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NEIGHBORHOOD DISORDER, DILAPIDATED HOUSING, AND CRIME: MULTILEVEL ANALYSIS WITHIN A MIDSIZED MIDWESTERN CITY CONTEXT

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NEIGHBORHOOD DISORDER, DILAPIDATED HOUSING, AND CRIME: MULTILEVEL ANALYSIS WITHIN A MIDSIZED MIDWESTERN CITY CONTEXT

By

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ABSTRACT

NEIGHBORHOOD DISORDER, DILAPIDATED HOUSING, AND CRIME: MULTILEVEL ANALYSIS WITHIN A MIDSIZED MIDWESTERN CITY CONTEXT

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This dissertation had two main purposes. First, it attempted to test the broken windows theory within a midsized Midwestern city context, using two waves of field observation data and other various official datasets. Second, cross-level interaction dynamics were examined via a Hierarchical Mixed Poisson Model including a spatial lag term. In order to make the multivariate contextual analyses more credible, this study further attempted to clarify sensitive methodological issues that are likely to influence study outcomes.

The Hierarchical Mixed Poisson Model revealed several notable findings. First, the results for violent crime were different from those for property crime, which appeared to be supportive of Clarke's (1970) notion that more crime-specific approaches need to be taken in research and crime prevention policy. Second, the effect of physical disorder change on violent crime change was negatively moderated by the level of concentrated disadvantage. In other words, the link between physical disorder and violent crime was less valid in prosperous neighborhoods than in disadvantaged counterparts, which implied that strategies focusing solely on reducing physical disorder might have little effect on dropping the level of violent crime in poor neighborhoods. Third, social disorder change and residential instability had a negative interaction effect on property crime change. It indicated that the impact of social disorder change on property crime

change became weaker as the level of residential instability increased, which further implied that dealing with social disorder might be less effective in reducing property crime in non-stable communities than in stable communities.

Along with the necessity of crime-specific approach, the above cross-level interaction effects made a suggestion that the link between disorder and crime could be different depending on various community contexts, and thus more context-specific approaches need to be taken. However, it was necessary for the findings to be interpreted with a caveat due to some limitations. As an example, the important mediating factor, collective efficacy was not controlled for.

To my parents, wife, son, and daughter, who encourages me to stand up again and again

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CHAPTER I: INTRODUCTION

Neighborhood Disorder, Dilapidated Housing, and Crime

Crime and fear of crime are often among the top concerns of urban residents. Along with poor schools, these concerns are frequently viewed as the leading proximate causes of urban decline across America. Criminologists have long compiled evidence that physical landscape and the social environment in inner cities serve as critical factors that can heighten fear of crime and crime rates (Skogan, 1990). For instance, Wilson and Kelling's (1982) classic essay, "Broken Windows," has influenced two decades of public policy by refocusing efforts away from targeting individuals towards addressing crime generators such as persistent, lower-level problems that violate social norms of public order. From this perspective, quality of life issues such as vandalism, panhandling, litter and trash, graffiti, and abandoned housing constrain pro-social neighborhood processes that have become known as a community's collective efficacy[1] (Sampson, Raudenbush, & Earls, 1997). In turn, the decrease in collective efficacy that arises out of social and physical disorder is linked to the growth of serious street crime (Sampson, Morenoff, & Raudenbush, 2005; Taylor, 2002). Thus, the link between neighborhood disorder and crime appears causal, inasmuch as the growth of disorder is consistently associated with an increase in serious crime. However, when communities address low-level disorder, whether social or physical, they communicate to those at risk for deviant behavior that the area is under capable guardianship and that there is a will to improve the community

[1] Sampson and his colleagues (1997) define collective efficacy as "social cohesion among neighbors combined with their willingness to intervene on behalf of the common good." It is proposed that the level of collective efficacy is the key connecting neighborhood structural conditions and crime rates. Refer to Chapter III for more detailed discussion on the neighborhood process mechanism.

and combat crime (e.g., Green, 1995). Accordingly, the "broken windows" thesis has become a working model under which some community policing (e.g., Katz, Webb, & Schaefer, 2001) and community prosecution (see White, Fyfe, Campbell, & Goldkamp, 2003; Worrall & Zhao, 2003) initiatives operate.

Meanwhile, abandoned or dilapidated housing has received special attention as a kind of representative measure of physical disorder. Neighborhoods are easily disfigured by ugly dilapidated houses, and those buildings often serve as a source of other types of disorderly conditions and behaviors. The influence of abandoned properties on crime appears to be strongly supported by empirical evidence. Tiechert (1999), for example, found that Franklin Villa, a small portion of Sacramento, California, was made up of 85% absentee landlord rental units and suffered from the highest crime rates in the entire city. According to Spelman (1993), Austin, Texas, experienced a dramatic 50% increase in the property crime rate and an 89% increase in robbery rate from the mid-1980s through 1991, when 25% of houses were vacant, with the number of vacant properties increasing each year. Sherman, Gartin, and Buerger (1989) discovered that in Minneapolis, Minnesota, 50% of the police service calls were concentrated in only 3% of its entire area, which were called "hot spots." Those hot spots were revealed to be more likely to occur in poor neighborhoods where the number of abandoned houses was also increasing (Rider, 2003).

The city of Lansing, Michigan, despite its relatively small size, appears to have suffered from similar problems. For instance, in 2003, the Chestnut neighborhood[2] that comprises only 11.8% of Lansing's land area contributed 20% of the city's dilapidated

[2] It falls neatly inside the area assigned to Team 3 of the LPD's Team Policing. Team Three's policing area is bordered by Saginaw Highway, Martin Luther King Blvd, East St, and the Grand River greenway north of Grand River and Willow Avenues (Rider, 2003).

houses and over 21% of criminal incidents reported by the Lansing Police Department (hereinafter LPD; Rider, 2003). Serious concerns with the issue of dilapidated housing among the residents in Lansing communities have often been expressed by the local media. As an example, an article in the *Lansing State Journal* stated:

> Residents say the hulking eyesores – deemed uninhabitable by the city – make potential home buyers balk at moving in and send a bad vibe to visitors driving Lansing's major thoroughfares. The houses are dangerous playgrounds for curious kids and attract homeless people and drug users. A suspicious fire gutted a red-tagged, two-story apartment house in Old Town last month.
>
> (MacDonald, 5/19/2003)

In sum, disorderly behaviors and conditions, including dilapidated housing, seem to be significantly associated with civil concerns, fear of crime, and actual concentration of criminal incidents in urban neighborhoods. In fact, as mentioned above, the link between disorder and crime is well conceptualized and contains very appealing policy implications. As a result, many public agencies eagerly have adopted initiatives that purport to reduce crime by dealing with disorderly street activities and conditions.[3] Responding to the civil concerns about dilapidated residential properties and crime, since 2003, the city of Lansing also has initiated some measures to improve physical environments across the city. The efforts provided a nice opportunity for empirical research. In response to that opportunity, the School of Criminal Justice at Michigan State University and the city of Lansing developed a cooperative initiative, Lansing Dilapidated Housing Project (hereinafter LDHP), to examine the effectiveness of the

[3] A typical example is the SMART (Specialized Multi-Agency Response Team) program in Oakland, California (Green, 1995). The key aspect of the program was constructing cooperative relationships among diverse public agencies (e.g., police, housing inspectors, public workers, gas and electric agencies), citizens, landlords, and business owners. The proactive enforcement of various city codes and civil laws (e.g., housing code, health and safety code, drug nuisance statement law, etc.) was effective in reducing disorder and drug problems in targeted areas. Even a small net effect of spatial diffusion of the benefits was detected.

city's efforts to deal with crime and related problems. A brief description of the project is presented below.

Lansing Dilapidated Housing Project

When residential units are poorly maintained and unsafe, consistent with the city's housing code, officers from the Lansing Code Compliance Office (hereinafter LCCO) issue and attach a red tag to the front door. In June, 2003, there were about 479 red-tagged houses located in 386 street segments across the city.[4] Those houses, as mentioned above, raised serious residential concerns about decreasing property values, high crime rates, and urban decline.

In response to these concerns, the project city's government and council have taken several official actions to improve the conditions of dilapidated housing properties with an aim of reducing crime. As an example, an amended state law was passed in 2003 that allowed cities to raze red-tagged houses with fewer constraints than existed previously. As a result of the amendment, they did not have to wait for six months of vacancy nor did they have to wait until the property value surpassed the State Equalized Valuation. Meanwhile, the LCCO hired a caseworker. Her key actions included cooperation with the LPD to identify neighborhoods with the most crime and dilapidation issues, cooperation with code inspectors to identify the neighborhoods with the most abandoned housing, working with those specific neighborhoods, locating homeowners and determining potential actions, arranging for boarding and securing of houses, and

[4] In other words, some segments had more than one red-tagged house. For instance, two segments contained as many as four tagged houses. Additionally, the roads of the project city consist of 5,953 segments.

connecting homeowners to diverse agencies, such as bankers, contractors, realtors, and property demolition experts (Rider, 2003).[5]

Those efforts provided an opportunity for empirical research on the theoretical link between physical disorder (represented by abandoned housing and its surrounding conditions), social disorder, and crime in the city's neighborhoods. The initial research plan was to perform a randomized field experiment, which was agreed upon by the city government. Researchers assigned 260 red-tagged houses into a treatment group and 217 into a control group.[6] The LCCO inspectors and caseworker were asked to work with owners and other interested parties (e.g., banks, community groups, home owners, etc.) only for the 260 treatment houses. To provide a pretest, two graduate students from the School of Criminal Justice conducted a street survey on the tagged houses and their segments during the spring and summer of 2003.[7]

Unfortunately, however, due to budget constraints, the original plan came to an early end without accomplishing the goal. The caseworker had to quit her job after treating 50 houses in 40 segments. This early end of the experimental approach left the researchers with only one option: the researchers decided to take a non-experimental approach, which was to observe and model the natural change of physical conditions, social disorder, and crime across the study segments. With the help of the Michigan

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[5] The community-oriented policing approach of the LPD deserves attention in terms of its structure. They divided the city into several team areas where permanent patrol officers and leadership were assigned. Also, every two team areas shared investigators so that they could become familiar with the people and other general conditions and situations in that area. However, much less organized efforts to enhance collective efficacy through proactive interactions with residents appear to be present in Lansing as compared to other well established COP programs (Rider, 2003). For this reason as well as data unavailability, this dissertation does not include the COP of Lansing as another dimension of the official actions.

[6] Information on two houses could not be found.

[7] Coding sheets for the street survey are attached (Appendix A). More discussions on the field survey are presented in the methods chapter.

State University Land Policy Institute, the author carried out the field survey for the same housing units and segments during the fall of 2005. A total of 444 housing units and 378 segments were observed again.[8] Thirty-five houses (in 8 segments) of the initial sample appeared to have been demolished completely during the intervention periods. Further, the researcher could witness that some of the dilapidated houses have been completely renovated. Figure 1 shows an example.

Figure 1. A Renovated Housing Unit during the Intervention Period

Study Purpose 1: In short, the LDHP faced an unexpected shift of its original plan of evaluating the project city's comprehensive efforts via a controlled experiment. The halt of treatment by the caseworker did not mean the end of all civil efforts, however. Although a detailed account of the course of remaining actions and any evaluation attempt of the efforts are beyond the scope of this dissertation, analyzing the changes in physical disorder, social disorder, and crime would be a valuable contribution to the

[8] One segment (325 W. Sheridan Road) was newly added because it had not been surveyed in 2003. But the author did not include it in the analysis. Thus, the analysis is based on 377 segments. For more information, refer to the sample in the methods chapter.

broken windows theory. Thus, using the two waves of field observation data and other various official datasets such as CAD (computer aided dispatch) 2003 and 2005, U.S. Census 2000, and Select Phone USA 2000, the author tests a multivariate model linking disorder and crime, which is the main purpose of this dissertation.

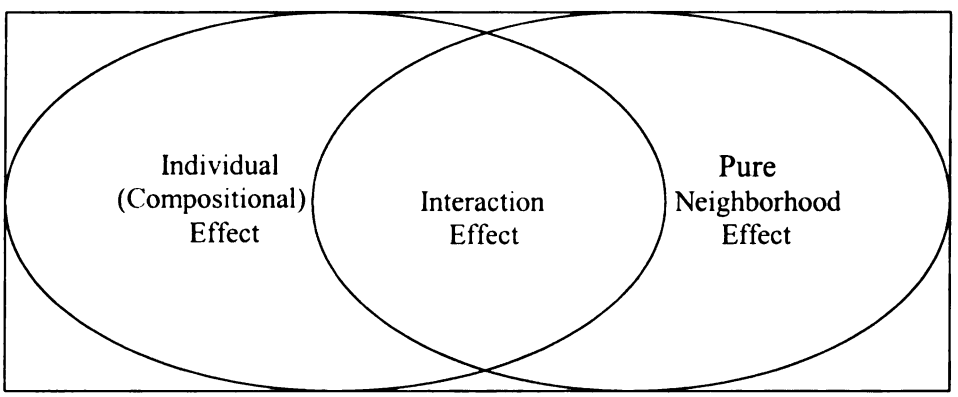
Contextual Effects

Neighborhood research on crime begins with the assumption that a neighborhood is not just a simple aggregation of individuals. Although little challenge has been made against this postulation, there still remains another critical methodological problem: how do we know that the differential outcomes for neighborhoods (e.g., crime rates) are rooted in neighborhood characteristics rather than the self-selection of individuals to live in the neighborhoods? This question has been one serious criticism of social disorganization theory. Just as the self-selected people in a treatment program tend to produce more desirable outcomes, individuals' choice of a certain neighborhood based on their income, education, race, and other circumstances produces a compositional effect that is clearly distinct from contextual effects. Thus, it is crucial to control for individual characteristics to sort out the contextual effects (Harcourt & Ludwig, 2006; Kubrin & Weitzer, 2003b; Sampson, Morenoff, & Gannon-Rowley, 2002).

Contextual effects take two forms: pure or direct neighborhood effects and interaction effects (Figure 2). A typical statistical solution is a contextual analysis that controls for individual sources as confounding or moderating factors. Treating individual factors as confounding variables involves sorting out the direct effects of neighborhoods (see Simcha-Fagan & Schwartz, 1986), and treating them as moderating factors involves examining the interaction effects of individual factors with neighborhood characteristics (see

Rountree, Land, & Miethe, 1994; Silver, 2000; Wikstrom & Loeber, 2000). Emphasizing the importance of understanding contextual effects, particularly through research on interaction effects, Miethe and McDowall (1993) argued, "[f]ailure to consider that the impact of individual-level factors depends on the wider social context is a form of specification error that would dramatically alter substantive conclusions" (p. 752). This growing interest in contextual effects is substantially related to the development of Hierarchical Linear Model (hereinafter HLM) that allows for the multilevel contextual analysis (Raudenbush & Bryk, 2002). Further, it has stimulated more systematic collection of individual data in neighborhood research (Kubrin & Weitzer, 2003b).

Figure 2. Neighborhood Effects



Study Purpose 2: This dissertation does not deal with human subjects. Thus, it was not feasible to attempt to sort out the pure and/or interaction effects of neighborhood characteristics on crime by controlling for human factors. However, the author figured that it would be desirable to conceptualize the link between disorder and crime in such a way that the effect of disorder on crime at a lower level (i.e., street segment) depends on community characteristics at a higher level (i.e., block group). To date, only a few studies (Jang & Johnson, 2001; Miethe & McDowall, 1993; Rountree, Land, & Miethe,

1994) have examined the interaction dynamics in the area of linking neighborhood disorder and crime. Further, concerning the cross-level interaction effect of disorder and community characteristics on crime, only one study (Rountree et al., 1994) attempted to test the multilevel model. Accordingly, another purpose of this dissertation is to examine whether there are meaningful cross-level interaction effects of disorder and neighborhood characteristics on street crimes. For this, a hierarchical model is constructed and tested.

Identifying contextual effects, particularly the interaction dynamics, has great potential for theory elaboration and policy implication. For example, Rountree and her colleagues (1994) found that perceived disorder and racial heterogeneity had a negative interaction effect on burglary victimization, which suggested that the proposed link between disorder and crime (i.e., burglary) may be less valid in heterogeneous neighborhoods than in homogeneous counterparts. The results further implied that an order-maintenance or control-oriented policy in the heterogeneous neighborhoods would not be as effective as is suggested by the theory. Such conceptualization is consistent with the ecological notion that a context-specific approach is likely to better reflect the reality of crime-generating and control processes.

Methodological Issues in the Broken Windows Field

Good research and policy begin with a clear understanding of the underlying theory(ies). Otherwise, the credibility of research and the effectiveness of policy are open to question. The eventual by-product is ongoing controversies. The field concerning neighborhood disorder and crime in relation to the broken windows theory provides a good example of such debates. Given the apparent distinction in the nature of a community-oriented broken windows policing and a control-oriented zero tolerance

approach, it is ironic that they share the same theoretical framework. This paradoxical situation springs either from a lack of theoretical consideration or from the partial absorption of the broken windows idea, wittingly or unwittingly. The unfortunate aspect is that some of the academic and political debates surrounding the New York style order-maintenance approach have even raised questions about the theoretical value of the broken windows theory approach (e.g., Harcourt and Ludwig, 2006; Sampson and Raudenbush, 1999). The author opposes any hasty conclusion, whether positive or negative, on the integrity and utility of the broken windows theory as well as other theories. A final judgment needs to be based on more credible, theory-driven studies, which the researcher argues have not been carried out yet.

The bulk of sociological theories, including the broken windows theory, have certain intrinsic limitations in their propositions and application. This is why they necessitate empirical tests through which they evolve or are sometimes discarded. Differential credit should be given to each study, however, depending on the level of methodological adequacy. The adequacy criteria concerning methodological procedures such as measurement, study design, and model specification are suggested primarily by theory and prior research. Accordingly, researchers with an aim of theory testing need to go to great lengths to understand and follow the suggested rigorous methodological standards. Unfortunately, however, for many reasons, it is often difficult to fully grasp the implied methodological criteria. One of the most critical reasons is, arguably, the absence of a comprehensive review of prior studies. The neighborhood disorder research is a good example. Besides theoretical confusion, the area appears to further suffer from

puzzlement over methodological standards, which the author believes is partly due to the lack of a systematic review of past research.[9]

Prior to constructing the multivariate contextual models, therefore, this dissertation provides a comprehensive review of the broken windows theory and research with an aim to clarify sensitive methodological issues.[10] The researcher further attempts to recommend appropriate standards for future research in the field. To the extent possible, the methodological approaches of this dissertation try to meet the most rigorous criteria by paying special attention to measurement and model specification. In this way, this study is expected to be able to serve as a credible piece of research for future systematic reviews. Through this effort, the author wishes that future research take a more theory-driven and methodologically sound approach, and that eventually conclusions about broken windows theory will be more valid.

Overview

In sum, the LDHP directly addresses the theoretical hypothesis that improving physical conditions is an attractive alternative to reduce criminal activities, either serious or minor, across urban neighborhoods. As several scholars have suggested (e.g., Bursik & Grasmick, 1993; Lab, 1988), collaborative efforts toward revitalizing the physical environment are expected to significantly improve quality-of-life throughout a city by strengthening neighborhood cohesion and informal social control among the community

[9] Although Sampson et al. (2002) and Taylor and Harrell (1996) attempted to review the link between disorder and crime, the former assessed it as one portion of comprehensive neighborhood effects and the latter focused on the relationship between physical environment and crime. Thus, it is fair to say that no systematic attempt to review the link between neighborhood disorder and crime based on the broken windows model has been made yet.

[10] The review in this dissertation is not a meta-analysis, which will be attempted when there is a sufficient number of theory-driven studies. Instead, the author focuses on identifying critical methodological issues in performing empirical research.

residents. Although the initial plan of randomized experiment ended prematurely, this dissertation attempts to perform rigorous non-experimental analyses, using the two waves of street observations and other various datasets. To accomplish the dissertation objective, several important methodological issues are identified and applied to this dissertation. The author expects that this research can become a valuable addition to the scientific knowledge of how public agencies can use civil remedies to ameliorate serious disorder and crime problems. Further, the contextual approach of this study (i.e., a cross-level interaction model) is expected to enrich the broken windows explanation of disorder and crime as well as other research areas about neighborhood characteristics and crime.

This dissertation includes six chapters. In chapter II, the ecological perspective in crime research is reviewed to identify a variety of dynamics and concepts leading to crime within neighborhood contexts. Then the author attempts to clarify causal paths proposed by the broken windows theory. Chapter III presents a detailed account of past literature on the broken windows model and contextual effects. Particular attention is paid to identifying the methodological issues that are likely to influence study results. The author further attempts to suggest methodological standards to help work out the issues. The suggested standards serve as the criteria for the whole research process throughout this dissertation. Then, a brief description of the current study including such subjects as study setting (research site), research design, limitations, and hypotheses is presented in chapter IV. Chapter V describes the methodology. Chapter VI will describe the study results. Findings from a hierarchical model will be highlighted. In chapter VII, the author will discuss the weaknesses and strengths of the research and suggest future directions.

CHAPTER II: THEORY – MAIN CONCEPTS AND CAUSAL PATHS

As mentioned, a credible study requires a clear understanding of the underlying theory(ies) and past studies. The huge controversies surrounding the broken windows idea, research, and policy (e.g., community-oriented broken windows policing vs. control-oriented zero tolerance policing) originate, arguably, from a lack of a firm grasp of the theory, its developmental context, and past empirical tests (see Harcourt & Ludwig, 2006; Kelling & Sousa, 2001; Sampson & Raudenbush, 1999). Accordingly, this dissertation presents a comprehensive overview of the theory and prior studies as an attempt to gain a clear grasp of the key theoretical ideas and research issues. This chapter focuses on identifying the main theoretical concepts and causal paths.

It is well known that the broken windows idea is a branch of theory within the ecological framework that attempts to explain criminal phenomena in the milieu of community life. Community dynamics are complex, and as such, resist any simple linear explanation. While the broken windows model highlights the central role of disorder in causing crime, there are dozens of important factors associated with crime suggested by other ecological theories, such as informal social control, environmental structure, and capable guardianship. Although each ecological theory is often discussed with no connection with other sibling explanations, the author argues that they are interconnected with one another; thus, understanding the whole gamut of the ecological perspective facilitates a firm grab of each sub-theory. Therefore, this dissertation attempts to understand the broken windows theory and literature within the ecological framework.

To this end, a brief description of the ecological perspective, sub-theories, major works, and main causal factors is presented first. Next, the broken windows theory is

reviewed in detail within the ecological framework. Causal paths of the broken windows model are presented connecting its main components – structure, disorder, and neighborhood (psychological) process. The next chapter presents a comprehensive review of the past studies.

Ecological Perspective in Crime Research

Nature and Scope

The Merriam-Webster online dictionary (2007) defines ecology as "the interrelationship of organisms and their environments." Meanwhile, human ecology, as it is applied to the relationship between humans and their environment, is defined as "a branch of sociology dealing especially with the spatial and temporal interrelationships between humans and their economic, social, and political organization" (Einstadter & Henry, 1995; see also Hawley, 1950). In a similar vein, one of the main paradigms in social ecology, COPET, suggests that change and development of human society is an ongoing interactive process of five multilevel components – culture, organization, population, environment, and technology (Hodge, 1990). Thus, the ultimate purpose of the ecological analogy in crime explanation would be to understand the interactions of humans with their community environment that influence and are influenced by crime (Einstadter & Henry, 1995). Humans must be assumed to have a constrained free will, and the interactions are expected to be complex, multilevel, ongoing, and reciprocal. Unfortunately, however, the early ecological studies of crime (until the 1910s) failed to incorporate the assumption of soft determinism and dynamic interactions into their theory and research. Thus, their position was sometimes labeled "environmental determinism"

(Einstadter & Henry, 1995, p. 124). Fortunately, the recent successors of the ecological explanation (since the 1920s' Chicago School) explicitly appreciate the dynamic mechanisms involving social forces, culture, and human agency. It seems that no theory dares to deny the existence of human will these days (Williams & McShane, 2003). Concerning the viewpoint on society, meanwhile, the ecological framework appears to be based on, in general, consensual viewpoint. However, most social ecologists, particularly since the advent of the Chicago School, have recognized diverse and even paradoxical realities at work within the seemingly whole world (Einstadter & Henry, 1995).

An important question concerns the scope in types of explanations that are regarded as ecological in crime research. In general, it appears that the ecological framework in the field is simply another expression of macro-level theory. However, it must be noted that not all macro-level theories are classified into the ecological perspective (e.g., Mertonian structural anomie theory). Also, in light of the ecological principle of multilevel interactions, the level of study is not likely to be an adequate criterion. According to Pratt and Cullen (2005), spatial variation of crime rates across ecological units (e.g., nation, state, county, city, neighborhood, etc.) and the underlying structural (or environmental) factors are the main identifiers that tell whether it is an ecological theory or not. Following their idea, this dissertation includes in the ecological perspective those theories that share common interests in the spatial pattern of crime (or victimization) and the influence of environmental (structural and situational) factors on uneven distribution of crime rates and criminal decision-making.

