of whose voice is being represented. Evaluations of some community policing programs have shown that some efforts help more advantaged areas (such as whites and homeowners), while disadvantaged areas (such as blacks and renters) do not yield the same benefits (Skogan, 1990). Neighborhoods that are better-off may already have organized groups that can lobby for funds or resources, while neighborhoods that are less organized may not reap the same rewards. There is a risk of perpetuating class and racial divides if attention is not paid to these issues. Furthermore, minority neighborhoods may especially be distrustful of the police due to racism and corruption (Skogan, 1990).

Disorder does not necessarily mean that residents do not care about their community. In his interviews with Chicago residents of a disadvantaged, high-crime area, St. Jean (2007) found that residents perceived disorder in their neighborhood as a lack of care by the city. He writes how "more important than the level of social disorder is where the social disorder is taking place and who the actors involved are" (St. Jean, 2007, p. 145). Residents may not have the means to fix or tackle issues in their area, especially larger, macro issues such as unemployment and poverty. Furthermore, the effects of disorder are cumulative. Disorder can send a signal that a neighborhood has declined, discouraging further investment and involvement in the area (St. Jean, 2007; Skogan, 1990). The findings in this study illustrate that large, macro forces underlie disorder, particularly economic and social forces. Skogan (1990) wrote how "the distribution of disorder…mirrors the larger pattern of structured inequality" (p. 173). This is reflected in the current study's findings, as disorder had different effects on crime depending on the socioeconomic status or racial composition of a neighborhood. This has profound implications not only for further research on the physical environment and crime, but also for policies that examine disorder and land-use in neighborhoods. Research that integrates social-structural characteristics of neighborhoods may better inform policy and programs that examine the physical environment and its relationship to crime.

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