Social Disorganization Theory: Chicago School

The early Chicago sociologists Robert Park and Ernest Burgess (1925) were very concerned with the dramatic pace of heterogenic growth. Borrowing the ideas of symbiosis, invasion, and succession from plant and animal ecology, they attempted to present a human ecology, "interpreting people in time and space as they naturally appear" through real observations (Williams & McShane, 2003, p. 59). As such, their basic premise was that the spatial distribution of humans within urban areas is determined by the competition for resources and space among them (Villarreal, 2004). The most important contribution of their works, particularly Burgess' (1925), was the "conception of the city as a series of distinctive concentric circles radiating from the central business district" (Williams & McShane, 2003, p. 59). The central business district was the area of the highest intensity of land use and fewest residences, and growth or invasion took place when the center intruded surrounding areas of lower intensity, resulting in intense land uses of the adjacent areas. The next zone, referred to as the "zone of transition," was in deteriorating condition due to the invasion, but most immigrants settled into this area because the living expenses were low and it was near the factories. The zone next to it was called "zone of workingmen's homes," because most working-class people lived there. Living conditions were somewhat better than in the zone of transition, and some of the immigrant workers who could afford it moved into this area. The zone of transition was subsequently occupied by another immigrant group. Outer areas were increasingly more expensive to live in (Williams & McShane, 2003). As such, each area in a circle was viewed as having similar demographic, cultural, physical and economic characteristics that tended to remain stable across time. Burgess (1925) argued that the formation and residential distribution of the city were due

mainly to "the distribution of land use and values," although cultural and economic factors also contributed to the process (Einstadter & Henry, 1995, p. 130).

Using the basic zonal model of Park and Burgess, Shaw and McKay (1942) investigated the spatial pattern of crime and other social problems by mapping a variety of official data such as juvenile arrests, residences of truants, physical deterioration, incidence of tuberculosis, and infant mortality. As predicted, the zone of transition had the most serious crime problem and the problem declined as the distance from the center became farther. The pattern remained stable for over forty years regardless of the change of racial or ethnic composition. Subsequent studies of 18 other cities by Shaw and McKay (1942) and other researchers (e.g., Longmoor & Young, 1936; Schmid, 1960) confirmed the pattern (Einstadter & Henry, 1995). The causes of this spatial pattern were then examined by ethnographic observations and in-depth interviews with residents (life histories). The research revealed that the conventional institutions of social control, such as family, school, church, and voluntary community organizations, were disrupted, social life was superficial with no ties, and traditional rules or norms did not function well. The negative conditions were caused by the dilapidated socioeconomic environment, frequent population change, racial heterogeneity, and culture conflicts among diverse ethnic groups within American culture. Shaw and McKay named this weakened condition of primary social relationships and its resulting lack of informal social control as "social disorganization," which was considered to be the main cause of crime (Williams & McShane, 2003; Pratt & Cullen, 2005). In other words, devastating structural conditions of the inner-city areas, such as poor socioeconomic conditions, residential instability, racial heterogeneity, and cultural conflict influenced the high crime rate, but only through the mediating role of social disorganization.

This insight was gained from the fact that some of the similarly situated areas (e.g., the rural South) showed low crime rates because of the strong informal social control (Einstadter & Henry, 1995).

Contemporary Ecological Theories: Resurrection of the Chicago Tradition

After World War II through the 1970s, the Chicago style neighborhood research lost much of its appeal as other perspectives became more popular, specifically functionalism, control, strain, subculture, and conflict theories.[11] The Chicago style community-based study did not disappear, however. In the late 1970s, the ecological perspective earned renewed interest, which has remained until today (Cullen & Agnew, 1999; Williams & McShane, 2003). The reason for its resurrection can best be understood within the sociohistorical contexts of the era.

As a reaction to the turmoil of the 1960s and the early 1970s, sociopolitical conservatism and economic neo-liberalism gained ground in the U.S. in the late 1970s through the 1990s, which fostered the ideology of individualism. The "me generation" and "X generation" were reflections of the feeling that individuals control their own lives (Williams & McShane, 2003, p. 273). Criminology and criminal justice were not free from the influence of individualism and sociopolitical conservatism. Since criminal behavior was considered to be mostly dependent on individuals' rational judgment, the positivistic search for the cause of crime (i.e., three major positivist theories – control, strain, and learning) and the critical agenda to unveil the influence of the power structure and relations on crime lost

[11] It would not be quite true to argue that the thoughts of the Chicago School theorists fell into decline during the era. Note that Hirschi's control theory finds its origin in the works of Chicago School theorists such as Shaw and McKay (1942), Reckless (1961), and Reiss (1951). Also, Cohen's subcultural theory and Cloward and Ohlin's differential opportunity theory were attempts to integrate the ideas of social disorganization and cultural transmission with Mertonian anomie theory (Williams & McShane, 2003).

much of their appeal[12]. Instead, neo-classical rational perspectives highlighting the critical role of environmental or situational factors in criminal decision-making and victimization gained a lot of attention as a new mode of conceptualization. Accordingly, interests in crime prevention and victim rights grew to an unprecedented degree. Also, many of the treatment and rehabilitation programs were replaced by harsher punishment of criminals and more rights for victims (Williams & McShane, 2003).

In this context, four ecological themes emerged. First, one of the growing interests among criminologists and practitioners was in preventing crime through environmental design (e.g., Jeffery, 1971; Newman, 1972) rather than in searching for the causes of crime. It was a (physical) environmental reflection of the ideology of free will and general deterrence[13]. Second, another ecological theme was developed by situational studies such as routine activity theory (Cohen & Felson, 1979), rational choice theory (Clarke & Cornish, 1985), and crime pattern theory (Brantingham & Brantingham, 1993) that mirrored the increased interests in victim rights and offender deterrence. It is notable that the situational studies were fueled by the National Crime Victimization Survey initiated in 1972, which increased criminologists' interests in the pattern of victimization depending on various situational and environmental factors (Williams & McShane, 2003). Third, again reflecting the sociohistorical circumstances of the era, a more general concern was not with the criminals or their traits, but with the ecology of crime, or spatial variation of crime rates by ecological units such as states, counties, cities, and neighborhoods, which revived the value of the Chicago-style social disorganization theory, particularly after the publication of an

[12] Again, it is not true to say that theories of individual criminality fell into decline during this era. It continued to survive through that time and still attracts considerable attention in the field.
[13] Note that free will does not imply a complete free will. It is simply the case that the free will aspect is more emphasized than the deterministic aspect in the continuum from hard-determinism to free will.

article by Judith and Peter Blau in 1982 (Cullen & Agnew, 1999, p. 62). Fourth, the final variation in the ecological perspective came from the integration of environmental design and social disorganization theories (e.g., Wilson & Kelling, 1982), which posited that physical and social disorder (or incivility) increase fear of crime and weaken informal social control mechanisms in neighborhoods, which in turn emboldens motivated offenders and eventually leads to an increase in serious crime rates.

Although these four groups of theories have somewhat different directions and foci from each other, they are generally classified into the ecological perspective in that they share common interests about spatial patterns of crime (or victimization) and the central role of environmental (structural) and situational factors.

Environmental Design

Influenced by Jane Jacob's (1961) work on urban renewal, C. Ray Jeffery (1971) suggested the idea of crime prevention through environmental design (CPTED), underscoring crime prevention through changing the physical environment rather than through changing the criminal. Further elaborating on Jeffery's idea and borrowing the notion of territoriality from animal ecology, Oscar Newman (1972), an architect, proposed "defensible space" theory. Newman thought that "any physical area would be better insulated against crime if those who live there recognize it as their territory and keep careful watch over the area" (Williams & McShane, 2003, p. 67). The simple and commonsensical idea of the defensible space theory strongly appealed to the policy makers, and thus many of its components were adopted by the federal government in making up regulations for public housing construction. Many modern crime prevention programs, including the neighborhood watch program, were initiated based on the general idea that environmental

design is a more efficient and effective crime prevention strategy than changing criminal motivations (Williams & McShane, 2003). Newman's idea, however, was not free from criticism. Merry (1981), for example, argued that improving surveillance in physical structures did not automatically result in increased surveillance of people. Further, offenders become familiar with surveillance immediately. Merry attacked the defensible space idea for ignoring other dimensions of social control (Eck & Weisburd, 1995).

Situational Studies

Situational studies such as routine activity theory (Cohen & Felson, 1979), rational choice theory (Clarke & Cornish, 1985), and crime pattern theory (Brantingham & Brantingham, 1993) are generally classified as neo-classical theories in that they assume that individuals make their own decisions taking various situations into account. Also, the theorists are interested in deterrence. The routine activity theory was originally an attempt to explain the distribution and change of crime rates as a result of the structural change of individuals' routine activities, not as an outcome of neighborhoods' change in their structural characteristics. The paradoxical reality that predatory crime rates have increased in spite of the apparent improvement of the structural socioeconomic conditions of American neighborhoods since 1960 stimulated the development of the routine activity framework, casting doubt on the credibility of the traditional macro-level (root-cause) explanations proposing a positive relationship between poor neighborhood conditions and crime rates. The routine activity theory consists of two basic premises. First, in order for a crime to occur, motivated offenders must converge in time and space with suitable targets in the absence of capable guardians. Second, the probability of this occurring is influenced by our routine activities, including work, family, leisure, and

consumption activities. Cohen and Felson (1979, p. 589) claimed that such a conceptualization could help to "develop an extension of the human ecological analysis to the problem of explaining changes in crime rates over time." In addition to macro-level changes in crime, the routine activity theory provides a very convincing explanation of the differential probability of individual victimization. As such, the theory has often been used to explain both spatial variation in crime rates and individual differences of victimization by sociodemographic groups. Further contemporary usage of the theory can be found in its logic about hot spots that are conceptualized as the places where intersection of offender, target, and absence of capable guardian is most likely to occur (Sherman & Weisburd, 1995; Williams & McShane, 2003). As the importance of places increases, land use patterns (e.g., business, residence, entertainment, leisure, etc.) are gaining more attention as a relevant proxy measure of routine activity (e.g., Kurtz, Koons, & Taylor, 1998; Sampson & Raudenbush, 1999; Wilcox, Quisenberry, Cabrera, & Shayne, 2004).

Do the offenders always commit crime when they find valuable targets that are not protected by capable guardians? Probably not. Then why do offenders engage in certain types of crimes in certain situations? Why is guardianship important in crime prevention? Such conceptual questions are not answered by the routine activity theory. As a solution, Clarke and Cornish (1985) proposed the rational choice theory (see also Cornish & Clarke, 1987), which attempts to model crime-specific decision-making processes of offenders, underscoring the rational aspect of human activities. The rationality is bounded, however, by the limited information available to offenders (see Simon's discussion on bounded rationality, 1957). Also, the rational choice theory does not aim for general deterrence

because both the demands of offenders and the choice structure of each crime type are specific in time and space. Since the motivated offenders tend to seek to fulfill their desires in the easiest way at the lowest cost, capable guardianship is more than likely to thwart attempted lawbreaking, and thus guardianship is crucial in crime prevention. Another implication is that crime can be reduced through decreasing target attractiveness or benefits of crime.

Felson (1987) extended the concept of capable guardian into three types – intimate handlers, capable guardians, and place managers. Consistent with informal control theory, intimate handlers are those who can exert direct influence over potential offenders, such as parents, teachers, employers, and friends. Capable guardians are people who protect targets. They could be either informal or formal agents. As such, they include friends, security guards, and public police. This concept of guardians who protect targets put an emphasis on the critical role of formal social control. Lastly, "place managers" refers to people who take care of places such as apartments, commercial buildings, and parks. They regulate behavior at the facilities or surrounding locations (Eck & Weisburd, 1995). The introduction of the concept of place managers shifts the theoretical attention from large-scale place to small-scale place and facility (Taylor, 1997). Accordingly, it leads to a connection with the environmental design thesis, particularly with the defensible space theory.

The crime pattern theory (Brantingham & Brantingham, 1993) extends the situational explanations already discussed to include the uneven distribution of opportunity caused by neighborhood characteristics as an antecedent factor to routine activity and rational choice. The main concern of this theory is to explore the interactions between offenders and the physical and social environment that influence the choice of target.

Offenders are assumed to be normal actors with legitimate jobs. They become aware of criminal opportunities while they are conducting their normal activities. Only a few, if any, serious offenders (mostly with no jobs) would aggressively seek out unfamiliar areas for more valuable targets. By tracking offender movements (geographic profiling), researchers attempt to model where the offender will commit the next crime. This strategy can be useful in investigations of serial crimes such as serial murder, serial rape, and serial arson (Eck & Weisburd, 1995; Taylor, 1997).

New Social Disorganization Theory

The situational theories fueled the resurrection of scholarly interests in the location or place of crime. Such interests were extended to apply Shaw and McKay's ideas in contemporary urban settings (Williams & McShane, 2003). The main idea of the new social disorganization theory is similar to that of its traditional counterpart developed by Chicago scholars: disadvantaged neighborhood conditions make people distrust each other and withdraw from involvement in community activities for the common good, which in turn increases the crime rates in the neighborhoods. Disadvantaged neighborhood conditions refer to socioeconomic characteristics of neighborhoods that are commonly measured by concentrated disadvantage, residential instability, and immigrant concentration (see Sampson et al., 1997; Sampson & Raudenbush, 1999; Sampson, Morenoff, & Earls, 1999; Morenoff, Sampson, & Raudenbush, 2001)[14]. In contrast, such

[14] Concentrated disadvantage is a combined measure of poverty, receipt of public assistance, unemployment, female-headed households, density of children, and percentage of black residents. Residential instability is obtained by merging the percentage of persons not living in the same house as 5 years earlier and the percentage of renter-occupied homes. Immigrant concentration is a factor combining the percentage of Latinos and the percentage of foreign-born persons. These factors are now widely accepted in many studies (e.g., Wilcox et al., 2004). However, note that Sampson et al. (1997) used a residential stability factor, not residential instability, combining the

collective neighborhood processes as mutual trust (social cohesion) and active intervention (informal social control) are regarded as the core factors necessary to break the link between disadvantaged neighborhood characteristics and crime rates.

Empirical evidence of the vital role of neighborhood processes has been established by Robert Sampson and his colleagues (Kubrin & Weitzer, 2003b). For example, in a multilevel study across 343 Chicago neighborhood clusters, Sampson et al. (1997) found that three structural factors – concentrated disadvantage, residential stability, and immigrant concentration – explained 70% of the variation in the neighborhood processes, which in turn mediated the effects of residential stability and concentrated disadvantage on violence rates. The neighborhood processes remained the most robust predictor of lower rates of crime, even after controlling for individual characteristics and prior violence. They termed the neighborhood psychological processes of social cohesion and informal social control "collective efficacy." In other words, collective efficacy is an elaborated concept of social disorganization. In sum, the disadvantaged neighborhood conditions are conceptualized to have an indirect effect on crime rates through the mediating role of collective efficacy. As a result, some neighborhoods with poor conditions would not have high crime rates if the level of collective efficacy were strong enough to intervene in the link between social conditions and crime rates.

The causal logic of the new social disorganization theory has been expanded by accepting the insights of the conflict perspective, or theory of political economy. Such ideas as the construction of public housing in disadvantaged neighborhoods,

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percentage of persons living in the same house as 5 years earlier and the percentage of owner-occupied homes. The author argues that the residential instability goes better with the other two factors and fits better into the traditional interests in population mobility and socioeconomic change.

deindustrialization, and racial stratification have been explored. For example, Bursik (1988; Bursik & Grasmick, 1993) argued that structural disadvantage in certain urban areas is not necessarily a natural outcome of ecological competition for resources, but a political product of public decision-making, such as the decision to construct a large-scale public housing facility in an already dilapidated neighborhood. Wilson (1987) further argued that the multiple forms of concentrated disadvantage were due to deindustrialization and outmigration of middle-class residents. In particular, the exodus of middle-class people who are the core of legitimate neighborhood processes left behind only the most disadvantaged residents. Sampson et al. (1997) also recognized that collective efficacy is imbedded in structural contexts and a wider political economy that stratifies places of residence by key social characteristics.

Broken Windows in Brief

The basic premise of the broken windows model (Wilson & Kelling, 1982) is that signs of disorder, either physical or social, lead to lack of neighborhood caring and increase of fear which, in turn, further aggravate crime and disorderly conditions. Skogan's (1990) contemporary revision extends the theoretical outcome (i.e., crime) to neighborhood decay and is more consistent with the ecological account. Three main characteristics of the contemporary idea are as follows. First, disorder and crime are parts of the cyclic development of neighborhood change, and thus they must be understood as a dimension of the whole developmental process. Second, disorder is theoretically conceptualized to have an indirect effect on the increase of crime. Social psychological processes (e.g., collective efficacy, social cohesion, place attachment) serve as the mediating variable. Third, crime is not only an outcome of disorder but also

functions as a cause of disorder. This theme springs from the conceptualization of reciprocal influences between crime and disorder.

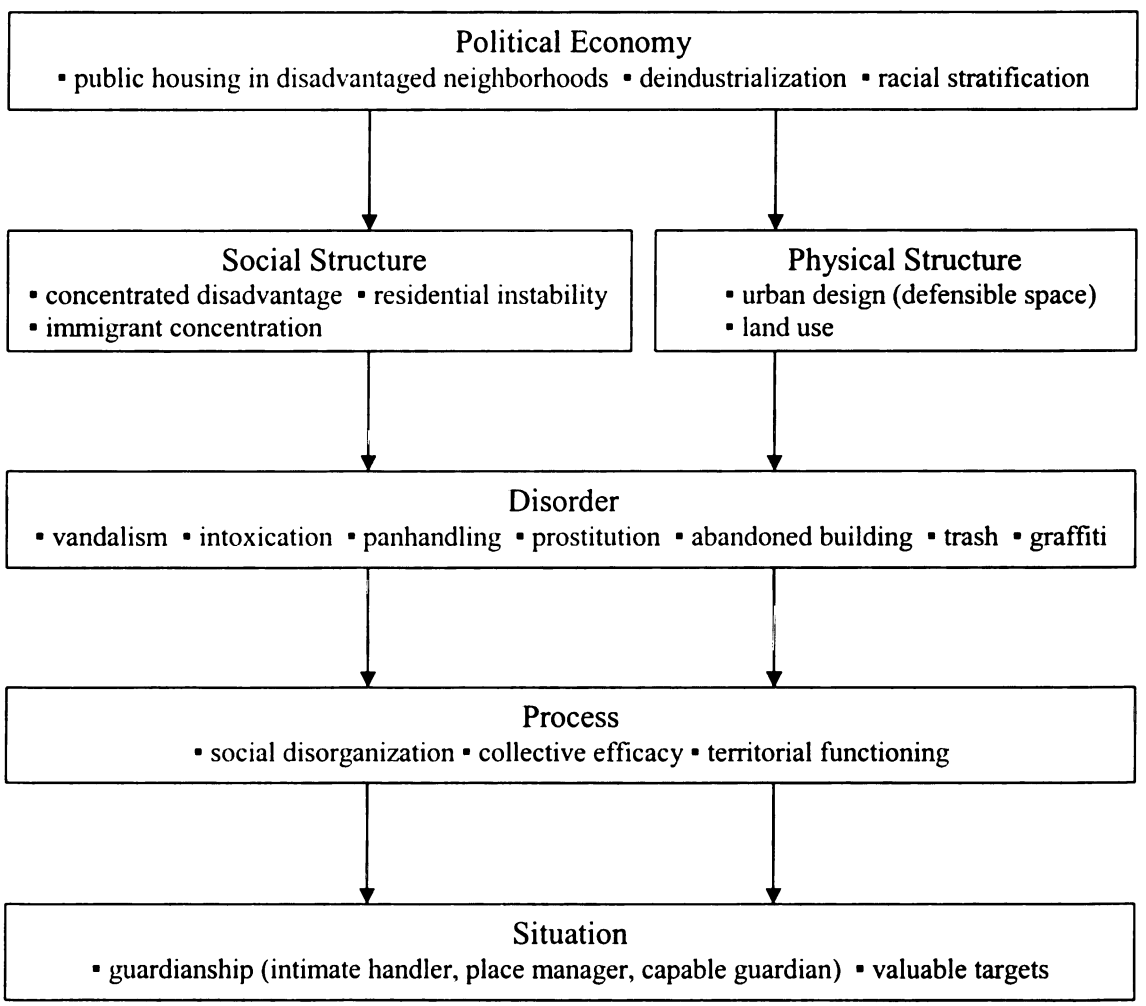
Summary: Main Causal Factors

The ultimate aim of reviewing the development of the ecological perspective in crime research is to understand the multidimensional interactions of human actors and their neighborhood environment that influence and are influenced by crime. Humans are assumed to have a constrained free will, and the diverse nature of neighborhood contexts and processes are appreciated. Notwithstanding differential foci and orientations, the various ecological theories share common interests in the spatial pattern of crime (or victimization) and the central role of environmental (structural and situational) elements in leading to uneven distribution of crime rates and/or criminal decision-making.

Influenced by sociopolitical conservatism, economic neo-liberalism, and cultural individualism, the contemporary versions of the ecological analogy put an emphasis on crime prevention through a proactive manipulation of neighborhood structures, processes, and situational elements. Redirection of interests away from individual characteristics to neighborhood forces has enriched the understanding of causal dynamics in criminology. Figure 3 describes the main ecological factors and processes proposed by the ecological theories. A general implication is that political economy influences neighborhood structures, either social or physical, which in turn affect the level of disorder. The capacity of informal control among residents is determined either directly by structural factors (i.e., environmental design, new social disorganization) or indirectly through disorder (i.e., broken windows). Informal social control is often capable of deterring criminal decision-making of motivated offenders, but it may not be enough. The

potential offenders further consider various situational factors, looking for easy targets requiring less effort (i.e., routine activity, rational choice). Disadvantaged neighborhoods would provide more and better opportunities to the potential offenders than their advantaged counterparts do (i.e., crime pattern). This effort to understand the interrelationships between ecological theories and factors is expected to increase the explanatory power of the full ecological perspective and its sub-theories.

Figure 3. Ecological Factors and Processes



Since the purpose of this dissertation is to test the broken windows model, a more detailed description of that theory is presented in the next section. In that part of the literature review, the ecological characteristics of the broken windows theory are emphasized, and causal paths of the model are identified. In the next chapter, a comprehensive review of prior research is attempted for each causal step revealed through a consideration of the broken window's model.

Broken Windows in Detail

Even though several theorists have highlighted the undesirable role of disorder (e.g., Garofalo & Laub, 1978; Hunter, 1978; Wilson, 1975), their primary outcome of interest was fear of crime (Taylor, 1999). The first attempt to relate crime to disorder was made by Wilson and Kelling in 1982. Wilson and Kelling argued that disorderly street behaviors (e.g., panhandling, prostitution, loitering, vandalism, etc.) and physical conditions (e.g., litter, graffiti, abandoned building, abandoned vehicle, etc.) that are in disrepair make residents withdraw from public spaces and feel fear of crime. This withdrawal and fear embolden local offenders and teenagers, resulting in more social and physical disorder. Increased disorder and lack of informal social control cause residents to become more fearful and sometimes move out of the community, which attracts outside serious offenders into the locale and eventually the serious crime rate increases (Taylor & Harrell, 1996). This sequential connection between disorder, fear of crime, informal social control, and serious crime suggests that disorder is one of the key causes of problems, and thus, it should be eradicated to restore healthy neighborhoods where residents care for one another and volunteer to set and keep informal rules for their own communities.

Extending and elaborating Wilson and Kelling's broken windows theory, Skogan (1990) focused on neighborhood decline as the ultimate outcome of interest (Taylor, 1999). Further, unequal distribution of disorder across communities was viewed as rooted in structured inequality, which extended attention to social condition and urban inequality as two causes of disorder (Taylor, 1999; Wilson, 1996). Skogan proposed spiral processes: undesirable structural conditions give rise to disorder, which increases fear and undermines informal social control and neighborhood satisfaction, which, in turn, motivates residents to move out and decreases property value. Unattached outsiders as well as offenders move into the locale primarily due to the low property value, prevalence of disorder, and lack of informal social control, which gives rise to serious crime, which, in turn, further worsens neighborhood cohesion and structural conditions.

After the publication of Skogan's thesis, many scholars have further examined the basic relationship between disorder and crime using a variety of data sources in diverse contexts. Although research findings have not been consistent across studies and several critical issues relating to theory and research have been raised and debated, the contemporary theoretical model on disorder and crime is very similar to Skogan's notion, except for a few added neighborhood characteristics (e.g., land use) and refined psychological factors (e.g., collective efficacy). It is characterized by three main themes. First, disorder and crime are parts of the cyclic development of neighborhood change. To Skogan, the root of the problem is in neighborhood characteristics and the ultimate outcome is neighborhood decay. Accordingly, disorder and crime must be understood as a dimension of the whole developmental process. Second, social psychological processes such as collective efficacy, social cohesion, place attachment, and resident-based

informal control mediate the effect of disorder on crime. That is, disorder is theoretically conceptualized to have an indirect effect on the increase of crime. Finally, crime is not only an outcome of disorder but also functions as a cause of disorder. This theme springs from the conceptualization of reciprocal causation. That is, the spiral model must be understood as a kind of feedback loop.

In sum, the broken windows idea was based on the assumption that street criminals, like general individuals, have (constrained) free will and they choose to commit crimes by considering various situational factors. Thus, criminologists and policy makers believed that street crimes can be effectively and efficiently deterred by dealing with the situational factors. In the broken windows model, physical and social disorders are representative of the situational factors, and their distribution is assumed to be influenced by broader structural factors, or socioeconomic conditions. Disorderly conditions and behaviors signal to motivated offenders that their criminal behaviors would not be intervened in within the neighborhoods (i.e., aggregate lack of capable guardianship). In contrast, systematic efforts to reduce disorder are believed to constrain the will of motivated offenders. As such, it must be noted that the broken windows theory emphasizes that strengthening collective efficacy via collaborative efforts among citizens, police, and government is the key to cut the link between disorder and crime (Bratton & Kelling, 2006).[15]

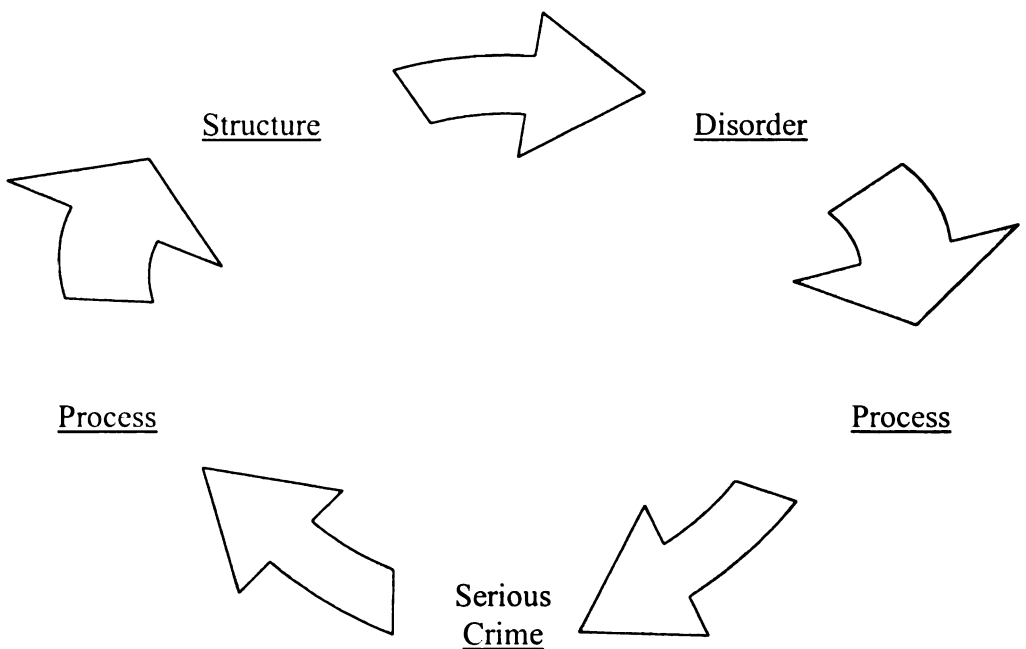
Causal Paths

Figure 4 describes the contemporary broken windows model that shows the sequential connection of neighborhood characteristics (structure), disorder, collective

[15] Therefore, although some researchers (e.g., Sampson & Raudenbush, 1999) argue that disorder and crime are intrinsically the same concepts, the author would like to propose that disorder is a concept closer to lack of collective guardianship than to crime. If this is true, researchers will be able to use disorder as a proxy measure for the level of collective guardianship.

neighborhood processes, and serious crime. Although the theory highlights the role of disorder, the other exogenous components cannot be disregarded, which would result in a violation of the ecological assumptions. Thus, the author proposes that each component be given equal weight in constructing and testing research models. In this vein, this dissertation attempts to identify how variables in each component play their own roles in leading to crime in neighborhood research.

Figure 4. Contemporary Theoretical Model Linking Disorder and Crime



- Structure (Neighborhood Characteristics): concentrated disadvantage, immigrant concentration, residential instability, land use, etc.
- Process (Collective Social Psychological Processes): collective efficacy (social cohesion + informal social control), place attachment, resident-based control, etc.

CHAPTER III: LITERATURE REVIEW

The broken windows theory, as it is understood within the ecological paradigm, suggests that the uneven distribution of crime is an outcome of the interactions among neighborhood structure (characteristics), disorder, and process. As mentioned in the previous chapter, each causal component must be considered equally important. Thus, the first section of this chapter describes how each component contributes to explaining the distribution of crime across various communities.

However, it must be noted that, just as the interaction dynamics within various neighborhood contexts are diverse, so are the study results. Although any meta-analytic attempt to find a consistent pattern of findings and its underlying cause is beyond the scope of this dissertation, the author attempts to identify critical, mostly methodological, issues that are likely to influence the study outcomes concerning the relationship between disorder and crime. As such, the author further presents several examples with unsupportive and/or mixed findings. Then, the methodological issues are discussed in detail, which will further serve as the criteria of conducting research for this dissertation.

In the next section, the author presents several examples of contextual effects. Context-specific understanding has great potential for theoretical elaboration and public policy. This dissertation attempts to test a cross-level interaction model including structure, disorder, and serious crime. Therefore, although no human subjects are involved in this study, the review of contextual effects would provide diverse senses of interaction dynamics among structure, disorder, process, and individuals.

Structure, Disorder, and Process

Neighborhood Structure and Crime

Neighborhood research begins with a consideration of the structural characteristics of communities. Although the conflict dimension (i.e., political economy) is sometimes specified as an antecedent factor to the structure, it is beyond the scope of this dissertation. Neighborhood structure consists of social and physical dimensions, though most literature has paid attention to only one side, to the exclusion of the other. As mentioned above (see also Figure 3), social structure includes socioeconomic disadvantage, residential instability (or mobility), and immigrant concentration (or ethnic heterogeneity). On the other hand, land use and urban design (defensible space) are representative of the physical structure. More attention is paid to land use than to urban design, because urban design is not controlled for in this study.

Social Structure

A large body of research exists on the effects of social structure on crime. However, a few selections would be enough to provide a good sense of the relationship between structural factors and crime. Scholarly interests in the influence of social conditions on crime can be traced back to the early works by moral statisticians such as Guerry (1833) and Quetelet (1835), who first noted the uneven geographical distribution of crime (Cohen & Felson, 1979). In research on the effects of diverse demographic and environmental aspects, such as season, climate, population, poverty, and geographical distribution, on crime rate, they reached a general conclusion that *societal conditions* are the causes of crime (Einstadter & Henry, 1995, p. 122, emphasis original). Meanwhile, parallel

to the notions of Durkheim and the Chicago School, Quetelet (1831) found the causes of crime in rapid socioeconomic changes and relative deprivation (Einstadter & Henry, 1995).

Sampson's early works show a similar result. In research using the National Crime Survey for the years 1973-1975, Sampson (1985) found significant effects of residential mobility and female-headed households on victimization rates of personal crime. Two years later, he (1987) reported that the high crime rates in black neighborhoods were because of poor economic conditions and high unemployment rates (Hayslett-McCall, 2002).

Meanwhile, holding the general ecological position that underscored place over person, or "kinds of places" explanations, Stark (1987, p. 893) argued that crime among black people is not universally high, but depends on where they live. As an example, the crime rates of black people in the South were not that high because many of them lived in suburbs and rural areas where the physical and structural environments were not conducive to crime. Alternatively, the high crime rates of black people in northern cities were attributable to urban environments that induced *anyone* to engage in criminal activities (Stark, 1987, p. 906, emphasis original).

Warner and Pierce (1993) and Smith et al. (2000) also reported supportive findings. Using calls to the police during 1980 in 60 Boston neighborhoods, Warner and Pierce discovered that poverty has a significant effect on burglary and assault rates, after controlling for the percentage of female-headed households and structural density. Poverty also increased robbery rates when residential mobility was low. Interestingly, the role of racial heterogeneity and residential mobility in their model was conditional on the level of poverty. In an attempt to test an integrated model of social disorganization and routine

activities, Smith et al. (2000) discovered that the number of single-parent households was consistently associated with more street robberies, controlling for a range of variables relating to social disorganization, land use, and guardianship/parochial control (Hayslett-McCall, 2002).

Finally, the devastating impact of community disadvantage has also been reported in juvenile studies. For example, Hay and his colleagues (2006) were interested in whether neighborhood contexts influence the link between family environment and juvenile crime. OLS product term analysis found that community poverty had a huge impact on the effect of family problems on juvenile delinquency (40% increase per one standard deviation increase in poverty). Such interaction effects suggested that juveniles with family problems are involved in considerably more delinquent activities if they live in poor neighborhoods than in affluent ones. Elliott et al. (1996) further tested for whether the effects of neighborhood disadvantage on adolescents' development are mediated by the organizational and cultural features of youths' neighborhoods. Path analysis found supportive results. Meanwhile, the HLM analysis revealed that neighborhood factors had substantial impact on juvenile development measured by prosocial competence, conventional friends, and problem behavior.

Physical Structure

Regarding the link between urban design and crime, few contemporary criminologists argue that urban design or defensible space measures are directly associated with crime prevention. Improved territorial sense among residents through the renovation of urban design is considered to be the key factor to deal with crime. A rare example of the direct link between urban design and crime is found in a study by Perkins,

Wandersman, Rich, and Taylor (1993). They found that some measures of built environment such as street visibility, private outdoor lighting, and narrow and visible street are inversely related to crimes. However, other measures for defensible space such as average building size and near-home barriers were not effective in reducing crimes.

The land use pattern has received much attention from ecological researchers, especially from routine activity scholars. Routine activity theorists (e.g., Cohen & Felson, 1979; Felson, 1987) propose two ways that land use may affect crime. One is by impairing resident-based control capacity of an area, and the other is by increasing particular types of activities such as alcohol consumption and illicit drug use. Both dynamics can be explained by a rather general measure of non-residential land use, which includes commercial (e.g., bars, convenient stores, shopping centers, etc.) and public area land uses (e.g., parks, libraries, recreation centers, bus stops, etc.). In other words, non-residential types of land uses tend to increase population mobility and anonymity, which in turn inhibit informal social control. Also, the increase of particular types of routine activities due to non-residential land use is likely to heighten the chance of intersection between potential offenders and victims (Hayslett-McCall, 2002).

Many researchers have examined the role of non-residential land use in leading to crime. As an example, Taylor and Harrell (1996) found a positive relationship between the proportion of nonresidential land use and burglary rates (Hayslett-McCall, 2002). Rountree et al. (1994) also reported that busy-place measures (e.g., schools, convenience stores, bars, fast-food restaurants, office buildings, parks or playgrounds, shopping malls, hotels, bus stops) are significantly related to violent victimization risk. They further noted that the role of resident-based informal control is the key to connect land use and

victimization. Meanwhile, Wilcox et al (2004) discovered that the proportion of business-oriented establishments increases violent crime, and the effect is partially mediated by neighborhood disorder.[16]

Prior studies on specific types of land uses deserve attention. The link between mass transit stops (e.g., bus stops, subway stops) and high victimization risks have been well-established by several studies (Block & Block, 2000; Block & Davis, 1996; Roncek, 2000). Sherman, Gartin, and Buerger (1989) reported that public parks are strong candidates as crime hot spots. Meanwhile, Smith et al. (2000) found a significant effect in the number of parking lots on robbery rates. Public schools also appeared to be significantly related to a higher number of robberies (Roncek, 2000). Convenience stores (Gordon & Brill, 1996) and bars (Peterson et al., 2000; Roncek & Maier, 1991) have been reported to be crime generators. However, Peterson et al. (2000) found that some institutions such as libraries and retail establishments were not related to violent crime rates (Hayslett-McCall, 2002). Similarly, Brantingham and Brantingham (1982) observed a mixed pattern depending on types of facilities. While fast food restaurants, traditional restaurants, and pubs had 2 to 2.5 times higher commercial burglaries, supermarkets and department stores had no effects (Eck & Weisburd, 1995).

[16] Several studies examined the effect of land use on disorder. In a study performed in two cities, Taylor and his colleagues (1995) discovered that the level of nonresidential land use on street blocks is significantly related to the level of physical deterioration. A similar result was found in Kurtz et al. (1998). They further found that the link between nonresidential land use and physical disorder was mediated by the level of informal control.

Neighborhood Disorder and Crime

Positive Findings

There is a large body of research on the effect of disorder on crime, and some of it supports the causal link between disorder and crime. The first systematic attempt to provide empirical evidence of this link was made by Skogan (1990). Using survey data of 13,000 residents in 40 neighborhoods of six different cities, he found that disorder was significantly related to fear of crime and crime. He further reported that increased fear of crime undermined neighborhood social control by increasing mobility, reducing neighborhood identification and feelings of territoriality, reducing supervision and mutual obligation, and leading to withdrawal from neighborhood life. Skogan found that disorder had a contagion effect and noted a spiral process where disorder led to crime and crime fed back to higher levels of disorder and reduced capacity for neighborhood control. Kelling and Coles (1996) supported Skogan's findings and idea. They concluded that Skogan's research verified the causal link between neighborhood disorder and serious crime.

After Skogan's research, several studies found positive results. For example, using Queensland Crime Victims Survey data (1991), Borooah and Carcach (1997) tested for the relationship of perceived neighborhood incivility on increased fear of crime and crime victimization, after controlling for neighborhood cohesion. They measured fear of crime and victimization in two ways – personal and housing. They discovered a consistent result that the perceived disorder had a significant effect on both types of crimes and fear.

Perkins, Meeks, and Taylor (1992) were interested in whether actual physical disorder (measured by Block Environmental Inventory) has a significant effect on perceived crime problems such as drug dealing, robbery, assault, and burglary. Noting that there are also positive, crime-reducing cues in neighborhoods reflecting the complex disorder-crime dynamics, they included physical signs of defensible space (e.g., outside visibility, barrier on property, private outdoor lighting, public street lights, bars on windows) and territorial functioning (e.g., private plantings, yard decorations) in their model. The multiple regression analyses showed that the observed physical disorder was significantly associated with perceived crimes. Further, the defensible space and territorial functioning measures appeared to reduce the perception of crime, controlling for the observed physical disorder.

Significant findings were also reported by Wilcox et al. (2004). Using a variety of datasets such as police records of crime (Seattle PD), U.S. Census reports, and telephone surveys of 5,302 Seattle residents, they attempted to examine the mediating role of neighboring[17] and/or disorder in the link between land use and two types of crimes, violent crime and burglary. Negative binomial regression analyses revealed that, after controlling for neighboring, land use, and community characteristics (i.e., concentrated disadvantage, population instability), the effect of perceived physical disorder on violent crime and burglary remained significant.

Negative Findings

Although Skogan's (1990) research has been regarded as the first systematic effort to verify the causal links among structure, disorder, process, and crime, some researchers cast doubt on Skogan's conclusions. After reanalyzing Skogan's data, for

[17] Neighboring may be defined as "the act of being neighborly to those around one."

example, Harcourt (1998) disclaimed Skogan's conclusions. He found that the effects of disorder on burglary, rape, and physical assault became nonsignificant after controlling for other explanatory variables. Further, influenced by Harcourt's findings, Eck and Maguire (2000) concluded that Skogan's findings are very sensitive to outliers and thus cannot hold strong policy implications (Harcourt & Ludwig, 2006; Worrall, 2002).

Meanwhile, some studies negated the broken windows hypotheses. In a recursive lagged model, Markowitz et al. (2001) found that the significant influence of perceived disorder on burglary victimization became non-significant after controlling for prior levels of burglary and other community variables. Another longitudinal study by Brown, Perkins, and Brown (2004) discovered that observed physical disorder change (from time 1 to time 2) was not significantly related to the change of police-reported crime.

Mixed Findings

Strong evidence for the complex broken windows dynamics can be found in studies that discovered mixed results depending on model specification, level of analysis, crime type, and incivility type. In one of the most systematic and rigorous studies, Sampson and Raudenbush (1999) reported contradictory results depending on model specification and crime types. In their recursive model, observed disorder had a significant effect on police-reported homicide and robbery. However, the effects on victimization (burglary and violent crime) and police-reported burglary were not significant. In the non-recursive model, they found that police-reported robbery was significantly influenced by observed disorder, but police-reported homicide was not.

Perkins and his colleagues (1993) also found different results depending on measures of disorder and crime. Controlling for informal social control, territorial

symbols, built environment, and neighborhood characteristics, the multiple regression model showed that perceived disorder had no significant effects on all types of crimes, but that observed physical disorder showed mixed relationships with diverse crime measures. While it had a significant influence on perceived delinquency and self-reported victimization, perceived index crime and police-reported serious crime were not significantly connected to it. Interestingly, the observed physical disorder appeared to decrease police-reported quality-of-life crimes.

Studies by Taylor (2001) and Robinson, Lawton, Taylor, and Perkins (2003) also produced mixed results. In a longitudinal research project in 66 neighborhoods in Baltimore, Taylor found different outcomes depending on types of incivilities. He suggested that different types of policies are necessary for different types of incivilities. Meanwhile, Robinson et al.'s study reported mixed results by level of analysis. At individual level analysis, perceived disorder had a significant effect on fear of crime in both lagged and change models. However, null results were found at the street-block level.

The mediating mechanism has received mixed support. For example, in a study on the effect of disorder on juvenile illicit drug use, Jang and Johnson (2001) found differential results depending on types of drugs (e.g., hard drug use and marijuana use) and types of mediators (e.g., religiosity, social bonding, and social learning). The analyses of three waves of National Youth Survey (Elliott et al., 1989) discovered that while juvenile religiosity mediates the effect of perceived disorder on self-reported hard drug use, the effect of perceived disorder on self-reported marijuana use was not mediated by the religiosity. Interestingly, and somewhat unexpectedly, social bonding

and social learning, which have long been regarded as crucial social psychological processes that substantially protect juveniles from becoming deviant, did not explain the direct effect of disorder on marijuana or hard drug use.

Another example is found in Wilcox et al.'s (2004) study. They were interested in whether neighboring mediates the effect of disorder on crime, or disorder arbitrates the effect of neighboring on crime. It was found that neighboring did not explain the effect of disorder on violent crime and burglary. However, disorder intervened in the effect of neighboring on violent crime. The results appeared to be contradictory to the general propositions of the collective efficacy theory proposed by Sampson and his colleagues (1997, 1999). At the same time, however, the intervening effect of disorder on the relationship between neighboring and crime suggested an alternative method of conceptualization with the resulting policy implication that dealing with the neighborhood disorder first could decrease more serious crime problems caused by the weakened neighborhood bonding.

Methodological Issues

As mentioned, the purpose of this section was to understand why the study outcomes are inconsistent. The review of theory and prior studies revealed several important and sensitive issues with regard to measure, data source, control factors, and study design. In a concise format, Table 1 presents the diverse characteristics of past studies linking disorder and crime that are discussed above. The studies took inconsistent methodological approaches, which seems to have influenced their findings. This sub-section illustrates those issues, and the author's suggestions are presented. The issues form the basis of the research plan of this dissertation.

Table 1. Summary of Individual Studies on the Effects of Disorder on Crime

Author(s) Place	Setting[a]	Disorder Measure[b]	Crime Measure[c]	Data Source[d]	Study Design[e]	Social Psychological Process	Other Important IVs Controlled	Main Findings[f]
Borooah, & Carcach(1997) Queensland, Australia	MIX (URB & RUR)	PPSD (no specific indicators)	Victimization (I & NI)	Same	CS; MIC	Cohesion;	Individual characteristics; Rural vs. urban; Perceived crime	• PPSD → Personal crime: sig. • PPSD → Housing crime: sig.
Brown, et al. (2004) Salt Lake City	SUB; RES	OPD (A); PPSD (A)	Police Report (no specific indicators)	Different	LG; MUL	Home Attachment	Individual & Community Characteristics	• BL OPD at T1 → Crime (T1 to T3): sig. • HL OPD at T1 → Crime (T1 to T3): ns. • BL OPD(T1toT2)→Crime(T1 to T3):ns. • HL OPD(T1toT2)→Crime(T1 to T3):ns.
Jang, & Johnson (2001) U.S.	Nation	PPSD (IA)	Self-Report (NI)	Same (NYS)	LG; MIC	Social bonding; Social learning	Individual characteristics; Religiosity	1. Main Effect: sig. 2. Mediating Effect • Religiosity on marijuana: ns. • Religiosity on hard drug: sig. • Bonding & Learning on marijuana: ns. • Bonding & Learning on hard drug: ns.
Kurtz, et al. (1998) Philadelphia	URB; MIX (PUB & RES)	OPD (A)	911 Calls (I & NI)	Different	CS; MAC	Informal social Control	NA	• Abandoned stores → Disturbance at house: sig.
Markowitz, et al. (2001) England	Nation	PPSD (A)	Victimization (I)	Same (BCS)	LG (PS); MAC	Cohesion	Community characteristics; Prior burglary	• PPSD in 1984 → Burglary in 1988: ns. • PPSD in 1988 → Burglary in 1992: ns.
Miethe, & McDowall (1993) Seattle, WA	URB	PPSD (A)	Victimization (I)	Same	CS; MUL	NA	Routine activities; Community & Individual characteristics	• PPSD → B & V: sig.

Table 1. (cont'd)

Author(s) Place	Setting[a]	Disorder Measure[b]	Crime Measure[c]	Data Source[d]	Study Design[e]	Social Psychological Process	Other Important IVs Controlled	Main Findings[f]
Perkins, et al. (1992) Baltimore, MD	URB	OPD (A)	Perception (I & NI)	Different	CS; MAC	NA	Territorial markers; Defensible Space	• OPD → Perceived crime: sig.
Perkins, et al. (1993) New York, NY	URB; RES	OPD (A); PPSD (A)	Perception (I & NI) Victimization (I); Police Report (I & NI)	Different	LG; MAC	Place attachment; Informal social control	Territorial symbols; Built environment; Community characteristics	• OPD→Perceived NI & Victimization I:sig. • OPD → Police report NI: sig. (-) • OPD → Perceived I & Police report I: ns. • PPSD → All measures of crime: ns.
Rountree, et al. (1994) Seattle, WA	URB	PPSD (A)	Victimization (I)	Same	CS; MUL	NA	Routine activities; Community & Individual characteristics	• PPSD → B & V: sig.
Sampson, & Raudenbush (1999) Chicago, IL	URB; MIX (PUB & RES)	OPSD (A); PPSD (A)	Victimization (I); Police Report (I & NI)	Different	CS; MUL	Collective efficacy	Community characteristics; Land use; Population density	1. Recursive Effect • OPSD → Victimization (B & V): ns. • OPSD → Police report (H & R): sig. • OPSD → Police report (B): ns. 2. Non-Recursive (Reciprocal) Effect • OPSD → Police report (R): sig. • OPSD → Police report (H): ns.
Wilcox, et al. (2004) Seattle, WA	URB; MIX (PUB & RES)	PPD (A)	Police Report (I)	Different	CS; MAC	Neighboring	Land use; Community characteristics	1. Main Effect • PPD → B & V: sig. 2. Mediating Effect • Neighboring on B & V: ns. • PPD on RV: sig.

Table 1. (cont'd)

Main findings reported in the table are those obtained from the most sophisticated analysis. That is, if one study used both cross-sectional and longitudinal model, outcomes only from the longitudinal model were reported (e.g., Brown et al., 2004). In a similar vein, the best specified model with the largest R^2 value was selected. Meanwhile, since the reported findings are only about direct and indirect relationships between disorder and crime, readers must note that the reported study characteristics are also limited to the corresponding analysis. For example, although land use is an important independent variable in Kurtz et al. (1998), we did not report it because it was not controlled for in the analysis of the link between disorder and crime.

a. MIX: mixed, PUB: public area, RES: residential area, RUR: rural, SUB: suburban, URB: urban
b. A: adequate measure, IA: inadequate measure, OPD: observed physical disorder, OPSD: observed physical and social disorder, PPD: perceived physical disorder, PPSD: perceived physical and social disorder
c. I: index crime, NI: non-index crime
d. BCS: British Crime Survey, NYS: National Youth Survey
e. CS: cross-sectional, LG: longitudinal, MAC: macro-level, MIC: micro-level, MUL: multilevel, PS: panel study
f. B: burglary, BL: block-level, H: homicide, HL: house-level, R: robbery, V: violent crime

Defining and Measuring Disorder

Although Wilson and Kelling (1982) and Skogan (1990) eloquently explained the crucial role of disorder giving rise to crime and facilitating neighborhood decline, they never systematically defined neighborhood disorder (Ross & Mirowsky, 1999). This lack of definition and theoretical operationalization resulted in many variations of measures, some of which did not appear to be appropriate. For example, Jang and Johnson (2001) included burglaries and assaults to measure perceived disorder of residents, but they seemed to be closer to crime than to disorder. Borooah and Carcach (1997) simply asked residents whether they perceived fairly common signs of incivilities without specifying theoretically relevant indicators.

Responding to this issue, Kelling and Coles (1996) provided their own definition:

> In its broadest social sense, disorder is incivility, boorish and threatening behavior that disturbs life, especially urban life . . . Most citizens have little difficulty balancing civility, which implies self-imposed restraint and obligation, with freedom. Yet, a few are either unable or unwilling to accept any limitations upon their own behavior. At the extreme are predatory criminals who murder, assault, rape, rob, and steal . . . Less extreme is disorderly behavior that, while not as serious as the crime noted above, nonetheless can threaten social order by creating fear and criminogenic conditions.
>
> (pp. 14-15)

They specifically indicated that disorder includes aggressive panhandling, street prostitution, drunkenness and public drinking, menacing behavior, harassment, obstruction of streets and public spaces, vandalism and graffiti, public urination and defecation, unlicensed vending and peddling, unsolicited window washing of cars, and other such acts. Most state laws and city ordinances classify these behaviors as petty offenses or misdemeanors that are most often punishable only by fines or community service.

Adding to Skogan's (1990) research, Ross and Mirowsky (1999) defined disorder as "visible cues indicating a lack of order and social control in the community" (p. 413). The visible cues included both social and physical signs. Social disorder was defined as "signs indicating a lack of social control that involve people," which included fights and trouble among neighbors and the presence of people hanging out on the streets, drinking, taking drugs, panhandling, and creating a sense of danger (p. 413). Physical disorder was referred to as "overall physical appearance of a neighborhood," which contained noisy, dirty, and rundown places, unrepaired or abandoned buildings, vandalism, graffiti, and litter, indicating that social control has broken down (p. 413).

Sampson and Raudenbush (1999) argued that disorder and crime have the same origins (exogenous factors) and, thus, are not separate concepts at least in terms of their roots. They insisted that disorder and crime are different only in their seriousness, saying "Although ordinance violations like drinking in public and many 'soft crimes' like graffiti may not be judged as particularly serious, this is an evaluation or classification issue and not a statement on etiology" (p. 608). Although Sampson and Raudenbush's argument makes sense to the degree that disorder and crime have the same roots, they seem to overlook the point that we should distinguish offensive behaviors or conditions on the basis of their seriousness and prevalence. Further, considering the differential level of tolerance toward different types of offenses across neighborhoods, disorder and crime do not necessarily appear to spring from the same source. Thus, combining the first two definitions by Kelling and Coles (1996) and Ross and Mirowsky (1999), neighborhood disorder may well be defined as "visible social or physical cues that disturb life and threaten informal social control and that are classified as petty offenses or

misdemeanors punishable only by fines or community service." This effort to clarify the meaning of disorder is expected to reduce measurement error committed from inappropriate conceptualization of disorder.

Presence or Perception?: A sensitive issue with regard to measuring disorder is whether we have to observe the actual presence of disorder or if residential perception is a better measure. Taking the first stance, Sampson and Raudenbush (1999) proposed Systematic Social Observation (SSO) as a key measurement strategy for natural social phenomena.[18] Brown and her colleagues (2004) further argued that the objective presence of disorderly conditions should be observed instead of using perceived disorder from residential surveys, which is consistent with the theoretical assumption that troublesome disorder starts with its actual presence in the neighborhood environment. However, some researchers (e.g., Bratton & Kelling, 2006) raised a question about the validity of observed disorder, particularly of social disorder, arguing that field observations tend to miss real world disorderly activities in the late evening hours from dusk to dawn. It appears that the debate will continue for a while (Jang & Johnson, 2001).

An additional issue is whether observed disorder and perceived disorder measure the same underlying concept. Several studies examined the empirical association between them, and the results appeared to be non-supportive. For example, Perkins et al. (1992) found that observed physical incivilities explained only 28% of the variance in perceived disorder and the explained variance decreased further to 16% after accounting for four control variables: racial composition, education, home ownership, and block size. Based on the results, they argued that perceived disorder is determined by other factors

[18] The necessity of systematic social observation was originated with Reiss (1971), and Sampson and Raudenbush supported for his idea.

than objective disorder. Sampson and Raudenbush (2004) discovered an analogous finding. Although actual disorder significantly increased the perception, a stronger influence was found for social structure, or racial and economic composition.

In sum, the convergent validity of perceived and observed disorder remains unverified due to the weak empirical association between them, which implies that the two measures of disorder might not assess the same concept (Taylor, 1999). Therefore, study findings may be different depending on how disorder is measured, although it is premature to conclude which measure is better (Jang & Johnson, 2001). Leaving the issue to future research, I suggest an alternative approach: using official data (e.g., 911 calls), especially for social disorder, could be another reliable and valid approach because it signifies both presence and perception.

Defining and Measuring Crime

In the broken windows literature, crime must be understood as a *separate* concept from disorder. Otherwise, we cannot expect much theoretical and practical utility because the factors for cause and effect could be redundant. Judging from the above discussion on disorder, therefore, it is obvious that crime as the endogenous variable in the disorder related literature must consist of serious offenses that "society almost uniformly condemns" and which are punishable by incarceration ordered by criminal law (Kelling & Coles, 1996, p. 15; Worrall, 2002). According to Durkheim (1933), the criminal law is a particular expression of the collective conscience to protect the commonly shared values of people. Thus, criminal offenders are punished by repressive sanctions, which go beyond restoring the status quo and seek to impose pain, because

what is being violated by the offenders is so sacred and large, as opposed to the interest of each individual.

Measuring crime as it is conceptualized by theory is as important as measuring disorder, since they should be separate concepts. However, some studies have not paid much attention to the crucial dimension of crime measurement, with the results that there are serious methodological flaws and results are questionable. For example, Jang and Johnson (2001) regressed juvenile drug abuse on perceived disorder that includes vandalism, burglary, assault, and the like. Although their main concern is the constraining mechanism of religion, the dependent variable, or drug abuse, clearly does not match with the broken windows notion. Rather, it is closer to disorder, which makes their model tautological. Some measures in other studies (Borooah & Carcach, 1997; Kurtz et al., 1998; Perkins et al., 1992; Perkins et al., 1993) also appeared to be inappropriate, for example, disturbance at house, drug dealing, and car tampering. Following a conventional approach, I suggest that serious crime be operationalized to include the FBI index crimes, such as murder, assault, rape, robbery, burglary, larceny, motor vehicle theft, and arson.

Theory-driven measures of disorder and crime are very important in hypothesis testing. One further step the author proposes is for researchers to check statistically whether they truly indicate separate concepts. No matter how well-measured they are, it would cause a serious problem if they measure the same concepts. Taylor (2002) argued that establishing discriminant validity between two concepts (e.g., social integration and collective efficacy) is the first step in statistical modeling. An exploratory factor analysis technique (EFA) would be a nice tool to explicitly check the issue, which is useful in

identifying latent variables out of measured indicators. Further, it can successfully solve the multicollinearity problem prevalent in sociological research that has multiple indicators for a certain concept, although the factors are still allowed to covary unlike the principal component approach (Tabachnick & Fidell, 2006).[19]

Data Sources for Indicators of Disorder and Crime

Another controversial issue in this area is that the disorder-crime link could be spurious if perceived crime or victimization experience (or fear) is measured in the same survey used to assess perceived disorder (Jang & Johnson, 2001; Sampson & Raudenbush, 1999). If the two constructs are indeed conceptually inseparable as discussed in the above section, the observed relationship between disorder and crime might be tautological (Harcourt, 1998). Another reason, more technically, may stem from the same data source problem (Perkins et al., 1992; Perkins et al., 1993). In other words, self-reported perception of disorder is very likely to reflect the level of fear of crime itself if they are included in the same survey (Jang & Johnson, 2001; Sampson & Raudenbush, 1999; Taylor, 1999). Therefore, researchers need to adopt different data sources for disorder and crime measure.

[19] Some social scientists seem to have confusion over the differential usage of principal component analysis (PCA) and exploratory factor analysis (EFA) mainly because most of the current software packages use the same name of factor analysis for both techniques. Although they are both frequently used for the purpose of data reduction, they are distinct from each other in several key aspects. For example, while PCA accounts for the variance of observed variables, EFA deals with the interrelationships (correlations or covariances) of them. Thus, the main purpose of PCA is to reduce the multiplicity of observed variables to a smaller number of components, which are not related to each other. Whereas, EFA attempts to identify latent factors that explain the interrelationships between observed measures, which could be assumed to be either correlated or independent. It is notable that researchers can meaningfully interpret factors, but not components (Fabrigar et al., 1999; Tabachnick & Fidell, 2006).

Defining and Measuring Neighborhood

A very important but largely ignored issue is how to define and measure neighborhood as conceptualized in theory. It has become increasingly important as the role of neighborhood processes, such as collective efficacy and social capital, gains more attention. That is, if community is more than just a simple aggregation of individual characteristics, it is problematic to use artificially defined boundaries, such as cities, census tracts, and block groups, as neighborhood units. In this line of thought, Sampson et al. (2002) argued that community researchers must appreciate the street-level dynamics of neighborhood interaction that would have the strongest influence on residents' lives and behaviors. Similarly, Brown and her colleagues (2004) insisted that street blocks best capture the social, environmental, and psychological neighborhood processes relevant to crime prevention and community development. This new approach can be seen in several contemporary studies (e.g., Brown et al., 2004; Grannis, 1998; Miethe & McDowall, 1993; Rice & Smith, 2002; Rountree et al., 1994; Sampson et al., 1999).

A contradictory argument appears to be gaining support recently, however. For instance, Sampson (2002) argued that the romantic definition of neighborhood as a primary group based on intimate relations and social bonds is of little relevance, particularly in modern urban contexts. This conceptualization is expected to provide a more flexible way of measuring neighborhood.

Control of Neighborhood Process

As the theoretical model suggests, collective neighborhood processes are expected to mediate the effect of disorder on crime. Accordingly, empirical research needs to specify them as intervening factors, or at least control for them as confounding variables.

One cannot overemphasize the importance of model specification based on theory and careful review of prior research, because otherwise the parameter estimates are more than likely to be biased and unreliable.

Following the above discussion on neighborhood process, the author would like to propose that researchers use collective efficacy as the measure for informal control, particularly when they use artificially defined areas as their neighborhood measure, for two reasons. First, collective efficacy goes well with the concept of formal social control (e.g., broken windows or community policing) because it does not require social ties or kinship. Formal control may have indirect effects on crime by influencing or interacting with residents' informal control practices. It seems to be obvious that proactive police control strengthens the willingness and capacity of residents to fight crime. Broken windows or community policing is based on such a theoretical premise, namely, that informal norms and rules set by residents can be effectively realized and maintained by the cooperative efforts between residents and police. Although there is little empirical evidence of the relationship between formal and informal social control, the policing literature illustrates a possible linkage (Greene, 1999; Skogan, 1990; Skogan & Hartnett, 1997). In contrast, inadequate policing in highly disadvantaged neighborhoods would undermine the informal control capacity of residents and could further allow offenders to set their own norms and rules in the communities. Kubrin and Weitzer's (2003a) study on retaliatory homicide demonstrates that residents in poor neighborhoods have little expectation of proactive police intervention, which fosters retributive justice by some residents.

Second, collective efficacy seems to be able to provide far more flexibility in measuring neighborhood than social ties or social capital do. In other words, research with

social ties or social capital emphasizing the sense of community are likely to have a serious limitation in measuring neighborhood because they appear to fit only into small-scale areas such as street blocks. However, researchers measuring collective efficacy would be able to try a variety of units for their neighborhood measures such as block groups, census tracts, and cities. Thus, although Sampson himself supports using street blocks as the best unit (see Sampson et al., 2002), his construct of collective efficacy seems to be able to allow him and other scholars to expand the unit of analysis to larger areas such as census tracts and cities. However, such a strategy would not make sense to other researchers who follow the traditional definition of neighborhood, which emphasizes intimate social bonds and a shared sense of community.

Control of Neighborhood Structure (as Confounding Factors)

The contemporary model of broken windows theory (e.g., Skogan, 1990) put an emphasis on the need for control of community characteristics to identify the unique or mediating effect of disorder on serious crime. Especially, studies with non-experimental design must control for the confounding factors. Major factors that are widely accepted in recent neighborhood studies include concentrated disadvantage, residential instability, and immigrant concentration, as proposed by Sampson and his colleagues in 1997 (Wilcox et al., 2004). Noticing that they represent only social dimensions of neighborhood structure, some scholars (e.g., Sampson & Raudenbush, 1999; Wilcox et al., 2004) have proposed including additional measures for physical structure, specifically the percentage of commercial buildings out of total properties.[20] It is suggested that

[20] In fact, as distinct from the routine activity propositions, the interests in the role of land use as a leading factor in crime date back to the Chicago sociologists (e.g., Burgess, 1925; Shaw & McKay, 1942).

measuring both social and physical structure would better reflect the theoretical concept of community characteristics than measuring only social structure.

Longitudinal Design

The contemporary model of the broken windows theory indicates that a longitudinal design is desirable in looking at the developmental process relating to disorder and crime. Without clarifying time order, it is hard to argue that disorder causes crime. Defining causal order is particularly crucial, since crime is also assumed to have a significant effect on disorder in a reciprocal way. However, only a few studies (e.g., Brown et al., 2004; Jang & Johnson, 2001; Markowitz et al., 2001; Perkins et al., 1993) used longitudinal analysis. The most common reason is the unavailability of community-level panel data (Markowitz et al., 2001).

Another plausible reason for the lack of longitudinal analysis is a lack of appropriate analysis technique to explicitly model neighborhood change including disorder and crime (Kubrin & Weitzer, 2003b). The common techniques used in longitudinal studies until recently, such as residual change scores and cross-lagged correlation approach, have certain limitations. First of all, they provide information mainly on the between-variable relations rather than on neighborhood change over time (Bursik & Grasmick, 1992; Kubrin & Weitzer, 2003b; Rogosa, 1995). Second, they are too cumbersome to be used to analyze multiple waves of data, and thus their usefulness is limited to a description of short-term trends. As an attractive alternative, Kubrin and Weitzer (2003b) suggested a (hierarchical) growth-curve model that has often been employed in the life-course literature. The model has some advantages. First, it models first level regression coefficients as random variables at the second level so that it can exactly

sort out the random effect and contextual effect of any level of exogenous factors. Second, it can specify the nonlinear trends, which are often the case in neighborhood change. And third, full information for a certain period of time rather than truncated information for the two time points is utilized in the model. Therefore, it is suggested that future research collect longitudinal panel data and utilize the growth-curve modeling technique so that the theoretical model can be fully tested.

Spatial Dynamics

Macro-level criminological inquiries need to consider the spatial dynamics of crime and its structural covariates or else analyses will not meet critical assumptions of traditional, econometric regression models. In particular, the assumptions regarding the independence of cases and the homoscedasticity of errors are questioned because, in practice, crime is often non-randomly distributed across areas, and because causal processes work differently within these areas. Violation of such assumptions results in larger and biased standard error of estimates and the property of BLUE (Best Linear Unbiased Estimate) of the OLS estimates does not hold any more (Bailey and Gatrell, 1995; Baller et al., 2001; Chainey and Ratcliffe, 2005). Notwithstanding the importance of spatial analysis in the field, however, no reviewed study carried it out. Hence, it is suggested that future research in this review area make a serious attempt to examine possible spatial processes.

Neighborhood Process and Crime: Social Disorganization, Systemic Control, Social Capital, and Collective Efficacy

Neighborhood process has been a central component in community research since the advent of the social disorganization theory (i.e., Shaw & McKay, 1942). As

articulated in chapter II, the broken windows theory appreciates the role of collective process as a mediator of the relationship between disorder and crime. Since there have been many variations of the concept with no clear understanding of their definitions and interrelationships (i.e., similarity and difference), this dissertation allocates some space for a discussion of it, particularly focusing on collective efficacy.[21]

Social Disorganization

Shaw and McKay (1942) named "the weakened condition of primary social relationships and its resulting lack of informal social control" as social disorganization. However, the authors simply assumed that the breakdown of conventional institutions (i.e., family, school, church, and voluntary community organizations) and rules automatically cause the lack of informal social control, which in turn increases crime rates (Kubrin & Weitzer, 2003b; Williams & McShane, 2003). As such, they did not pay much attention to the mechanism through which social networks and rules are transmitted to social control in neighborhoods (Bursik, 1999). Further, they did not even attempt to test their theoretical model in a quantitative manner.

In criminology, the first rigorous empirical examination of their assumption was performed after several decades by Sampson and Groves in 1989. Their findings were largely supportive of the mediating role of social disorganization in the link between structural characteristics (residential mobility, ethnic heterogeneity, low SES, family disruption) and crime rates. Many subsequent works (e.g., Bellair, 1997, 2000; Elliott et al., 1996; Markowitz, Bellair, Liska, & Liu, 2001; Morenoff et al., 2001; Sampson et al.,

[21] Taylor (2002) argues that many of the various concepts for neighborhood process are overlapped in terms of their measuring practices. For example, social integration and social ties (networks) and territorial functioning and collective efficacy actually represent the same dynamics. Thus, this dissertation focuses on identifying differences between the four concepts – social disorganization, systemic control, social capital, and collective efficacy.

1997; Sampson & Raudenbush, 1999) provided further support for the social disorganization hypotheses (Kubrin & Weitzer, 2003b). Unfortunately, however, these studies failed to pay attention to the dynamics of social control that are exercised through neighborhood network structures.[22]

Systemic Control

Contemporary systemic theorists redefined the definition of social disorganization to be "the regulatory capacity of a neighborhood that is imbedded in the structure of that community's affiliational, interactional, and communication ties among the residents" (Bursik, 1999, p. 86). In other words, they succeeded in separating informal social control capacity from neighborhood networks (or ties). Further, they identified three types of networks and examined how the effect of structural conditions on informal control varies across different types of networks: (1) private networks refer to intimate friendship and kinship relationships; (2) parochial networks include less intimate and secondary group relationships; (3) public networks are linkages to groups and institutions located outside of the neighborhood (Bursik & Grasmick, 1993; Bursik & Grasmick, 1995; Hunter, 1985 in Bursik, 1999, p. 86).[23] Their main proposition was that "rapid residential turnover and population heterogeneity make it difficult to establish relational network structures that can serve as the sources of effective social control" (Brusik, 1999, p. 87).

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[22] Bursik and Grasmick (1993) noted that there have been many conceptual variations of social disorganization and integration. A few examples include community integration, responsiveness, and social networks (McGarrell, Giacomazzi, & Thurman, 1997). In addition, Taylor (2002) argued that there have been similar conceptualizations and research in other disciplines such as community psychology, environmental psychology, and sociology.

[23] Since the general systemic model of urban structure has had a great influence on the development of this new orientation (see Berry & Kasarda, 1977), the reformulated version of social disorganization often is referred to as the systemic theory of neighborhoods and crime (Bursik, 1999, p. 86).

Like Shaw and McKay, however, the systemic theorists have paid little attention to the dynamics of social control that are exercised through network structures. This issue has gradually gained attention because of several studies that have found that some forms of social networks (ties) do not serve as informal controllers of crime. For example, Pattillo-McCoy (1998) discovered that, in a black neighborhood in Chicago, some networks undermine residential efforts to fight crime because they include both law-abiding residents and active criminals such as drug dealers and gang members. Bellair (1997) found that frequent interaction is not related to the capacity of informal control. Wilson (1996) also noted that many poor urban neighborhoods do not show strong informal control even though they are tightly interconnected. These studies raised questions about the assumption of social disorganization and systemic theory that neighborhood networks and interaction automatically foster informal control among residents.

Social Capital

Responding to this issue, Bursik (1999) attempted to explain how neighborhood networks serve as informal regulators against non-conforming behaviors. To this end, he adopted Coleman's (1988, 1994) social capital theory. Coleman (1988: S100) defined social capital as intangible resources produced in 'relations among persons that facilitate action' for mutual benefit (Kubrin & Weitzer, 2003b). Bursik argued that the social capital theory is useful in explaining the macro (networks) to micro (self-control) transition dynamics because of its "dual focus on the overall structure of relationships among actors and the nature of the exchanges that occur with that structure" (p. 87). In other words, the social capital obtained through the various relationships can either be

related to social control or not, depending on the nature of networks and interactions. For example, "Janowitz (1976: 9-10) noted that some forms of nonconforming behavior may be tolerated by the members of a group as long as they do not interfere with the attainment of some other common goal" (p. 87).

Drawing on a simple random survey of 386 adult residents in Oklahoma City, Bursik tested a model in which the ecological positions of an individual influence the systemic variables (i.e., various forms of networks), which in turn affect the social control measured by loss of respect. He found that neighborhood-based private and parochial networks increased informal social control. However, the friendship/family networks outside the neighborhood were not associated with social control.

Collective Efficacy

A criticism of the social capital explanation is that, although important, the resources obtained through social interactions are not sufficient conditions for social control to fight neighborhood problems including crime (Kubrin & Weitzer, 2003b). Although Bursik (1999) articulated that some forms of social capital are effective and others are not, his study appears to focus on individuals' self-regulation mechanism to the exclusion of collective intervention dynamics. In other words, the key implication of his idea and research is that people would not commit crime because they are afraid of losing valuable resources.

The other side of informal social control is the willingness of residents to intervene with nonconforming conditions and behaviors. The author would like to argue that while social capital could be a nice self-controller, it has only a limited utility in explaining why people do not tolerate others' anti-social behaviors. That is, proactive intervention efforts

of individuals might entail the risk of losing certain types of social capital. A concept highlighting the dimension of collective intervention, called "collective efficacy," was developed by Sampson and his colleagues (1997, 1999). Collective efficacy is a combination of informal social control and social cohesion. They combined the measures of informal social control and social cohesion and trust because "willingness and intentions to intervene on behalf of the neighborhood would be enhanced under conditions of mutual trust and cohesion" (p. 921 in Gibson, Zhao, Lovrich, & Gaffney, 2002, p. 544). It was proposed that the differential level of collective efficacy is the determining factor of neighborhood variation in interpersonal violence, without regard to neighborhood- and individual-level characteristics. They found that three neighborhood characteristics – concentrated disadvantage, residential stability, immigrant concentration – explained 70% of the neighborhood variation in collective efficacy, which in turn mediated the effects of residential stability and concentrated disadvantage on violence rates. Collective efficacy remained the most robust predictor of lower rates of crime, even after controlling for the individual characteristics and prior violence, which was consistent with the causal logic of social disorganization theory.

The constraining effects of collective efficacy on fear of crime and crime have generally enjoyed strong supports. For example, using survey data from three medium-sized cities, Gibson et al. (2002) found that collective efficacy significantly reduced fear of crime. The results were consistent across the cities. Morenoff et al. (2001) also discovered positive results. The measure of collective efficacy was related to significantly reduced homicide rates in Chicago neighborhoods. Interestingly, the causal mechanism was similar across racial groups.

Contextual Effects

As mentioned in the introduction chapter, examining contextual effects is important because neighborhood is more than the sum of individuals. Besides individuals, collective process, physical structure, and some elements of the social structure make up the entity of neighborhood, which is why neighborhood dynamics are so diverse and complex. The contextual model has a further advantage for theory elaboration and policy implication. Meanwhile, the contextual effect can be tested via two approaches. One is to control for individual characteristics as confounding factors, which allows researchers to sort out the direct and unique effect of neighborhoods. The other is to test an interaction model of individual and neighborhood factors, which shows how the relationship between individual variables and outcome measures (e.g., crime) differs depending on neighborhood characteristics (Rountree et al., 1994). Since this dissertation attempts to test a cross-level interaction model of disorder and structure on crime, several examples on interaction effects are reviewed.

In a growth curve model involving perceived disorder, juvenile religiosity, and illicit drug use, Jang and Johnson (2001) found a significant interaction effect of disorder and religiosity both on marijuana and hard drug use. This result implied that adolescents' religiosity weakens the effect of disorder on illicit drug use, or alternatively, religiosity has a stronger constraining effect on drug use for adolescents living in a disorderly neighborhood than for their counterparts living in an ordered neighborhood.

On the other hand, Miethe and McDowall (1993) used telephone survey data (1989, part of a larger project on changes in crime over the last three decades in Seattle, WA) to examine whether macro-level variables (e.g., population density, ethnic

heterogeneity, disorder) interact with the individual-level risk factors (e.g., home unoccupied, family income and expensive goods, safety precautions and living alone) to impact individuals' risks of crime victimization (burglary & violent crime). Whereas there was no such interaction effect on victimization of violent crime, perceived disorder interacted with safety precautions to affect victimization of burglary. This interaction effect indicated that while the safety precautions appear to have little effect in reducing the victimization risks of burglary for residents in disordered neighbors, the protective actions may be substantially effective for their counterparts living in ordered neighborhoods. Put another way, safety precautions weaken the effect of disorderly conditions on burglary victimization.

Using the same data and measure as Miethe and McDowall (1993), Rountree et al. (1994) further examined whether disorder interacts with ethnic heterogeneity and safety precautions to affect victimization risks. One distinct feature of their study, different from Miethe and McDowall, was that they adopted a hierarchical logistic linear model to capture the multilevel characteristics of the study variables. Similar to Miethe and McDowall, they found that perceived disorder interacts with safety precautions to have a significant effect on victimization of burglary. Further, they discovered a negative interaction effect of disorder and ethnic heterogeneity on burglary victimization, which suggested that the effect of heterogeneity on burglary decreases in more disordered neighborhoods, or alternatively, the positive effect of disorder on burglary victimization is significantly tempered in heterogeneous neighborhoods.

Implications

Based on the above results, it seemed to be valid to argue that individual characteristics such as religious belief and safety precautions can effectively buffer the harmful effect of disorder on crime. This result underscored the crucial role of human agency in overcoming the harmful effect of dilapidated neighborhood conditions. It also suggested that adolescents can be protected by local institutions such as churches from the effect of disorder (Jang & Johnson, 2001). Meanwhile, individual lifestyle or preventive strategy (i.e., safety precautions) appeared to be effective only in an ordered neighborhood. That is to say, individual efforts to reduce victimization risk of burglary by increasing safety precautions (and other forms of guardianship) seemed to be more useful in ordered neighborhoods than in already disordered neighborhoods (Miethe & McDowall, 1993). However, this did not necessarily mean that the individual preventive strategy is completely ineffective in disordered neighborhoods. Rather, residents in more disordered neighborhoods must try harder to avoid victimization than their counterparts do in less disordered areas (Rountree et al., 1994). Lastly, the negative interaction effect of ethnic heterogeneity and disorder on burglary risk suggested that in more heterogeneous neighborhoods, disorder does not necessarily appear to contribute to more serious crime. Thus, a control-oriented policing strategy in those areas would not be as effective as was suggested by the theory. Because the root cause of serious crime in disordered neighborhoods appears to be in their disorganized characteristics themselves, policies would be better-oriented toward improving overall neighborhood conditions.

As implied by these interaction mechanisms, the differential effect of disorder on crime depending on different contexts is of particular importance, because it suggests that

a context-specific approach is likely to better reflect the reality. As Miethe and McDowall argued, failing to consider such contextual effects would result in distorted conclusions. Further, these context-specific effects are important because they illustrate the necessity of bridging the macro-micro gap in developing integrative theories of criminal victimization (Miethe & McDowall, 1993). This line of thought is crucial in that it stimulates theoretical elaboration and enables practitioners to take a more realistic, sophisticated approach.

Summary

As proposed by the ecological perspective, particularly by the broken windows theory, much of the literature shows that structure, disorder, and process play important roles in determining the uneven spatial distribution of crime rates. A closer look at the empirical evidence, however, indicates that the contemporary broken windows model has received only moderate, though not ignorable, supports. But, the author suggests that it does not necessarily cast doubts on the veracity of the theory itself. Rather, the systematic review of theory and research implied that the mixed and inconsistent findings appeared to be related to several, mostly methodological, issues such as measurement, data source, research design, model specification, and so on. Identifying those issues was of great value in that they could guide more theory-driven and rigorous approaches.

Meanwhile, the review of research on contextual effects (or interaction mechanisms) suggested that the link between disorder and crime varies across diverse neighborhood contexts. For instance, the effect of disorder on burglary appeared stronger in homogeneous neighborhoods than in heterogeneous ones (Rountree et al., 1994). Despite such an important observation, actual testing for a cross-level interaction effect

has seldom been performed. Thus, the attempt of this dissertation to examine cross-level interaction effects in Lansing neighborhoods deserves a lot of credit. If the hypotheses for contextual effects prove to be true, policy makers will have to pay more attention to the differential dynamics in order to distribute limited resources in a more efficient and effective manner.

CHAPTER IV: THE CURRENT STUDY

As mentioned in the first chapter, this dissertation has two main purposes. First, it attempts to test the broken windows theory within the Lansing, Michigan, context, using the two waves of field observation data and other various official datasets such as CAD, US Census reports, and Select Phone USA records. Second, cross-level interaction dynamics are examined via a hierarchical model. In order to make the multivariate contextual analyses more credible, this study further attempted to clarify sensitive methodological issues that are likely to influence study outcomes. The previous chapter identified several critical issues regarding measurement, data sources, model specification, and spatial and temporal analysis, which serve as the methodological guideline for this research.

Prior to a detailed description of the methodology, this chapter provides a general outline of this dissertation, in order to make a smooth transition from the review of theory and literature to methods and analyses. First, the history and characteristics of the study place, Lansing, are described. The unique value of studying a mid-sized city is further discussed. Next, the Lansing Dilapidated Housing Project (LDHP) is revisited to explain the study subjects (sample), unit of analysis, and research design of this dissertation. Then, several limitations of the current research are discussed. Finally, a study model is proposed and the main research hypotheses are identified.

Study Setting: Lansing

Lansing is the capital city of the State of Michigan. It was originally named after the village of Lansing in New York State, from which the original settlers of Lansing

arrived in the early 1800s. There is an interesting history behind its status as state capital. The state capital was temporarily located in Detroit in the mid-1800s. Afraid of foreign invasion (e.g., the War in 1812), however, the Michigan legislators tried to find another place. James Seymour, a rich immigrant to Detroit from New York, suggested Lansing as a candidate. Although ignored at first, his idea finally prevailed, and Lansing became the new hub of Michigan's government in 1847 (City-Data.com, 2006).

Today, Lansing is a mid-sized city with a population of 118,379 as of 2003. Although the population has decreased gradually in recent years, it is still a great community where government, business, education, and culture flourish. As an illustration, the active business climate was recognized by *Entrepreneur* magazine in 2003 as number seven on its list of "Best Cities for Entrepreneurs: Top Midsize Cities in the Midwest" (City-Data.com, 2006).

Table 2. Racial and Economic Conditions of Lansing, Michigan, and U.S.

	Race (%)				Income	
	White	Black	Hispanic	Others	Median ($)	Poverty (%)
Lansing (2000)	65.3	21.9	10	2.8	34,833	16.9
Michigan (2000)	80.2	14.2	3.3	2.3	44,667	10.5
U.S. (2004)	67.4	12.8	14.1	5.7	43,318	12.5

Compared to other Michigan areas, however, Lansing has a large variation in racial composition and income distribution. The percentage of persons living below the poverty line is also much larger than the state average (U.S. Census, 2000). Along with the economic downturn (mainly due to the staggering automobile industry), it seems to threaten the quality-of-life in the Lansing community. At the same time, however, the

large variation of racial and economic conditions makes Lansing a suitable site for study testing the ecological hypothesis. Table 2 describes the racial and economic conditions of Lansing, along with those of Michigan and the U.S.

Meanwhile, it would be valuable to examine how different settings have different dynamics in the formation of the relationship between disorder and crime, since the well-known studies have focused only on metropolitan urban areas (e.g., Sampson & Raudenbush, 1999; Skogan, 1990; Wilson & Kelling, 1982; see also Table 1). For example, Brown et al. (2004) argued that disorder such as graffiti and vandalism may exist both in urban areas and suburbs, but unkempt lawns and ill-maintained homes may signify more salient disorderly conditions in the suburbs than in urban areas. In a similar vein, Markowitz et al. (2001) highlighted the importance of cultural understanding, insisting that neighborhoods have differential levels of tolerance toward various criminal activities. Some activities are not considered to be all bad (Patillo-McCoy, 1998) and some are simply regarded as adaptive behaviors to devastated socioeconomic conditions (Anderson, 1999). Such interests in differential dynamics across various levels of communities are closely related to the contextual understanding that is presented in the previous chapters. As such, this study appreciates a strong caveat against simple generalization.

Lansing Dilapidated Housing Project Revisited

As explained already, the initial plan of randomized experiment of the LDHP prematurely ended after treating 50 tagged houses in 40 street segments. To make up for that, the researchers decided to take a non-experimental longitudinal approach, where they attempted to observe and model the natural change of disorder and crime across the

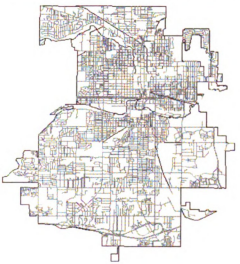
study segments. To this end, the author performed another field survey in 2005 to measure physical conditions of the street segments.

The purpose of this dissertation is to test a longitudinal multilevel model linking disorder and crime, using the two waves of field surveys and other datasets (e.g., computer aided dispatch, the U.S. Census). Although neither explicit nor direct, this study is likely to provide a good sense of whether the cooperative efforts involving city government, council, businesses, and residents have been effective in reducing physical disorder as well as social disorder and crime. A detailed description of the analytic technique is presented in the next chapter. This section focuses on describing the sample, unit of analysis, and general characteristics (i.e., strengths and weaknesses) of the research design of this study.

Study Subjects (Sample) and Unit of Analysis

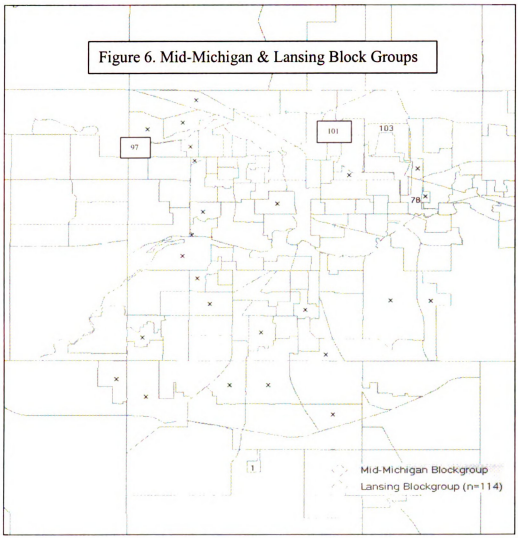
The street surveys of physical conditions of the segments were performed twice, in the summer of 2003 and in the fall of 2005. In 2003, there were 386 segments observed and 378 segments were surveyed in 2005. A total of 377 segments were commonly surveyed in both years, and the multilevel analysis is based on them. The sample segments represent 6.48% of all street segments of the city. Figure 5 shows the study segments.

Figure 5. Study Segments (n=377)



Meanwhile, the city of Lansing consists of 109 block groups. But only 84 block groups in 2003 and 83 block groups in 2005 contained at least one street segment. Thus, 83 block groups are used in this study for the hierarchical model. Figure 6 shows the block groups of Mid-Michigan and Lansing for the 2000 Census.[24]

[24] The block group 1 (official ID - 260650055019) does not exist in the Census, and each of the four block groups – 78 (260650010002), 97 (260650034001), 101 (260650009001), 103 (260650031021) – is a part of a larger block group overlapped with another block group within the boundary of Lansing. Thus, the exact total number is 109, although it seems there are 114 block groups. Meanwhile, the block groups marked with x (n=26) are those that do not contain



The study model adopts street segments as the level-1 unit of analysis, and block groups serve as the level-2 unit. As explained in the previous section about methodological issues, using street segments as the measure of neighborhood could be a

any study segment: 12 (260450214003), 82 (260650009002), 71 (260650014001), 64 (260650016001), 52 (260650017011), 48 (260650022001), 34 (260650023002), 45 (260650025003), 22 (260650027003), 16 (260650028002), 53 (260650029011), 113 (260650033011), 108 (260650033021), 106 (260650033022), 100 (260650034001), 88 (260650034002), 54 (260650035002), 19 (260650036012), 33 (260650037005), 84 (260650038012), 70 (260650040003), 36 (260650044041), 11 (260650051002), 9 (260650052011), 8 (260650053033), 4 (260650053042).

more valid approach. It would be especially the case in a mid-sized urban context such as Lansing.

Non-Experimental Longitudinal Design

Menard (1991, p. 4) defines longitudinal research as "a research in which (a) data are collected for each item or variable for two or more distinct time periods; (b) the subjects or cases analyzed are the same or at least comparable from one period to the next; and (c) the analysis involves some comparison of data between or among periods." He further argues that "at a bare minimum, any truly longitudinal design would permit the measurement of differences or change in a variable from one period to another" (p.4). There are three types of longitudinal studies – trend, cohort, and panel studies. First, trend studies examine a trend or pattern of an event(s) among general populations over a certain period of time. Examining burglary rates over the last four decades in Lansing would be an example. Meanwhile, cohort studies look at a specific group of population (e.g., birth cohort) as they change in their certain characteristics or behaviors over time. Although the study subjects at each time point are not the same, they are usually comparable in many of the core study characteristics. Finally, the panel studies follow the same subjects across time, and thus, they provide the most comprehensive picture of temporal changes (Maxfield & Babbie, 2001).

Compared to a cross-sectional design, a longitudinal study is superior in terms of the internal validity because it clearly has the element of temporal order between independent variable and dependent variable. However, the longitudinal design, particularly the panel study, could suffer from participant attrition and other problems

such as maturation and instrumentation.[25] Regarding the external validity, meanwhile, longitudinal studies, particularly the panel ones, have more disadvantages than cross-sectional studies in dealing with the threats to external validity because they have limited population, in general, with which to make an inference. However, it is notable that a random (probability) sampling could solve many of the threats to external validity just as the random assignment does most of the threats to internal validity (Maxfield & Babbie, 2001; Menard, 1991; Shadish et al., 2002).

In short, the design of this research fits into the category of a panel study, which has the greatest potential to verify the causal order among non-experimental studies. The loss of nine segments, however, might raise a substantial concern. Also, it must be noted that this study is not based on a random sample. Accordingly, the author does not attempt to generalize the study results to other contexts. Such consideration is closely related to appreciating the importance of context-specific understanding.

Limitations

As shown in the previous chapter, study results can be contaminated by neglecting such methodological issues as measurement, model specification, and design. Accordingly, this study tried not to be trapped in such controversies. Detailed research processes are described in the next chapter. Unfortunately, however, this research project could not be free from limitations. First, the neighborhood process could not be controlled for because no residential survey was conducted due to budget constraints. Accordingly, study findings must be interpreted with some caution. Another limitation

[25] Maturation: Developmental changes in the subjects (e.g., growing in a long-term study or becoming bored and being tired in short-term research) could be confused with a treatment effect.
Instrumentation: Change of measurement process due to, for example, different questionnaires or changed standards of experimenters could be confused with a treatment effect.

was that this study could not perform a systematic longitudinal analysis such as the growth curve modeling, because only two observations have been made for the same subjects. To make up for this weakness, the author followed the approach by Markowitz et al. (2001) and Sampson and Raudenbush (1999), where they controlled for prior levels of crime. This strategy was expected to be able to control for the time order in the hierarchical model.

A Study Model and Hypotheses

After reviewing the theory and previous research, several general hypotheses were identified for cross-sectional and longitudinal models. Figure 7 shows the conceptual hierarchical model to be tested in this dissertation. For the cross-sectional model, the author expects:

H1: Disorder, physical and social, has a significant effect on serious crime at the first level.

H2: Structural characteristics have significant effects on block group means of crime rates at the second level.

H3: The effect of disorder on serious crime remains significant after controlling for neighborhood characteristics (multivariate significance).

H4: The relationship between disorder and crime at the first level is significantly influenced by structural covariates at the second level (cross-level interaction).

H5: The mean crime rate of a block group is further influenced by the mean crime rates of neighboring block groups, after controlling for the structural covariates (spatial lag).

On the other hand, for the longitudinal model, the author expects:

H1: Change of disorder, physical and social, has a significant effect on change of serious crime at the first level.

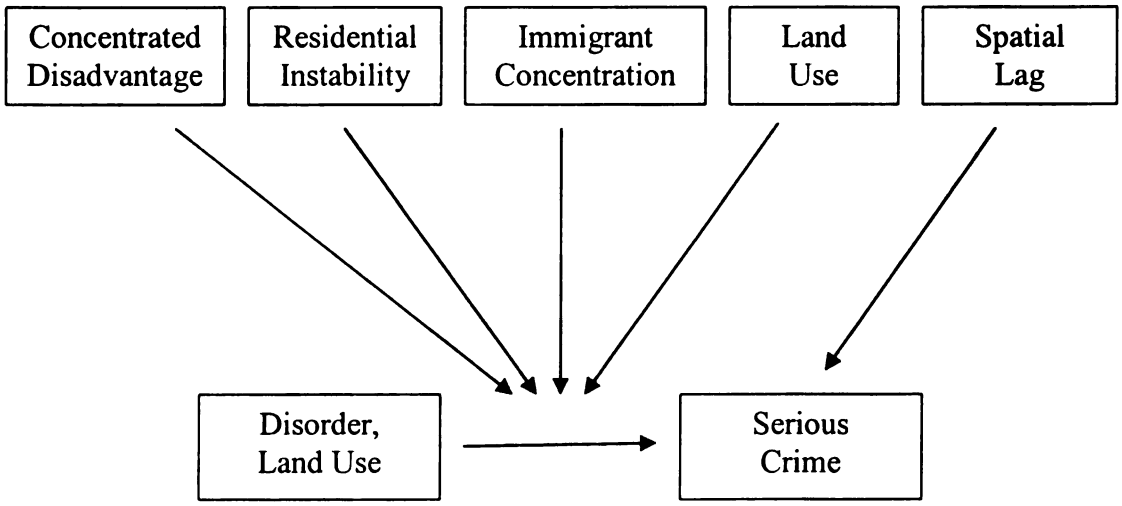
H2: *Structural characteristics have significant effects on block group means of crime rates change at the second level.*

H3: *The effect of disorder change on serious crime change remains significant after controlling for neighborhood characteristics (multivariate significance).*

H4: *The relationship between disorder change and crime change at the first level is significantly influenced by structural covariates at the second level (cross- level interaction).*

H5: *The change of mean crime rate of a block group is further influenced by the change of mean crime rates of neighboring block groups, after controlling for the structural covariates (spatial lag).*

Figure 7. A Hierarchical Model Linking Disorder and Crime[26]



Summary

The city of Lansing appears to be a nice candidate for ecological research in that there is a large variation in racial and economic composition. Further, in light of the fact that most of the well-known studies have been carried out in the contexts of large

[26] Spatial lag represents spatially lagged crime rates of each block group, which amounts to a simple average of the crime rates for the neighboring block groups. In other words, the model controls for the spatial autocorrelation process (Anselin, 2005). Analytic strategies in the next chapter provide a more detailed discussion on the spatial model.

metropolitan urban areas, this study of the Lansing area provides a good opportunity to examine how the ecological dynamics in a mid-sized Mid-Western city are different from those in large urban areas.

This dissertation constructs a hierarchical model for the non-experimental two-waves of datasets. Main effects and cross-level interaction dynamics are tested via the multilevel model. Although the panel design can successfully construct internal validity, it has a limited capacity to verify external validity or generalization.

Meanwhile, two main limitations are likely to constrain the conclusion validity and reliability of the study results. First, one of the most critical mediators, collective efficacy, is not controlled for in the non-experimental model. And, a more systematic longitudinal analysis (e.g., growth curve model) is not performed due to the absence of neighborhood panel data. Notwithstanding these limitations, however, strict applications of the sensitive issues and cross-level interaction tests are expected to enrich the theory, research, and policy implications.

CHAPTER V: METHODOLOGY

This study attempts to test the above hypotheses, using the two waves of street surveys and various official datasets. This chapter describes methods for rigorous hypotheses testing. The first section explains the characteristics of the datasets. Then, the author illustrates how the study variables were measured. Particular attention is paid to examining whether the measures of social disorder and crime represent the same underlying concept or not. Finally, the analytic strategies are presented, including a detailed description of spatial analysis and a hierarchical mixed Poisson model.

Data

This research project utilized four types of datasets to measure the variables in the study model. Table 3 provides a general description of the datasets. Each of them is explained below in more detail.

Table 3. Description of Data

Type	Source	Year	Basic Unit	Measure
CAD (911)	LPD	2003, 2005	Address	Crime, Social Disorder
Street Survey	Christopher D. Maxwell, Ph. D., MSU Land Policy Institute	2003, 2005	Address, Segment	Physical Disorder
Census	U.S. Census Bureau	2000	Block Group	Social Structure
Phone	Select Phone CD-ROM	2000	Address	Land Use

CAD (911)

Citywide computer-aided dispatch (CAD), or 911, data were collected for 2003 and 2005. There were 85,550 calls for service in 2003. The number increased slightly to

85,646 in 2005. Various types of crimes and social disorder were available to be utilized. The LPD provided geocoded data with the last two digits of address deleted for privacy purposes. The author planned to aggregate them into the street segment level using a GIS program.[27] For some unknown reasons, however, much of the data was contaminated, and thus the researcher could not match some of the cases with corresponding segments. Left with no choice, the author decided to do it manually using the SPSS program.

This study utilized the CAD data instead of other police records such as incident report and arrest data for two reasons. First, since the basic level of analysis was street segment, it was very likely that most of the segments did not have incident or arrest records. In other words, the author attempted to increase the statistical validity by expanding the variation of crime and social disorder, which was possible by taking advantage of the CAD data (Kurtz et al., 1998). The other reason was that the CAD is generally regarded as a more reliable measure of crime (Green, 1995; Sherman et al., 1989; Sherman & Weisburd, 1995, in Katz et al., 2001). Incident or arrest records are a product of police discretion, and thus highly vulnerable to distortions of reality. In particular, an intervention effort (i.e., initiation of a new program or policy) would aggravate the distortion by influencing the police discretion process.

However, several potential weaknesses of the CAD data must be noted, too. First, the CAD data may not reflect the location of the criminal incident but the caller's address. This will raise a serious concern when one carries out research at the address level. But, the problem will be less severe if the CAD data is aggregated into larger areas such as block groups and census tracts (Warner & Pierce, 1993). Since the basic level of analysis of this study involving crime and social disorder is street segments, the author would like

[27] ArcGIS 9.0 (a product of ESRI)

to say that the issue might not be that serious. Second, there could be multiple calls for service recorded for a single incident. Lastly, the wrong type of crime may be recorded because many citizens are not able to tell the exact nature of a crime. For example, a call could be recorded as a robbery when it actually meets the burglary criteria (Hayslett-McCall, 2002). Thus, researchers have to be cautious in using the CAD data, although it is generally considered to be a better measure of crime than the incident or arrest record, a product of police discretion. If possible, it would be desirable to assess the validity of the CAD data by, for example, comparing them to incident or arrest data. Unfortunately, this study could not cross-check the CAD data due to limited resources and data unavailability.

Street Survey[28]

Researchers including the author conducted street surveys in 2003 and 2005 with an aim to collect data on the physical disorder of tagged houses and street segments.[29] In particular, the survey in 2005 was made possible through a grant from the Land Policy Program. The initial plan was to use the first survey in 2001 as a proxy of pretest for the randomized experiment. Despite the premature ending of the initial scheme, however, the researchers decided to carry out the same survey again after two years in order to

[28] As will be explained later, the number of houses recorded in the surveys (item 8) was used for two purposes. First, the author combined it with the number of business properties from the phone data to create the denominator (i.e., total number of buildings) for calculations of crime, social disorder, and physical disorder rates. It was based on the fact that the street surveys contained more exact information of the number of houses than the phone data due to the underreporting problem. Second, land use at the segment level was measured by the percentage of (crime attracting) business properties out of the sum of houses and (crime attracting) businesses. In the summation, the number of houses from the street surveys was utilized. Refer to the measurement section for more detailed discussion.

[29] Besides physical disorder, the street surveys attempted to measure other dimensions of physical structure, such as crime watch sign, street lights, and volume of motorized traffic. However, they were not used in this dissertation in light of the study purpose and model.

make comparisons of any changes in physical disorder and crime in a non-experimental fashion. For visual evidence, they also took pictures of all houses.[30]

The researchers created two separate survey questionnaires (coding sheets) for houses and segments, respectively. The questionnaires contained items measuring as many dimensions of physical conditions as possible. For a complete list of the items, refer to Appendix A. To increase the inter-rater reliability, a detailed guideline for coding (or evaluation) was developed for the field observers, who were then educated on how to use it. The evaluation scheme is attached as Appendix B.[31]

The field survey was designed following the theoretical notion that troublesome disorder begins with its actual presence in the neighborhood environment (Brown et al., 2004). Consistent with this assumption and following the idea of Reiss (1971), Sampson and Raudenbush (1999) supported systematic social observation (SSO) as a key measure for natural social phenomena. Although it is premature to conclude which one is a better measure between perceived and objective disorder, study results would be influenced by the way of measuring disorder (Jang & Johnson, 2001).

Census

The U.S. Census 2000 was utilized to measure the social characteristics of neighborhoods. The author downloaded the dataset from the ICPSR database.[32] Since no information was available on the level of street segment, the data were aggregated into the block group level. Although the block group did not appear to be a good measure of neighborhood as was discussed above, the author believed that such practice would not

[30] Figure 1 shows an example of a renovated housing unit.
[31] Since this study does not use the survey data of houses, the evaluation guideline for housing survey is not included.
[32] Inter-University Consortium for Political and Social Research. http://www.icpsr.umich.edu/

cause a serious problem because the block group represented a higher level of neighborhood. Otherwise, it might well have raised a severe concern.

Phone Data

To measure land use, phone data from Select Phone CD-ROM 2000 were collected. The data contained a variety of information on the listed phone number, such as name (resident and business), address, types of business, and so on. In other words, both residential and business information were available, which made the source very useful in measuring land use. A total of 34,980 households and 5,642 businesses were listed as of 2000.

However, the dataset appeared to suffer from an underreporting problem. That is, it was obvious that some of the houses and businesses did not register their phone numbers.[33] The author figured out this problem by comparing the dataset with the U.S. Census. The Census indicated there were 49,505 households in 2000 and 8,047 businesses in 1997. Assuming the number of businesses remained the same, around 29% of the households and 30% of the businesses seem to have been missed.

The phone data had aspects of both strength and weakness. Since the address was geocoded, the researcher planned to aggregate houses and businesses into segments and block groups using the ArcGIS program. As was the case with the CAD data, however, some of the cases could not be matched with corresponding segments for unknown reasons. Thus, the SPSS program was utilized to match each address with the study segments manually. Unlike the CAD data, exact addresses were readily available.

[33] It was also possible that some of the poor households did not own a phone. A rather trendy reason was that more and more people rely on mobile phones, disconnecting the traditional phone service.

Considering the underreporting problem, however, it did not appear to be appropriate to use only the phone data in order to measure land use at the segment level.[34] Since the street surveys contained more exact information on the number of houses for each study segment than the phone data, it seemed to be more valid to use the street surveys for counting houses and the phone data for counting businesses. The sum of houses and businesses obtained from the two sources was further utilized as a denominator for calculations of crime, social disorder, and physical disorder rates.

In sum, the author took advantage of the field surveys and phone data to measure land use at the segment level. On the other hand, the ArcGIS was still useful for the author to aggregate houses and businesses in the phone data into the block group level. No problem of mismatching was detected. Also, the underreporting issue did not appear to cause a serious threat in light of the large scale of measurement unit, block groups.

Measurement

It is well known to social scientists that measurement error is one of the most salient and inevitable sources of the weakness or flaw of social science research. For this reason, it is recommended that researchers "describe the measurement process explicitly" (Maxfield & Babbie, 2001, p. 101). Basically, the author followed the above discussions on methodological issues to measure each concept, with an aim to increase their reliability and validity.

[34] In fact, the phone data contained no information on house or business for twelve study segments, which did not make sense at all because the street surveys indicated that all segments had at least one building, house or business.

Dependent Variable: Serious Crime

As suggested above, the researcher decided to use FBI index crime as the measure of serious crime, using the CAD data. Serious crime was measured in two ways – violent and property. Violent crime was a sum of homicide, rape, robbery, and assault. Burglary, larceny, vehicle theft, and arson were combined to measure property crime. Since the information on population was not available at the segment level, the author used total number of buildings in each segment as the denominator in calculating crime rates.[35]

In general, the dynamics involving violent and property crimes are regarded to be different from each other, which might well be explained by the examples of mixed findings depending on crime types. Accordingly, one related research interest was whether the results are different depending on the outcome measure. In fact, noting the unique trend and mechanism of each type of crime, Clarke (1997) suggested that criminologists and practitioners need to focus on more narrowly defined types of crime (Maxfield, 1999). Unfortunately, however, it did not appear to be appropriate to further narrow down the crime measure in this study because too many segments did not have a single record of crime. Thus, the author used the combined measure of violent and property crime.

As mentioned before, the SPSS program was utilized to calculate the number of crimes for each segment. The basic scheme was to compare the addresses of crimes to the range of addresses of each segment. By assigning the unique number of a segment (i.e., segment id) to the address of a crime incident, the researcher attempted to total the number of crimes for each segment. Unfortunately, however, the strategy faced two

[35] As explained above, the number of houses was obtained from the street surveys and the number of businesses was acquired from the phone data.

challenging issues. The first issue was that, since the last two digits of each crime address were deleted, the number of assigned crimes became somewhat inflated in those segments that do not have address ranges from xx00 to xx99 (i.e., segments in which the last two digits of the starting address are not 00 and/or the last two digits of the ending address are not 99).[36] For those segments, the inflated sum had to be adjusted by a reliable standard. The author decided to use "the percentage of buildings (sum of houses and crime-attracting businesses[37]) within the exact segment ranges out of total buildings (sum of houses and crime-attracting businesses) within the modified segment ranges with 00s at the starting point and 99s at the ending point" as the weighting variable. The phone data was used to construct the weight because it contained information on the exact address of each house and business for the study segments as well as the other segments. It must be noted, however, that the weighting scheme might have been incorrect, because the number of properties was somewhat underreported in the phone data.

The other issue was that some of the incidents were recorded at intersections. As Table 4 shows, 8.6% of violent crimes and 6.4% of property crimes were recorded at intersections in 2003. In 2005, 10.8% of violent crime and 6.0% of property crime were located at intersections.[38] Instead of dropping those cases, the author decided to count

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[36] Sixty five segments out of 377 (17.24%) were those with inflated crime rates.

[37] In this case, both the number of houses and crime attracting businesses were extracted from the phone data, because the street survey data had housing information only for the 377 study segments, which made it impossible to compare the number of buildings of a study segment to its neighboring ones within the adjusted address ranges. Refer to the measure of land use for more information on crime attracting businesses.

[38] The percentage was calculated by dividing the crime number on intersections by the total crime number on study segments and intersections (e.g., percentage of 2003 violent crime = 42 / (449+42) = .086).

one incident as half in light of two rationales. One reason was that, compared to the incidents on segments, those at intersections took place relatively far away from the study segments and were likely to have less impact on residents than their counterparts on segments do. The other rationale was related to avoiding the possibility of double- or triple-counting of the incidents that occurred at intersections with two or three study segments.[39]

Table 4. Percentage of Crimes and Social Disorders Recorded on Intersections

	Study Segments : Intersections (percentage)	
	2003	2005
Violent Crime	449 : 42 (8.6%)	472 : 57 (10.8%)
Property Crime	960 : 66 (6.4%)	1015 : 65 (6.0%)
Social Disorder	930 : 321 (25.7%)	829 : 329 (28.6%)

Primary Independent Variables of Interest

Physical Disorder

Through the street surveys, the researchers collected a lot of information on the physical conditions of the street segments in 2003 and 2005. Surveyed items for physical disorder measure included cigarettes (item 9), litter (item 10), garbage (item 11), empty bottles (item 12), abandoned or disabled cars (item 14 or 15), condoms (item 17), needles and syringes (item 18), graffiti (items 19 and 20), and dilapidated houses (items 22, 23,

Appendix C contains a complete list of the number of crime and social disorder for the total segments, 377 study segments, and intersections.

[39] One case of social disorder (noise complaint) in 2003 and two cases of social disorder (juvenile complaint) in 2005 were recorded at intersections with four study segments.

and 24).[40] Unfortunately but not unexpectedly, many of the indicators, such as empty bottles, abandoned or disabled cars, condoms, needles and syringes, and graffiti, were not found for most segments.[41]

One research interest was whether the multiple indicators represented the same concept. To examine the issue, an exploratory factor analysis technique (EFA) was attempted.[42] Before that, the author took two steps to make the EFA valid. First, the net counts of indicators were transformed into rates. For litter and garbage, the number of houses was used as the denominator (i.e., number of houses with litter or garbage per 10 houses). The total number of houses and commercial buildings was used as the

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[40] Cars parked on the street (item 13) and cars with parking violations (item 16) were excluded from the analyses since they did not seem to be adequate measures of physical disorder. FYI, item 16, cars with parking violations, was found only at one segment in 2003 and two segments in 2005.

[41] For example, empty bottles, the most prevalent item among those rarely found indicators, were located only at 36 segments in 2003. Although it was found at 211 segments in 2005, the author decided not to use the item as an independent variable for the EFA to make the independent variables for the EFA consistent across the years.

[42] The author presents several methodological points concerning EFA that were taken advantage of in this study. (1) The standard method for factor extraction in EFA is maximum likelihood. Compared to the principal component analysis (PCA), it has an additional advantage that a goodness of fit test is presented. In other words, one can decide how many factors he/she needs to extract out of the observed variables. It saves researchers from arbitrarily setting the minimum of the eigenvalue. It must be noted, however, that the decision on the adequate number of factors to retain needs to be based on substantive issues (i.e., theory and prior research) as well as statistical issues (Fabrigar, Wegener, MacCallum, and Strahan, 1999). (2) Assuming the identified factors are correlated with each other, the author chooses oblique (i.e., promax) rotation. In general, this approach is regarded to be better representative of reality in social science than the orthogonal rotation technique with the assumption of independent factors. (3) Concerning the minimum factor loading of an indicator for its inclusion in factor interpretation, the researcher followed the rule suggested by Norman and Streiner (1994): Minimum factor loading when the sample size is larger than 100 = 5.152 / sqrt(n-2). Applying this rule, in case of disorder for the 377 segments, an indicator has to have at least .266 factor loading to be considered as a pertinent variable in factor interpretation: 5.152 / sqrt(375) = .266. For social structure of 83 block groups, an indicator would need at least .572 factor loading, although the sample size is smaller than 100: 5.152 / sqrt(81) = .572. The bolded numbers in Table 5 and Table 6 indicate non-meaningful factor loading in interpretation. FYI, the factor loadings in EFA represent how much each indicator is correlated with the factor. (4) For factor score estimation, the author selected a weighted least squares method (Bartlett scores) instead of regression method following the general trend. However, it must be noted that none is uniformly better than the other.

denominator for the other indicators (i.e., number of the indicators per 10 buildings).[43] Meanwhile, the score for cigarettes was standardized to z-scores so as to make the scores comparable across the two collection years, which was necessary because the raters were not the same people for each survey. Second, the rarely found indicators were combined into one variable – "others." In a similar vein, litter and garbage were aggregated into one variable because they appeared to measure similar phenomenon. Model 1 in Table 5 shows the EFA results. It suggested that the various indicators represented one underlying concept, namely, physical disorder. Created factor scores were further utilized as the primary independent variable for the hierarchical model.

Table 5. Factor Loadings of Physical Disorder and Serious Crime

	Model 1		Model 2							
	2003	2005	2003				2005			
			(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Physical Disorder										
Cigarettes	.54	.50	.54		.59	.33	.54		.52	.69
Litter or Garbage	.62	.84	.62		.58		.79		.80	.44
Dilapidated Houses	.44	.48	.41	.32	.46		.49		.53	
Others	**.12**	.38		.29	**.13**		.40		.37	.37
Violent Crime			.38				**.18**			
Property Crime						.78				.36

Another question to deal with, probably a more important issue than the first one in the broken windows field, was to confirm whether the measures of serious crime and disorder (physical and social) represent distinctly separate concepts. Modeling with different concepts was crucial because otherwise the conclusion validity of study

[43] The denominator used in this case was the same as that of crime and social disorder. Refer to footnote 33.

outcomes was highly likely to be questioned. To analyze the issue, the EFA was performed again. As Model 2 in Table 5 shows, both violent and property crimes did not appear to represent the same underlying concept as the indicators of physical disorder do.

Social Disorder

The CAD data was used to measure social disorder. Following the above discussion on measurement, six indicators were extracted – drunken subject, juvenile complaint, noise complaint, panhandling, loud party, and prostitution – that appeared to fit well into the suggested definition: "visible social cues that disturb life and threaten informal social control and that are classified as petty offenses or misdemeanors punishable only by fines or community service." Through the identical processes of measuring crime (i.e., denominator for crime rates, weight for inflated crime rates, half-counting for incidents at intersections), those multiple indicators were aggregated into street segments. One notable issue was that social disorder seemed to have been recorded at intersections much more frequently than serious crime (see Table 4), and dropping those cases would have caused a serious threat to the validity of the measure.

As with physical disorder, two issues had to be addressed. One was if the multiple indicators of social disorder represent one underlying concept. The other was to examine if the indicators of social disorder and serious crimes represent an identical concept. It was a particularly important question in this study because the same data source, CAD, was used to measure both crime and social disorder.

To examine the issues, the EFA was performed again. Since drunk subjects, panhandling, and prostitution were rarely found events, they were combined into a

variable – "others."[44] Model 1 and Model 2 in Table 5 describe the results for the two questions, respectively. Model 1 confirmed that the indicators of social disorder measure one latent factor for both years. Model 2 appeared to prove that the measures of serious crime and social disorder did not represent the same underlying concept. Thus, the factor of social disorder created in Model 1 was further included in the study model.

Table 6. Factor Loadings of Social Disorder and Serious Crime

	Model 1		Model 2							
	2003	2005	2003				2005			
			(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Social Disorder										
Juvenile	.29	.62		.39		.29	.43		.34	
Noise	.99	.30		.72		.99	.31		.32	
Loud Party	.31	.28		.41		.32		.78		.75
Others	**.14**	.37	.99		.53		.58		.62	
Violent Crime			.43	.44			.53			
Property Crime					.99				.88	

Control Variables: Neighborhood Structure (Characteristics)

Social Structure

The author attempted to measure neighborhood structure with two dimensions – social and physical. For social structure, this dissertation followed the approach of Sampson and his colleagues (1997). Using the Census data, the author created very similar indicators to those used by Sampson et al. (1997). The indicators were as follows: percent of families below the poverty level, percent of households receiving public assistance, percent female-headed households, percent youth, percent black,

[44] Refer to Appendix C.

percent unemployment, percent Hispanic, percent foreign-born, percent of residents who lived in a different house 5 years ago, and percent of renter-occupied residential units.[45]

Table 7. Component Loadings of Community Characteristics

	Model (2)		
	1	2	3
Concentrated Disadvantage			
Households below poverty level	.81		
Households on public assistance	.85		
Female headed households	.80		
Youth (less than age 18)	.62		
African Americans	.67		
Unemployment	.65		
Immigrant Concentration			
Hispanic		.79	
Foreign born		.79	
Residential Instability			
Different house from 1995			.85
Renter occupied house			.85

Since the three neighborhood factors – concentrated disadvantage, immigrant concentration (ethnic heterogeneity), residential instability (mobility) – had received enough support, theoretical and empirical, within the neighborhood research, this study attempted to reduce the indicators to those corresponding factors that share the common variance of the indicators. In other words, since no hypothesis (or model) testing was attempted to find latent factors here, the Principal Component Analysis (PCA), instead of

[45] As of the year of 2000, about 10 percent of Lansing's population had Hispanic origins, and around five percent were born in foreign countries. The author could not get any information on racial makeup of the people born in foreign countries. As such, the author did not attempt to give further meanings to the findings related to immigrant concentration.

the EFA, was performed three times to extract the three factors.[46] Table 7 shows the component loadings of each indicator for its corresponding factor.

Physical Structure: Land Use

Next, the author used the phone data mainly and the field survey data also to measure land use for street segments and block groups. As explained above, the basic scheme was to use the survey data for a housing count and the phone data for a business count at the segment level. Only the phone data was utilized for the block group level, however.

The basic approach to operationalize the land use was to calculate the percentage of commercial properties out of all buildings, following Wilcox et al. (2004). However, a more conservative approach was taken in this study. In other words, the researcher restricted the business types to those that are generally considered to be crime-attracting. Put more specifically, the author referred to the SIC (Standard Industrial Classification) Code and counted businesses with numbers of 50 through 60, 70, 72, 75, 76, 78, 79, 80 and 82.[47] Thus, the land use measure of this dissertation is better conceptualized as criminogenic land use. Considering the study results that certain types of commercial and public land uses (e.g., library) are not related to high crime rates (Brantingham &

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[46] Refer to footnote 42 for more discussions on the PCA vs. EFA. As mentioned before, the first six indicators were reduced to concentrated disadvantage, the next two to immigrant concentration (heterogeneity), and the last two to residential instability.

[47] 50: Wholesale Trade – durable goods, 51: Wholesale Trade – nondurable goods, 52: Building Materials, Hardware, Garden Supply,and Mobile Home Dealers, 53: General Merchandise Stores, 54: Food Stores, 55: Automotive Dealers and Gasoline Service Stations, 56: Apparel and Accessory Stores, 57: Home Furniture, Furnishings, and Equipment Stores, 58: Eating and Drinking Places, 59: Miscellaneous Retail, 60: Depository Institutions, 70: Hotels, Rooming Houses, Camps, and Other Lodging Places, 72: Personal Services, 75: Automotive Repair, 76: Miscellaneous Repair Services, 78: Motion Pictures, 79: Amusement and recreation Services, 80: Health Services, 82: Educational Services

Brantingham, 1982; Peterson et al., 2000), this approach would not cause a serious measurement problem.

Analytic Strategies

As mentioned already, this dissertation attempts to test a hierarchical model linking disorder and crime, controlling for the spatial autocorrelation. Adjusting for autocorrelated crime rates is crucial in hypothesis testing because otherwise the estimated parameters become unreliable. Meanwhile, since the outcome variable of this dissertation is count data, the author plans to construct a hierarchical mixed Poisson model. Both cross-sectional and longitudinal analyses are conducted. Following Markowitz et al. (2001) and Sampson and Raudenbush (1999), the key strategy for longitudinal analysis is to control for the prior level of crime. The strategy appears to further fit well into the hierarchical mixed Poisson model because it requires that dependent variable(s) have non-negative values. Detailed descriptions of the spatial analysis and non-linear hierarchical model (HGLM) are presented below.

Spatial Analysis

Every single social phenomenon has a spatial (and temporal) dimension. It seems that the spatial patterns of most of the social phenomena tend to follow the pattern of population distribution, which is not random or even. Crime is not an exception and thus its distribution tends to be spatially dependent. This spatial dependence is well-illustrated by Tobler's first law of Geography – "everything is related to everything else but nearby objects are more related than distant objects" (Tobler, 1969).

Spatial analysis of crime is important both statistically and theoretically. Regarding statistical inference, the clustered nature of crime distribution is highly likely to produce correlated prediction errors in statistical analysis, which is called spatial autocorrelation of errors. The spatial autocorrelation produces inflated and biased standard errors of regression coefficients, and so, if the spatial process is not accounted for, statistical inference will be inaccurate. Concerning its theoretical (substantial) importance, on the other hand, the causal processes involving crime do not necessarily operate identically in all places (spatial heterogeneity) and spatial analysis can reveal subareas of geography in which the effects of predictor variables differ (Baller et al., 2001; Messner and Anselin, 2004).

Put more technically, the behavior of a spatial phenomenon consists of first-order process or large scale variation in mean value (i.e., overall trend) and second-order process or stochastic deviations from the mean (i.e., local dependence of error) (Bailey and Gatrell, 1995). The key element in the spatial analysis is to appropriately model the second-order process. For this, three sources of the second-order process have been suggested by Anselin and his colleagues – spatial heterogeneity, spatial lag (or spatial effect), and spatial error (or spatial disturbance) (Anselin, 2002, 2005; Baller et al., 2001). As explained above, the spatial heterogeneity process represents the unexplained nature of heterogeneity across study areas. Meanwhile, the spatial lag process signifies that the crime rate of an area is influenced by that of neighboring areas. Finally, the spatial error process indicates the influence of omitted covariates that are spatially correlated.

Anselin and other researchers suggested a convincing spatial modeling process. According to them, the first step is an exploratory analysis to examine whether crime

rates are distributed randomly. Significant Global Moran's I indicates non-randomness of crime distribution, which further suggests that spatial modeling is necessary. In contrast, a notable spatial process would not exist if the measure of global autocorrelation (i.e., Global Moran's I) were not significant. Next, a pure structural model or the linear regression with OLS estimation is run, and it is examined if the residuals are homogeneous and independent across study areas. Finally, following the results of diagnostics for autocorrelation, a spatial lag or a spatial error model is tested.

Under the assumptions of independence and homogeneity (i.e., no second-order process), the error matrix takes a form of $\sigma^2 I$, which represents the identically and independently distributed (iid) errors. The spatial heterogeneity, however, makes the diagonal of the error matrix have diverse values.

Meanwhile, the spatial lag process implying a possible diffusion process can be expressed (in matrix form) as

$$y = \rho Wy + X\beta + u$$

Where, ρ is the spatial lag parameter, W is a weight matrix for neighboring units, Wy is a lagged outcome variable weighted by W, and u is identically and independently distributed (iid) errors ($\sigma^2 I$).[48]

Lastly, since the spatial error process indicates the influence of omitted covariates that are spatially correlated, the error term can be expressed (in matrix form) as

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[48] A simple matrix operation transforms the formula into $y = (I - \rho W)^{-1} X\beta + (I - \rho W)^{-1} u$. Where, I is identity matrix and $(I - \rho W)^{-1}$ is spatial multiplier. The formula indicates that crime at one location is influenced not only by covariates at that location but also by covariates at neighboring areas through the spatial multiplier. Also, the whole portion for residuals does not take the iid form ($\sigma^2 I$) anymore. The author presents the simpler formula because it appears to imply the diffusion process better.

$$\varepsilon = \lambda W\varepsilon + u$$

Where, λ is the spatial error parameter, W is a weight matrix, and u is iid. By substituting the correlated error term into the traditional linear model ($y = X\beta + \varepsilon$), a new model is constructed for the spatial error process as below.

$$y = X\beta + (I - \lambda W)^{-1}u$$

Where, $(I - \lambda W)^{-1}$ is spatial multiplier and u is iid. This model indicates that crime at a location is influenced by errors at neighboring areas through the spatial multiplier.

Construction and Control of Spatial Lag

To examine the plausible spatial processes, this dissertation uses a user-friendly software package for spatial analysis, GeoDa, which was developed by Anselin with the support of the Center for Spatially Integrated Social Science (CSISS). Unfortunately, however, it is not feasible to follow the whole modeling process suggested above because it does not fit with the hierarchical modeling process. Instead, Anselin suggests that a researcher can create a spatially lagged variable within GeoDa and include the lag in another software as a control for the neighboring effects. This way one can test spatial processes of interest.

This study has interests in whether the crime rates of an area (i.e., block group mean of crime rates) are influenced by those of neighboring areas above and beyond the impact of structural covariates. If this is the case, it suggests a spatial diffusion process, although a more formal test is required to verify that. Meanwhile, the study has less interest in the spatial error process, or the impact of omitted covariates, because the study model of this dissertation appears to be well-specified as the theory suggests, with the possible exception of neighborhood process. In fact, few models in social science

research can be perfectly specified. Further, it is difficult to model the spatial error process in HLM due to the author's lack of knowledge and the limitation of GeoDa's functionality. Therefore, this research project attempts to test the spatial lag process in HLM (HGLM, put more specifically) after constructing the lag variable of crime rates in GeoDa.

A Hierarchical Mixed Poisson Model

When an event of interest is discrete, truncated at zero, and distinctly skewed (i.e., count data), the traditional linear model with OLS estimation produces biased and unreliable estimates due to violations of several assumptions. First, the event is highly likely to have a non-linear relationship with independent variables. Thus, a linear model might predict a negative value, which does not make sense at all. Second, the prediction residuals tend to have a differential variability depending on the level of independent variables (heteroscedasticity). Finally, the residuals are likely to be correlated with independent variables (Raudenbush & Bryk, 2002; Sturman, 1999). A related issue is that any transformation of the event cannot solve the problems. For example, a square root transformation keeps the value greater than zero (truncated) and still suffers from heteroscedasticity (Sturman, 1999). The logit transformation that is useful in a binary outcome model does not solve the heteroscedasticity and non-linearity, although it makes the value of an event unlimited. Therefore, an effective solution is to use a nonlinear model based on a relevant distribution function for the count data, such as the Poisson model (Raudenbush & Bryk, 2002). [49]

[49] To examine whether the non-linear model of this study better fits the data distribution than its linear counterpart does, the author tested a linear (unconditional) model and compared the results (reliability estimates) of both models. For the linear model, the author tried to normalize the

Various Poisson Models

The Poisson distribution is a discrete probability distribution discovered by the French statistician Simeon-Denis Poisson (1781-1840). The number of events in an interval of given length or in a spatial area is Poisson distributed with the below probability density function. In other words, the function specifies the probability that there are exactly k occurrences of Y in a given time or area (Land et al., 1996).[50]

$$P(Y = k) = e^{-\lambda} \lambda^k / k!$$

Where:

k is a natural number including 0, $k = 0, 1, 2, \ldots > 0$,
e is the base of the natural logarithm (e = 2.71828...),
$k!$ is the factorial of k,
λ (intensity or rate parameter) is a positive real number, equal to the expected number (mean) of occurrences that occur during the given interval (or in the given area).

The formula specifies an unconditional model that the probability does not depend on factors other than λ. A standard application of the Poisson model specifies a conditional Poisson process where each unit is permitted to have its own unique intensity parameter, and differences across units in these parameters are a function of a set of known explanatory variables. Under this conditional Poisson specification, the probability that the i^{th} area will experience k events is given by:

$$P(Y_i = k \mid X) = e^{-\lambda} \lambda^k / k!$$

And the intensity parameter is specified by:

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distribution of the dependent variables (i.e., weighted crime rates) by adding 1 and taking the natural log. The results are presented in Appendix F. The relatively low reliabilities (particularly for the violent crime model) indicated that the block group mean estimates in the linear model are much less reliable than those in the non-linear model, which further suggested that the latter model better reflects the data (i.e., real world phenomenon).

[50] In light of the purpose of this project, my discussion focuses on the area units rather than temporal periods.

$$E(Y_i \mid X) = \lambda_i = e(\sum \beta_j X_{ij}).$$

In this specification, β_js are effect parameters to be estimated. Thus, the analytical framework is based on the premise that the likelihood any area will experience a given number of discrete events is a function of a set of exogenous factors that affect the intensity parameter governing the area. Variation in the number of events across areas, therefore, must be due to corresponding spatial variation in the explanatory factors (Cameron & Trivedi, 1998; Beck & Tolnay, 1995).

The Poisson distribution possesses an interesting feature in that the mean (expected value) of the event is the same as its variance, which is called "equidispersion" (Cameron & Trivedi, 1998). In many instances, however, count data displays "overdispersion," with its variance being larger than the mean. Thus, applying the Poisson model to overdispersed data results in a violation of the crucial assumption, leading to smaller standard errors. It eventually increases the probability of misidentification of non-existent relationships (Type I error). Further, the Poisson model assumes that an occurrence of the event is independent of the number of previous occurrences. This assumption is also inconsistent with many real cases, which provides another source of controversy.

There is a modified Poisson approach that deals with the overdispersion problem by adding one unknown parameter ψ to the model.

$$E(Y_i \mid X) = \lambda_i = e(\sum \beta_j X_{ij})$$

$$\text{Var}\,(Y_i \mid X) = \psi * \lambda_i$$

In this model, the estimated effect coefficients are not affected, but only their standard errors become larger by the factor ψ. Hence, the asymptotic t ratios will be

proportionally smaller. However, the model assumes that there are no excluded explanatory variables or other sources of randomness.

To relax this strong assumption, one can respecify the regression component to include a term ε for specification errors or other origins of randomness.

$$E(Y_i \mid X, \varepsilon) = \lambda_i = e(\sum \beta_j X_{ij} + \varepsilon_i)$$

This model is known as a mixed Poisson regression because it accounts for the two stochastic processes: (a) the number of events experienced by each unit is assumed to follow a Poisson process, but (b) the Poisson parameter itself has a gamma distribution.[51] The model is very attractive because it not only corrects for the overdispersion problem but also allows for random errors and random influences of excluded variables (Land et al., 1996).

Construction of HGLM

A handy software for the hierarchical modeling is HLM 6.0 developed by Raudenbush, Bryk, and Congdon (2005). It has a function to handle various forms of hierarchical generalized linear models (HGLM), including the hierarchical mixed Poisson model. For a valid test for the hierarchical mixed Poisson model, it is suggested that researchers select the "LaPlace" approximation and "full PQL (Penalized Quasi-Likelihood)" estimation method. Furthermore, in general, only one level 2 random effect is estimated for HGLM. Following that, this dissertation attempts to fit the various datasets to the hierarchical mixed Poisson model.

It is customary to construct an unconditional model (i.e., one-way ANOVA) first to examine the variability of the outcome measure across level 2 units. Then, a random

[51] The gamma family of distributions is a very general class of continuous, unimodal distributions for random variables that take on only nonnegative values (Land et al., 1996, p. 393).

coefficient model is constructed to test the first hypothesis. The other hypotheses are tested via a conditional model that controls for all variables at both levels. Below is an example of cross-sectional conditional model for violent crime 2003.

$$\text{Level 1: } \eta_{ij} = \log(VC03) = \beta_{0j} + \beta_{1j}*PD03 + \beta_{2j}*SD03 + \beta_{3j}*LU03$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}*CD + \gamma_{02}*IC + \gamma_{03}*RI + \gamma_{04}*LU + \gamma_{05}*W(VC03) + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11}*CD + \gamma_{12}*IC + \gamma_{13}*RI + \gamma_{14}*LU$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}*CD + \gamma_{22}*IC + \gamma_{23}*RI + \gamma_{24}*LU$$
$$\beta_{3j} = \gamma_{30}$$

Where:

β_{0j} = the average log of VC 2003 of a block group j when there is no PD, SD, or LU

β_{1j} = the average slope of PD 2003 in a block group j

β_{2j} = the average slope of SD 2003 in a block group j

β_{3j} = the average slope of LU in a block group j

γ_{00} = the average log of VC 2003 across 83 block groups with no PD, SD, or LU

γ_{10} = the average slope of PD 2003 across 83 block groups

γ_{20} = the average slope of SD 2003 across 83 block groups

γ_{30} = the average slope of LU across 83 block groups

$\gamma_{01}, \gamma_{02}, \gamma_{03}, \gamma_{04}$ = the effects of structural covariates on the average log of VC 2003 in a block group j

γ_{11}~γ_{14}, γ_{21}~γ_{24} = the effects of structural covariates on the average slope of SD 2003 and PD 2003 in a block group j

γ_{05} = the effect of neighboring VC 2003 on the average log of VC 2003 in a block group j

u_{0j} = level-2 random effect (deviation of block group j's mean from the grand mean)

Therefore, the first hypothesis (*H1: Disorder, physical and social, has a significant effect on serious crime at the first level.*) is tested via β_{1j} and β_{2j}.[52] The second hypothesis (*H2:*

[52] It must be noted that the first hypothesis is tested by a random coefficient model that has control variables (i.e., physical disorder, social disorder, and land use) only at the segment level. Refer to the chapter on results.

Structural characteristics have significant effects on block group means of crime rates at the second level.) is examined via γ_{01}, γ_{02}, γ_{03}, γ_{04}. The third hypothesis (*H3: The effect of disorder on crime remains significant after controlling for neighborhood characteristics – multivariate significance.*) is analyzed via γ_{10} and γ_{20}. The fourth hypothesis (*H4: The relationship between disorder and crime at the first level is significantly influenced by structural covariates at the second level – cross-level interaction.*) is tested via γ_{11}, γ_{12}, γ_{13}, γ_{14}, γ_{21}, γ_{22}, γ_{23}, γ_{24}. The fifth hypothesis (*H5: The mean crime rates of a block group is further influenced by the mean crime rates of neighboring block groups, after controlling for the structural covariates – spatial lag.*) is examined via γ_{05}.

Meanwhile, an example of longitudinal conditional model for violent crime 2005 is presented below. It must be noted that land use 2005 is controlled for in the model, instead of the land use change, because only 11 segments experienced a decrease or increase of commercial land use. Also, as suggested above, the author does not use the change of crime as the dependent variable because the Poisson model requires the outcome variable to be non-negative numbers. Instead, logged crime rates of the previous year (i.e., year 2003) will be controlled for in the model.

$$\text{Level 1: } \eta_{ij} = \log(VC05) = \beta_{0j} + \beta_{1j}*(PD05\text{-}PD03) + \beta_{2j}*(SD05\text{-}SD03) + \beta_{3j}*LU05 + \beta_{4j}*VC03$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}*CD + \gamma_{02}*IC + \gamma_{03}*RI + \gamma_{04}*LU + \gamma_{05}*W(VC05\text{-}VC03) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}*CD + \gamma_{12}*IC + \gamma_{13}*RI + \gamma_{14}*LU$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}*CD + \gamma_{22}*IC + \gamma_{23}*RI + \gamma_{24}*LU$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

Where:

β_{0j} = the average log of VC 2005 of a block group *j* when there is no PD change (from 2003 to 2005), SD change (from 2003 to 2005), LU 2005, or VC 2003.

β_{1j} = the average slope of PD change (from 2003 to 2005) in a block group *j*

β_{2j} = the average slope of SD change (from 2003 to 2005) in a block group *j*

β_{3j} = the average slope of LU 2005 in a block group *j*

γ_{00} = the average log of VC 2005 across 83 block groups with no PD change, SD change, LU 2005, or VC 2003

γ_{10} = the average slope of PD change across 83 block groups

γ_{20} = the average slope of SD change across 83 block groups

γ_{30} = the average slope of LU 2005 across 83 block groups

$\gamma_{01}, \gamma_{02}, \gamma_{03}, \gamma_{04}$ = the effects of structural covariates on the average log of VC change in a block group *j*

γ_{11}~γ_{14}, γ_{21}~γ_{24} = the effects of structural covariates on the average slope of SD change and PD change in a block group *j*

γ_{05} = the effect of neighboring VC change on the average log of VC change in a block group *j*

The first hypothesis (*H1: Change of disorder, physical and social, has a significant effect on change of serious crime at the first level.*) is tested via β_{1j} and β_{2j}.[53] The second hypothesis (*H2: Structural characteristics have significant effects on block group means of crime rates change at the second level.*) is examined via γ_{01}, γ_{02}, γ_{03}, γ_{04}. The third hypothesis (*H3: The effect of disorder change on crime change remains significant after controlling for neighborhood characteristics – multivariate significance.*) is analyzed via γ_{10} and γ_{20}. The fourth hypothesis (*H4: The relationship between disorder change and crime change at the first level is significantly influenced by structural covariates at the second level – cross-level interaction.*) is tested via γ_{11}, γ_{12}, γ_{13}, γ_{14}, γ_{21}, γ_{22}, γ_{23}, γ_{24}. The fifth hypothesis (*H5: The change of mean crime rates of a block group is further*

[53] As with the cross-sectional model, the first hypothesis is tested by a random coefficient model.

influenced by the change of mean crime rates of neighboring block groups, after controlling for the structural covariates – spatial lag.) is analyzed via γ_{05}.

CHAPTER VI: RESULTS

This chapter presents the results of various analyses. First, general characteristics of the study subjects are described for the study variables. A simple examination was further attempted to check whether there had been a notable pattern of change of disorder and crime. Next, bivariate relationships among the variables are presented. Third, detailed procedures for constructing spatial lag and examining autocorrelation of crime are described. Finally, the results of multivariate hierarchical models, both cross-sectional and longitudinal, are discussed.

General Characteristics of Study Subjects (Street Segments and Block Groups)

Table 8 shows the descriptive statistics of the variables for both street segments and block groups. The average violent crime rate for 2003 was .93 (per 10 buildings) within a range of 0 and 11.11. That for 2005 was .90 within a range of 0 and 13.33. Meanwhile, the average property crime rate was 2.05 (per 10 buildings) for both years. The minimum was 0 and maximum was 33.33. Both violent and property crimes were highly and positively skewed, which was consistent with the distribution of the count data.[54]

The mean factor scores of social disorder were 1.00 and 1.43 for 2003 and 2005. Interestingly, social disorder appeared to take place as rarely as property crime in light of the average rates of 2.18 and 2.24 for 2003 and 2005.[55] It also was highly and positively

[54] Although not shown in Table, 166 segments out of 377 study segments (44%) had no occurrence of violent crime in 2003. Similarly, 160 (42.4%), 78 (20.7%), and 85 (22.5%) segments showed no case of violent crime 2005, property crime 2003, and property crime 2005, respectively. It also appeared to be somewhat consistent with the general frequency distribution of the count data.

[55] Similar to property crime, 84 (22.3%) segments in 2003 and 93 (24.7%) segments in 2005 showed no occurrence of social disorder.

skewed. Meanwhile, physical disorder showed mean factor scores of 1.33 and 1.14. It was not notably skewed, which was understandable because all segments contained a certain amount of physical disorder.

Table 8. Descriptive Statistics

	N	Mean	S.D.	Min	Max	Skewness
Segment-Level Variables						
Violent Crime 2003	377	.93	1.51	.00	11.11	3.22
Violent Crime 2005	377	.90	1.47	.00	13.33	4.01
Property Crime 2003	377	2.05	3.27	.00	33.33	4.94
Property Crime 2005	377	2.05	2.79	.00	33.33	4.92
Social Disorder 2003 (rates)	377	2.18	3.48	.00	25.75	3.54
Social Disorder 2005 (rates)	377	2.24	3.95	.00	41.67	5.26
Social Disorder 2003 (factor)	377	.00	1.00	-.46	8.84	4.72
Social Disorder 2005 (factor)	377	.00	1.43	-.90	13.00	3.79
Physical Disorder 2003 (factor)	377	.00	1.33	-3.11	3.98	.43
Physical Disorder 2005 (factor)	377	.00	1.14	-2.09	4.01	.67
Land Use 2003	377	5.54	13.95	.00	100.00	4.03
Land Use 2005	377	5.62	14.56	.00	100.00	4.18
Block Group-Level Variables						
Concentrated Disadvantage	83	.00	1.00	-1.65	2.56	
Immigrant Concentration	83	.00	1.00	-1.67	3.16	
Residential Instability	83	.00	1.00	-1.39	2.93	
Land Use	83	5.74	5.62	.00	33.62	

The average land use was 5.54 and 5.62 for 2003 and 2005 at the segment level, which indicated that 5.54% and 5.62% of all buildings at the study segments were crime-attracting commercial properties for 2003 and 2005.[56] The study block groups had an

[56] For both years, 264 (70%) segments did not have crime-attracting businesses at the segment level.

average of 5.74% of crime-attracting commercial properties for 2003. Similar to crime and disorder variables, the land use was highly skewed.

Finally, the three social structural covariates – concentrated disadvantage, immigrant concentration, and residential instability – were converted to mean component scores and thus were all zeros with one standard deviation.

Change of Disorder and Crime

Since the main focus of this study was whether the change in crime is attributable to the change in disorder, the author examined several descriptive statistics for evidence of change in crime and disorder. First, the overall rates of crime and social disorder were examined. As Table 9 shows, violent crime rates decreased from .93 in 2003 to .90 in 2005, which amounted to a reduction of 3.33%. However, property crime rates remained the same. In contrast, social disorder rates increased from 2.18 in 2003 to 2.24 in 2005, which was equal to an increase of 2.75%. Overall, crime and social disorder appeared to have remained stable.

Second, the total sum of physical disorder indicators appeared to have decreased from 8.22 in 2003 to 7.00 in 2005, which represented a reduction of 14.84%.[57] Although the change seems to be impressive, the results for the two surveys should not be compared because, though every effort was made to maintain inter-rater reliability and follow coding guidelines (Appendix B), the two field surveys for physical disorder were conducted by different researchers. Thus, 10% of street segments with the lowest sum of

[57] Total sum of 2003 (or 2005) = z-score of cigarette (item 9) + rates of litter (item 10) + rates of garbage (item 11) + rates of empty bottles (item 12) + rates of abandoned or disabled cars (item 14 or 15) + rates of condoms (item 17) + rates of needles and syringes (item 18) + rates of graffiti (items 19 and 20) + rates of dilapidated houses (items 22, 23, and 24). These items are those that were used to measure physical disorder. Refer to pages 85 and 86.

physical disorder (n=38) and 10% of street segments with the highest sum of physical disorder (n=38) were examined to check whether there had been notable changes in physical disorder, social disorder, and crime on those segments during the study period.

Table 9. Change of Disorder and Crime for Total and Selected Segments[58]

		2003	2005	Change	
Total Segments (n=377)	Physical Disorder	8.22	7.00	-1.22	14.84%
	Social Disorder	2.18	2.24	.06	2.75%
	Violent Crime	.93	.90	-.03	3.33%
	Property Crime	2.05	2.05	.00	0.00%
High PD Segments (n=38)	Physical Disorder	16.30	10.03	-6.27	38.47%
	Social Disorder	2.17	3.00	.83	38.25%
	Violent Crime	1.15	1.42	.27	23.48%
	Property Crime	2.18	2.39	.21	9.63%
Low PD Segments (n=38)	Physical Disorder	1.84	3.50	1.66	90.22%
	Social Disorder	.57	1.55	.98	171.93%
	Violent Crime	.45	.55	.10	22.22%
	Property Crime	2.37	1.69	-.68	28.69%

As Table 9 reveals, the segments with high physical disorder experienced a stronger reduction than the total did (38.47% vs. 14.84%), which seemed to be a good sign. However, those with low physical disorder went through an opposite trend: physical disorder increased 90.22% in those segments. Overall, it appeared that the level of physical disorder tended to converge toward the mean.

Interestingly, social disorder and the two types of crimes increased on the high physical disorder segments, which foreshadowed that physical disorder might not be

[58] A series of paired samples t-tests were conducted to statistically check the changes of violent crime and social disorder for the total segments. No significant change was discovered (not shown in table).

highly correlated with social disorder and crimes. On the low physical disorder segments, meanwhile, social disorder and violent crime went up 171.93% and 22.22%, respectively. But, property crime decreased 28.69%. Overall, no notable pattern of change was detected.

Bivariate Relationships

As Table 10-1 shows, the zero-order correlations among independent variables at the segment level were not that high, even though some of them were statistically significant (e.g., PD 2003 & SD 2003, PD 2003 & LU 2003, SD 2005 & LU 2005). Except land use, the structural covariates at the block group level were all highly correlated at the .01 level, which indicated that there could be a multicollinearity problem (Table 10-2).

Table 10-1. Correlation Matrix (Level 1)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. PD 2003	1.00									
2. SD 2003	.13*	1.00								
3. LU 2003	.10*	.05	1.00							
4. VC 2003	.23**	.29**	.16**	1.00						
5. PC 2003	.11*	.24**	.57**	.47**	1.00					
6. PD 2005	*.44***	*.14***	*-.04*	*.10**	*.04*	1.00				
7. SD 2005	*.19***	*.18***	*.16***	*.19***	*.22***	.03	1.00			
8. LU 2005	*.11**	*.04*	*.98***	*.14***	*.53***	-.05	.24**	1.00		
9. VC 2005	*.23***	*.11**	*.22***	*.38***	*.32***	.13*	.31**	.26**	1.00	
10. PC 2005	*.21***	*.21***	*.40***	*.25***	*.39***	.07	.45**	.49**	.40**	1.00

*p < .05 **p < .01 (2-tailed)

Table 10-2. Correlation Matrix (Level 2)

	1	*2*	*3*	*4*
1. CD	1.00			
2. IC	.48**	1.00		
3. RI	.38**	.42**	1.00	
4. LU	-.04	.15	.14	1.00

* $p < .05$ ** $p < .01$ (2-tailed)

Diagnostics of Multicollinearity

One of the important assumptions of multivariate analysis is that there should be no perfect collinearity between independent variables, for a perfect collinearity makes it impossible to calculate parameter estimates. In practical situations, however, a perfect collinearity problem rarely happens, and if it takes place, computer programs warn researchers, thus it is easy to figure out the problem. The real issue is that sometimes independent variables are either highly correlated or linearly dependent with each other, which is called multicollinearity. It is problematic because it tends to result in very large standard errors and unreliable or unusual regression coefficients (Allen, 1997; Berry & Feldman, 1985; Fox, 1991).

Besides high bivariate correlations, as mentioned above, the multicollinearity problem can spring from a linear combination of more than two other independent variables. Notwithstanding the relatively low correlations among the level 1 and level 2 independent variables,[59] therefore, the author further conducted more rigorous diagnostics by examining tolerance statistic, VIF (Variance Inflation Factor), and

[59] It would be fair to say that the bivariate correlations were relatively low in that the usual cutoff value for multicollinearity is .80 (Berry & Feldman, 1985: 43).

condition index. For this, OLS regressions were performed via the SPSS program, and the results for the level 2 variables are discussed below.[60] [61]

First, tolerance and VIF (Variance Inflation Factor) statistics were examined, which were more likely than the correlation matrix to detect a multicollinearity problem, especially when there were multiple correlations between independent variables. Table 11 describes the results. All of the level 2 covariates did not appear to be problematic, since both tolerance and variance inflation factors were close to 1.0. [62]

Table 11. Tolerance and Variance Inflation Factors (VIF)

Independent Variables	*Tolerance*	*VIF*
Concentrated Disadvantage	.72	1.34
Immigrant Concentration	.68	1.46
Residential Instability	.77	1.30
Land Use	.95	1.01

Table 12. Collinearity Diagnostics

Concept	Eigen-value	Condition Index	Variance Proportions				
			Intercept	CD	IC	RI	LU
1	1.89	1.00	.01	.10	.11	.11	.02
2	1.69	1.06	.12	.03	.02	.02	.11
3	.64	1.72	.02	.38	.03	.74	.00
4	.52	1.90	.03	.40	.77	.11	.01
5	.26	2.69	.82	.09	.07	.03	.85

[60] Since the study model included (i.e., controlled for) the average crime rates of neighboring block groups (= lagged crime rates), the author also examined the various collinearity statistics for the level 2 variables including the lagged crime rates. The results were little different than what is presented in the text. Refer to Appendix D.

[61] The results for the level 1 variables are presented in Appendix E. As was the case with the level 2 variables, no substantial sign of multicollinearity was detected.

[62] The general rule of thumb is that VIF over 10 is problematic, though there is not a cutting-point (DeJong, 2004).

To further check the magnitude of linear dependency and the amount of variation that each variable contributes to each concept, the author examined condition index and variance proportions. Table 12 contains the results. No variable appeared to have abnormal values in the condition index, a measure of linear dependency.[63] Also, the variance proportions indicated that none of the variables appeared to measure one same concept.

In sum, the various diagnostic statistics indicated that there seems to be no substantial multicollinearity problem in the multivariate model. Also, the four level 2 covariates were those that have been theoretically important and empirically supported. Therefore, the author decided to keep all the covariates in the model.

Correlations between Dependent Variables and Independent Variables

The dependent variables, violent crime rates and property crime rates, were significantly and positively associated with most of the segment level independent variables (Table 10-1). It was remarkable that both types of crimes were correlated more highly with social disorder than with physical disorder. However, it was not unexpected because social disorder is generally regarded as more closely related to serious crime than is physical disorder. Also, the issue of "same data source" could have been influential although the EFA confirmed that social disorder and crimes represent different concepts. The relationships were further tested via multivariate models in the next sections.

[63] In general, condition index over 30 is problematic, although it is not a cutting-point (DeJong, 2004).

Spatial Lag and Autocorrelation of Crime

Before examining the spatial autocorrelation of crime rates, the author attempted to create lagged variables of them, using GeoDa. For this, crime rates were first aggregated into the block groups, since they were measured at the segment level. Figure 8 shows the overall distribution of violent crime rates and property crime rates. Although several areas, including the "Chestnut area" (northwestern area of the State Capitol), appeared to suffer from the concentrated crime problem, it was hard to tell from the maps whether the crime rates were autocorrelated or not.

Figure 8-1. Quantile Maps of Crime Rates (Violent Crime 2003)

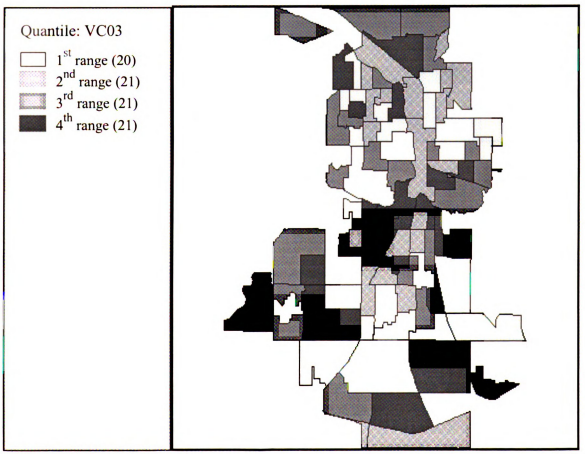


Figure 8-2. Quantile Maps of Crime Rates (Property Crime 2003)

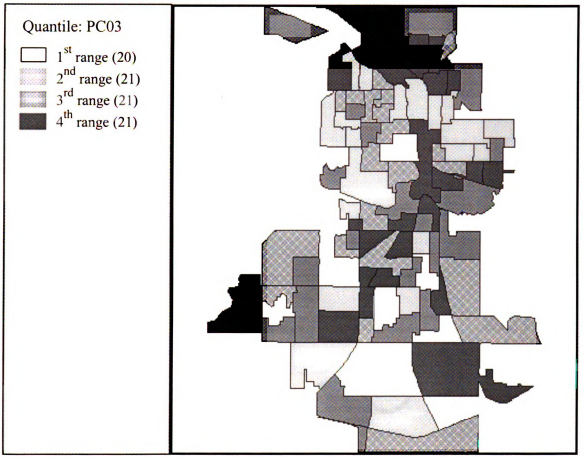


Figure 8-3. Quantile Maps of Crime Rates (Violent Crime 2005)

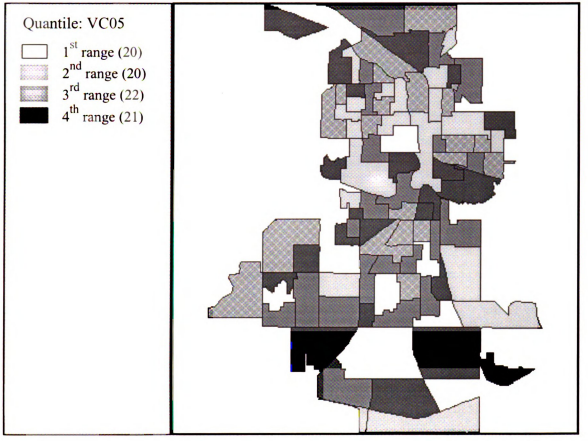
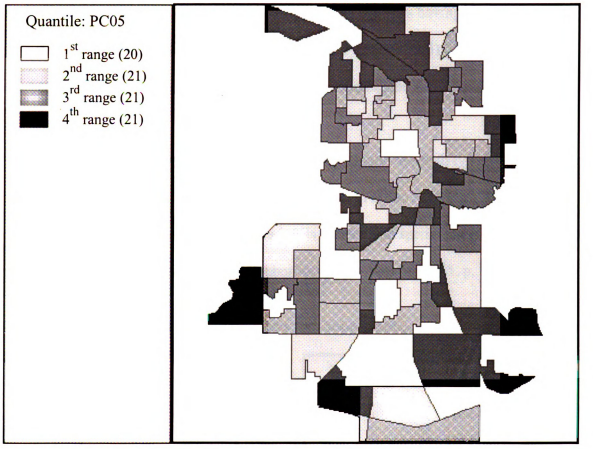


Figure 8-4. Quantile Maps of Crime Rates (Property Crime 2005)

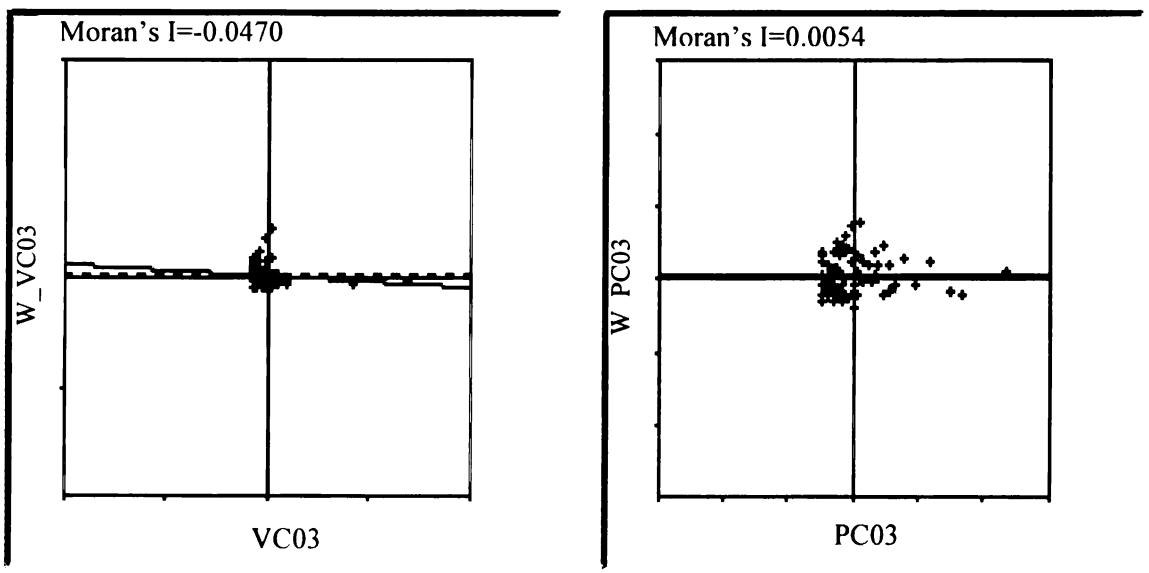


Next, spatial weights were assigned to each block group, considering two technical points. (1) By definition, while the rook criterion counts neighboring units with common boundaries as the neighboring units, the queen criterion considers neighboring units with either common boundaries or common corners as the neighboring units (Anselin, 2005). In this study, the queen criterion rather than the rook criterion was used to determine neighboring block groups, because the suggested diffusion process was not necessarily supposed to take place in surrounding block groups with common boundaries. (2) By definition, the first-order neighboring units based on the queen criterion include the neighbors with common boundaries or corners. Whereas, the higher-order

neighboring units based on the queen criterion (e.g., the second-order neighboring units) include not only the first-order neighbors but also the neighbors having common boundaries or corners with the first-order neighbors (Anselin, 2005). In this study, only the first-order neighboring units were weighted considering the small number of block groups.

Through the procedures, the spatial lags were created for both types of crime rates for both years. Further, the spatial lags for the change in crime rates from 2003 to 2005 were created through the same procedures.[1] It is notable that spatial lag corresponds to "a simple average of the values for the neighboring units" (Anselin, 2005, p. 125).[2]

Figure 9-1. Moran's I and Permutation Tests for Crime Rates



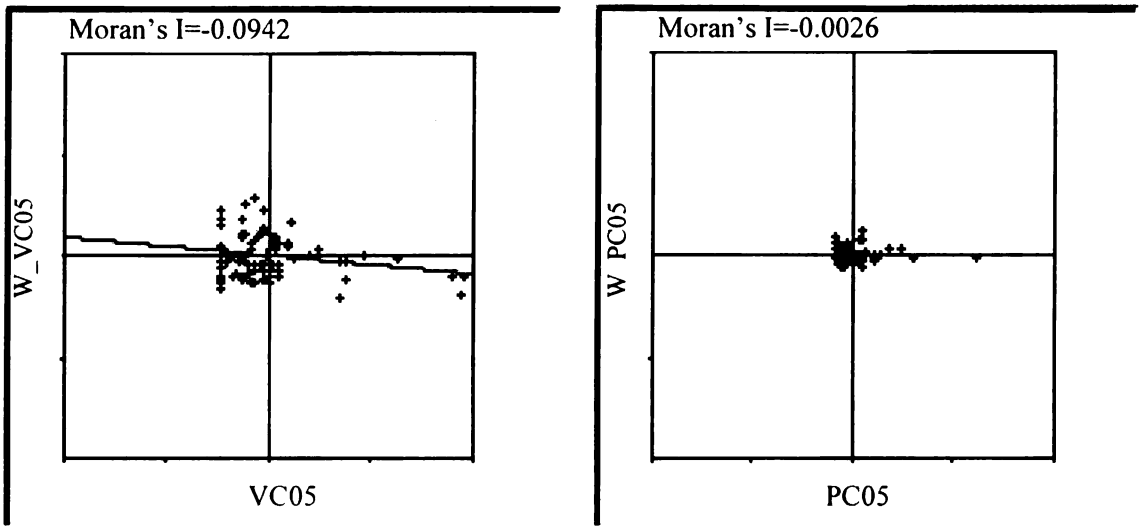
P = .25 (999 permutations)

p = .34 (999 permutations)

[1] The spatial lags for the change in crime rates are used in the longitudinal model, and the other lags are controlled for in the cross-sectional model.

[2] One block group (260650065004) had no neighboring units (i.e., island) and the spatial lags of crime rates of the block group were zeros. It caused a problem when the author attempted to transform the spatial lags to logged lags in order to control for the logged lags in the conditional models (see p. 121). Thus, the aggregated average rates of crimes were assigned to the block group as its spatial lags.

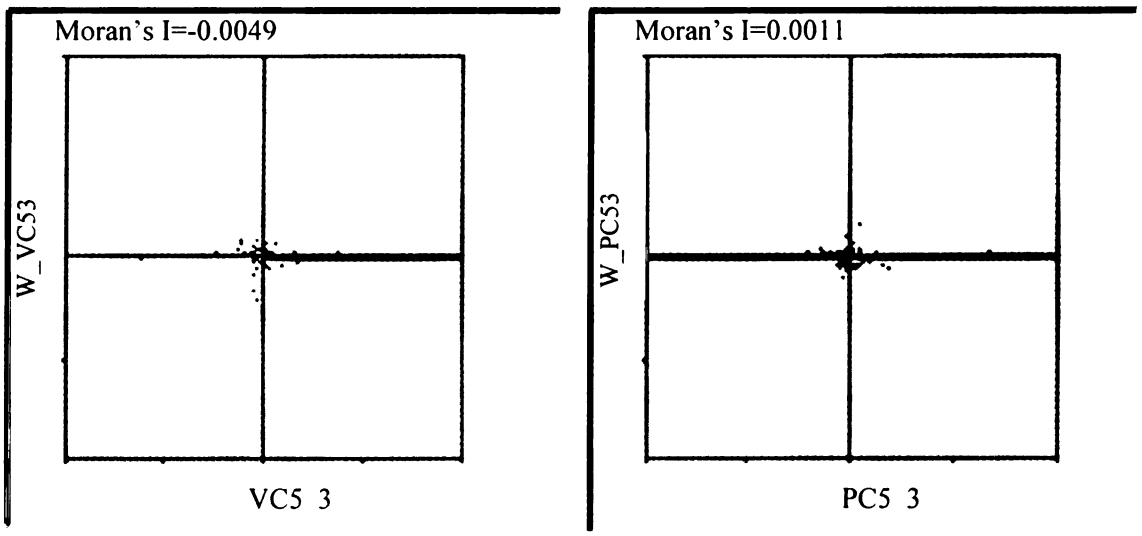
Figure 9-1. (cont'd)



P = .11 (999 permutations)

p = .59 (999 permutations)

Figure 9-2. Moran's I and Permutation Tests for Crime Rates Change



p = .53 (999 permutations)

p = .39 (999 permutations)

Using the original and lagged crime rates, the author tested whether the crime rates were spatially dependent or not. To this end, the Global Moran's I statistics were calculated and then tested through a random permutation (or simulation) procedure. The

results are presented in Figure 9. No significant results were detected either for cross-sectional lags (Figure 8-1) or longitudinal lags (Figure 8-2),[66] which suggested that the crime rates were not spatially correlated to each other. Further, results suggested that there might be little utility to control for the lagged variables in the HGLM model. However, the author decided to include them in the model to obtain parameter estimates that were as valid as possible.

The Hierarchical Mixed Poisson Model

HGLM uses the log link function when the level-1 sampling model is Poisson.

$$\eta_{ij} = \log(\lambda_{ij})$$

The purpose is to handle the truncated nature of count data. In other words, while λ_{ij} is always a nonnegative number, $\log(\lambda_{ij})$ can take on any value. For an adequate interpretation of the coefficient, however, researchers need to transform the logged value back to the original form by using the exponential function. Fortunately, the HLM program produces results with both the logged and original units (Raudenbush and Bryk, 2002).

To examine the variability of violent crime and property crime across the block groups, an unconditional model (one-way ANOVA) was tested first. Next, cross-sectional analyses were performed, including a random coefficient model and a conditional model, to test the study hypotheses. And then, the author conducted longitudinal analyses.

[66] A plausible reason was that the crime rates were unstable for two reasons. First, since crimes were rare events at the segment level, the crime rates had much larger variances compared to the means (refer to Table 8). Second, the number of study segments in each block group varied a lot.

Unconditional Model (One-Way ANOVA)

The author tested an unconditional model to check whether the variances of crimes are statistically significant across the level 2 units, block groups. It was the first step required to verify the utility of a hierarchical approach to fit the data. Table 13 presents the results.

Level 1: η_{ij} = Log(crime rates) = β_{0j}

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$, $\quad u_{0j} \sim N(0, \tau_{00})$

Where:

β_{0j} = the average log of crime of a block group j

γ_{00} = the average log of crime across 83 block groups

u_{0j} = level-2 random effect (deviation of block group j's mean from the grand mean)

τ_{00} = the variance between block groups in block group-average log of crime

Table 13-1. Unconditional Model (Violent Crime 2003)[67]

Fixed Effect	Coefficient		Standard Error	P
	Log	Rate		
γ_{00}	-.14	.87	.10	.17
Random Effect	Variance Component			P
Block group mean, u_{0j}	.53			.00
Reliability of Coefficient Estimate				
β_{0j}	.56			

[67] As mentioned before, the reported statistics are based on the LaPlace approximation. Also, the author reported the results of a population average model rather than of a unit specific model for two reasons: first, the research interest of this study was in how a unit change in the independent variables is expected to affect the overall mean of the outcome variables, not in how a unit change in the independent variables is expected to affect a particular level 1 unit's mean. Second, population average inferences do not require as many assumptions about the distribution of random effects as unit specific inferences do, and tend to be more robust to erroneous assumptions. However, it must be noted that the HLM program does not produce deviance statistics for the population average model, which makes it difficult to compare the superiority of various models through a multivariate likelihood-ratio test (Raudenbush & Bryk, 2002).

Table 13-2. Unconditional Model (Property Crime 2003)

Fixed Effect	Coefficient		Standard Error	P
	Log	Rate		
γ_{00}	.61	1.84	.10	.00
Random Effect	Variance Component			P
Block group mean, u_{0j}	.59			.00
Reliability of Coefficient Estimate				
β_{0j}	.70			

Table 13-3. Unconditional Model (Violent Crime 2005)

Fixed Effect	Coefficient		Standard Error	P
	Log	Rate		
γ_{00}	-.20	.82	.09	.03
Random Effect	Variance Component			P
Block group mean, u_{0j}	.34			.00
Reliability of Coefficient Estimate				
β_{0j}	.46			

Table 13-4. Unconditional Model (Property Crime 2005)

Fixed Effect	Coefficient		Standard Error	P
	Log	Rate		
γ_{00}	.74	2.09	.09	.00
Random Effect	Variance Component			P
Block group mean, u_{0j}	.49			.00
Reliability of Coefficient Estimate				
β_{0j}	.70			

The average logs of violent crime 2003, violent crime 2005, property crime 2003, and property crime 2005 across 83 block groups were -.14, .61, -.20, and .74, respectively. Each of them corresponded to the rates of .87, 1.84, .82, and 2.09.

The significant variance components for both types of crimes of both years indicated that the block groups have significantly different averages of crimes. This was further supported by the relatively higher reliability of the level 1 coefficient estimates. These results justified the hierarchical approach in this study.

Cross-Sectional Analysis - *Random Coefficient Model*

Next, a random coefficient model was fitted to examine whether the covariates at street segments have a significant effect on crime without controlling for the block group level structural covariates (Hypothesis 1). First, a cross-sectional analysis was conducted. In other words, physical disorder, social disorder, and land use of the same year as the crime were controlled for. The results are displayed in Table 14.

$$\text{Level 1: } \eta_{ij} = \beta_{0j} + \beta_{1j}*\text{PD} + \beta_{2j}*\text{SD} + \beta_{3j}*\text{LU}^{68}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
$$\beta_{2j} = \gamma_{20}$$
$$\beta_{3j} = \gamma_{30}$$

Where:

β_{0j} = the average log of crime rates of a block group j when there is no PD, SD, or LU

β_{1j} = the average slope of PD 2003 in a block group j

β_{2j} = the average slope of SD 2003 in a block group j

β_{3j} = the average slope of LU in a block group j

[68] PD = Physical Disorder, SD = Social Disorder, LU = Land Use

The average block group mean was .74, .69, 1.34, and 1.65 for violent crime 2003, violent crime 2005, property crime 2003, and property crime 2005, respectively, when physical disorder, social disorder, and land use were zero. After controlling for social disorder and land use, one unit (i.e., one standard deviation) increase of physical disorder was associated with .22 log increase of violent crime 2003, .21 log increase of violent crime 2005, .03 log increase of property crime 2003, and .17 log increase of property crime 2005.[69] Except property crime 2003, the effects were highly significant.

Table 14-1. Random Coefficient Model (Cross-Sectional - Violent Crime)

	2003				2005			
Fixed Effect	Log	Count	Se	P	Log	Count	Se	P
Average Block Group Mean, γ_{00}	-.31	.74	.08	.001	-.37	.69	.09	.000
PD-Crime Slope, γ_{10}	.22	1.24	.04	.000	.21	1.23	.05	.000
SD-Crime Slope, γ_{20}	.19	1.21	.04	.000	.14	1.15	.03	.000
LU-Crime Slope, γ_{30}	.01	1.01	.00	.000	.01	1.02	.00	.000

Table 14-2. Random Coefficient Model (Cross-Sectional - Property Crime)

	2003				2005			
Fixed Effect	Log	Count	Se	P	Log	Count	Se	P
Average Block Group Mean, γ_{00}	.29	1.34	.08	.000	.50	1.65	.07	.000
PD-Crime Slope, γ_{10}	.03	1.03	.03	.376	.17	1.18	.04	.000
SD-Crime Slope, γ_{20}	.19	1.20	.03	.000	.11	1.11	.02	.000
LU-Crime Slope, γ_{30}	.03	1.03	.00	.000	.02	1.02	.00	.000

[69] Although log .22, log .21, log .03, and log .17 correspond to net count of 1.24, 1.23, 1.03, and 1.18, researchers should not use the net count because the Poisson model is a non-linear model.

One unit (i.e., one standard deviation) increase of social disorder increased the rates of violent crime 2003, violent crime 2005, property crime 2003, and property crime 2005 by .19 log, .14 log, .19 log, and .11 log, respectively. The effects were highly significant for all outcome variables. Finally, land use also had a significant effect on all dependent variables, controlling for physical disorder and social disorder. In sum, except for the influence of physical disorder 2003 on property crime 2003, the results appeared to be supportive of the first research hypothesis of the cross-sectional model.

Cross-Sectional Analysis - *Conditional Model*

Finally, the author controlled for the exogenous variables at both levels. A cross-sectional model was first constructed. Four main interests were examined: the first interest was in what community factors affected the block group means of crime, controlling for the other factors (Hypothesis 2). Another interest was whether the significant relationships between disorder and crime, confirmed by the above random coefficient model, remained significant even after controlling for the level 2 structural covariates (Hypothesis 3 – multivariate significance). Third, and one of the most critical interests, was whether the relationships between disorder and crime at the first level were significantly moderated by the structural factors (Hypothesis 4 – cross-level interaction). The last interest was whether the average crime rates of a block group were influenced by the mean crime rates of neighboring block groups, after adjusting for the structural covariates (Hypothesis 5 – spatial lag or diffusion). Table 15 displays the results.

$$\text{Level 1: } \eta_{ij} = \beta_{0j} + \beta_{1j}*PD + \beta_{2j}*SD + \beta_{3j}*LU$$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}*CD + \gamma_{02}*IC + \gamma_{03}*RI + \gamma_{04}*LU + \gamma_{05}*Wy + u_{0j}$[70]

$\beta_{1j} = \gamma_{10} + \gamma_{11}*CD + \gamma_{12}*IC + \gamma_{13}*RI + \gamma_{14}*LU$

$\beta_{2j} = \gamma_{20} + \gamma_{21}*CD + \gamma_{22}*IC + \gamma_{23}*RI + \gamma_{24}*LU$

$\beta_{3j} = \gamma_{30}$

Table 15-1. Conditional Model (Cross-Sectional) – Violent Crime

	Violent Crime 2003				Violent Crime 2005			
Fixed Effect	Log	Count	Se	P	Log	Count	Se	P
Model for Block Group Means								
INTERCEPT, γ_{00}	-.47	.63	.12	.000	-.62	.54	.12	.000
CD, γ_{01}	.19	1.20	.09	.049	.13	1.14	.09	.161
IC, γ_{02}	.08	1.09	.08	.285	.06	1.06	.08	.439
RI, γ_{03}	-.00	1.00	.09	.981	.12	1.12	.09	.183
LU, γ_{04}	.00	1.00	.01	.917	.00	1.00	.01	.881
Wy, γ_{05}	-.16	.85	.08	.064	-.28	.76	.09	.004
Model for PD-Crime Slope								
INTERCEPT, γ_{10}	.12	1.12	.07	.098	.03	1.03	.08	.710
CD, γ_{11}	.01	1.01	.05	.879	-.06	.95	.06	.374
IC, γ_{12}	-.05	.95	.05	.280	.05	1.05	.05	.347
RI, γ_{13}	-.04	.96	.06	.439	.06	1.07	.06	.316
LU, γ_{14}	.02	1.02	.01	.021	.01	1.01	.01	.019
Model for SD-Crime Slope								
INTERCEPT, γ_{20}	.23	1.26	.06	.001	.14	1.15	.07	.039
CD, γ_{21}	-.09	.91	.05	.089	-.02	.98	.05	.665
IC, γ_{22}	-.09	.91	.05	.046	-.05	.95	.04	.279
RI, γ_{23}	.06	1.06	.05	.219	.08	1.08	.04	.072
LU, γ_{24}	.00	1.00	.01	.925	-.00	1.00	.01	.740
Model for LU-Crime Slope								
INTERCEPT, γ_{30}	.01	1.01	.00	.000	.02	1.02	.00	.000

[70] CD = Concentrated Disadvantage, IC = Immigrant Concentration, RI = Residential Instability, LU = Land Use, Wy = Logged Spatial Lag of Crime

cf., The slope for land use was fixed assuming the slope does not vary across block groups. It was mainly to simplify the model in light of the principle of parsimony. Another reason was that cross-level interaction involving land use was not in the main interests (hypotheses).

Table 15-2. Conditional Model (Cross-Sectional) – Property Crime

	Property Crime 2003				Property Crime 2005			
Fixed Effect	Log	Count	se	p	Log	Count	Se	P
Model for Block Group Means								
INTERCEPT, γ_{00}	.34	1.40	.12	.007	.45	1.56	.12	.001
CD, γ_{01}	.12	1.13	.08	.116	.08	1.08	.07	.267
IC, γ_{02}	-.04	.96	.07	.577	-.05	.95	.07	.426
RI, γ_{03}	.30	1.35	.08	.000	.25	1.28	.07	.001
LU, γ_{04}	-.01	.99	.01	.572	.00	1.00	.01	.810
Wy, γ_{05}	-.19	.83	.11	.091	-.11	.90	.14	.433
Model for PD-Crime Slope								
INTERCEPT, γ_{10}	-.01	.99	.05	.805	.11	1.12	.06	.048
CD, γ_{11}	.03	1.03	.04	.398	.02	1.02	.04	.554
IC, γ_{12}	-.03	.97	.03	.387	-.01	.99	.04	.726
RI, γ_{13}	-.05	.95	.04	.204	.00	1.00	.05	.978
LU, γ_{14}	.01	1.01	.01	.183	.00	1.00	.00	.885
Model for SD-Crime Slope								
INTERCEPT, γ_{20}	.21	1.23	.05	.000	.15	1.16	.05	.002
CD, γ_{21}	.01	1.01	.04	.841	-.08	.92	.03	.015
IC, γ_{22}	-.08	.92	.03	.011	-.04	.96	.03	.195
RI, γ_{23}	.04	1.04	.03	.273	.04	1.04	.03	.151
LU, γ_{24}	-.00	1.00	.00	.958	-.01	.99	.01	.426
Model for LU-Crime Slope								
INTERCEPT, γ_{30}	.03	1.03	.00	.000	.02	1.02	.00	.000

Regarding the second hypothesis, concentrated disadvantage had a positively significant effect on violent crime 2003, and residential instability significantly increased property crime in both years.

With regard to the third hypothesis, while the effect of social disorder remained significant for all outcome measures, the influence of physical disorder remained

significant only for property crime 2005. In other words, the significant relationships between physical disorder and violent crime 2003 and 2005 at the segment level became null after controlling for the community factors. The stronger multivariate relationship between social disorder and crime than that between physical disorder and crime was anticipated, in a way, by the results of zero-order correlations.

Concerning the fourth hypothesis, several interesting results were discovered. First, the effect of physical disorder on violent crime varied across block groups depending on land use. Put more specifically, one unit increase of land use increased the influence of physical disorder on violent crime 2003 and 2005 by .02 log and .01 log. This suggested that physical disorder has a stronger impact on violent crime in the neighborhoods with more crime-attracting commercial properties. Second, the relationships between social disorder 2003 and violent crime 2003 and social disorder 2003 and property crime 2003 were negatively influenced by immigrant concentration. Put in more detail, one unit (one standard deviation) increase of immigrant concentration reduced the impact of social disorder 2003 on violent crime 2003 and property crime 2003 by .09 log and .08 log, respectively. In other words, social disorder appeared to have a weaker effect on violent crime 2003 and property crime 2003 in the neighborhoods with more heterogeneous racial distribution. Or, social disorder seemed to be more problematic in homogenous neighborhoods. Third, the slope for social disorder 2005 and property crime 2005 varied significantly depending on the level of concentrated disadvantage. Put more specifically, one unit increase of concentrated disadvantage lowered the influence of social disorder 2005 on property crime 2005 by .08 log, which suggested that social disorder has a weaker impact

on property crime 2005 in more disadvantaged neighborhoods. Or, social disorder appeared to be more problematic in advantaged communities.

As to the fifth hypothesis, the level of crime in neighboring block groups (i.e., logged spatial lag of crime rates) did not have a positively significant effect on any outcome measure. That is, the fifth hypothesis was not supported at all. This was anticipated by the extremely weak result of the autocorrelation measure, or Global Moran's I.

In sum, the cross-sectional analysis produced several notable results. (1) Concentrated disadvantage appeared to have the most salient effect on violent crime,[71] but property crime seemed to be most significantly influenced by residential instability. (2) While the significant relationship between physical disorder and crime became mostly non-significant (except for property crime 2005) after controlling for the structural covariates, the impact of social disorder remained significant for all types of outcome measures. (3) Regarding the cross-level interaction effect, the impact of physical disorder on violent crime appeared to become stronger as the percentage of crime-attracting businesses increased. Meanwhile, the effect of social disorder on violent crime 2003 and property crime 2003 got weaker as the level of immigrant concentration rose. Lastly, the influence of social disorder on property crime 2005 decreased as the degree of concentrated disadvantage became stronger. (4) As expected, no significant spatial diffusion was detected.

Longitudinal Analysis - *Random Coefficient Model*

As the theory suggests, the focal point of community research must be in the longitudinal relationship among factors. Thus, this study attempted to examine the various types of hypotheses concerning the link between disorder change and crime change during

[71] Although the effect of concentrated disadvantage on violent crime 2005 was not statistically significant, it had the strongest impact on the outcome variable relatively (see Table 13-1).

the study periods, 2003-2005. First, a longitudinal random coefficient model was fitted to test whether the change in disorder had a significant effect on change in serious crime at the segment level (Hypothesis 1). Several notes deserve attention: (1) the changes in disorders were measured by subtracting the levels of them in 2003 from those in 2005; (2) since this study was utilizing the mixed Poisson model, which requires a non-negative outcome variable, the author controlled for the 2003 crime instead of creating the change variable by subtracting 2003 crime from 2005 crime; (3) as noted already (see p. 108), land use 2005 was controlled for in the model, instead of the land use change, because only 11 segments experienced a decrease or increase in commercial land use. The results are presented in Table 16.

$$\text{Level 1: } \eta_{ij} = \log(VC05) = \beta_{0j} + \beta_{1j}*(PD05\text{-}PD03) + \beta_{2j}*(SD05\text{-}SD03) + \beta_{3j}*LU05 + \beta_{4j}*VC03$$ [72]

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
$$\beta_{2j} = \gamma_{20}$$
$$\beta_{3j} = \gamma_{30}$$
$$\beta_{4j} = \gamma_{40}$$

Where:

β_{0j} = the average log of crime rates of a block group j when there is no change of PD, no change of SD, no LU, or no previous crime

β_{1j} = the average slope of PD change in a block group j

β_{2j} = the average slope of SD change in a block group j

β_{3j} = the average slope of LU 2005 in a block group j

The average lags of block group means of violent crime 2005 and property crime 2005 were .59 and 1.66, respectively, when there was no change in disorder, no land use, and no previous crime. Unlike the cross-sectional counterpart, physical disorder change was

[72] The same type of model was applied to property crime 2005.

not significantly related to the two-year lags of violent and property crimes.[73] Social disorder change did not have a significant effect on the lag of property crime either. The only significant relationship was found between social disorder change and violent crime lag. In sum, it appeared that, except for the impact of social disorder change on the lag of violent crime, the first longitudinal hypothesis was not supported.

Table 16. Random Coefficient Model (Longitudinal)

	Violent Crime 2005				Property Crime 2005			
Fixed Effect	Log	Count	Se	p	Log	Count	Se	P
Average Lag of Block Group Mean, γ_{00}	-.53	.59	.09	.000	.51	1.66	.08	.000
PD Change Slope, γ_{10}	-.02	.98	.04	.621	-.03	.97	.03	.341
SD Change Slope, γ_{20}	.08	1.08	.03	.008	.03	1.03	.02	.180
LU-Crime Slope, γ_{30}	.01	1.01	.00	.001	.01	1.01	.00	.000
Previous Crime (2003)	.19	1.21	.02	.000	.03	1.03	.01	.010

Longitudinal Analysis – *Conditional Model*

The final model controlled for all exogenous factors at both levels. It must be noted that the slopes for land use and previous crime were fixed, assuming the slopes do not vary across block groups for the same reasons as those in the cross-sectional model. As was done in the cross-sectional analysis, four main interests were tested: the first interest was in what community factors affected the block group means of crime lags, controlling for the other exogenous variables and previous crime (Hypothesis 2). Another interest was whether the significant relationship between social disorder change and crime change, proved by the

[73] The two-year lags of crimes are sometimes expressed as crime changes in the text just to fit the interpretation of results into the study hypotheses (cf., hereinafter, lag means two-year lag).

above random coefficient model, remained significant after controlling for the level 2 structural covariates (Hypothesis 3 – multivariate significance). This particular question was quite limited because the other relationships between disorder change and crime change at level 1 were not significant. Meanwhile, the third, and one of the most critical interests, was in whether the relationships between disorder change and crime change at the first level were significantly moderated by structural factors (Hypothesis 4 – cross-level interaction). The last interest was whether the average crime rates change in a block group was influenced by the mean crime rates change in neighboring block groups, after adjusting for the structural covariates (Hypothesis 5 – spatial lag or diffusion). Table 17 shows the results.

$$\text{Level 1: } \eta_{ij} = \log(VC05) = \beta_{0j} + \beta_{1j}*(PD05\text{-}PD03) + \beta_{2j}*(SD05\text{-}SD03) + \beta_{3j}*LU05 + \beta_{4j}*VC03$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}*CD + \gamma_{02}*IC + \gamma_{03}*RI + \gamma_{04}*LU + \gamma_{05}*W(VC05\text{-}VC03) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}*CD + \gamma_{12}*IC + \gamma_{13}*RI + \gamma_{14}*LU$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}*CD + \gamma_{22}*IC + \gamma_{23}*RI + \gamma_{24}*LU$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

[74]

With regard to the second hypothesis (i.e., first interest in the conditional model), immigrant concentration, residential instability, and land use had a significant effect on the lag of violent crime at the block group level. The result was quite different from that of the cross-sectional counterpart. On the other hand, the lag of property crime was significantly related to residential instability, which was consistent with the result of the cross-sectional model.

[74] Unlike the cross-sectional conditional model, the author did not transform the spatial lag of crime change, or W(VC05-VC03), by taking the natural log, for the lag had a number of negative values.

Concerning the third hypothesis, no positively significant effect was found after controlling for the structural covariates.[75] In other words, the significant effect of social disorder change on violent crime change failed to remain significant. In sum, the third hypothesis did not receive empirical support.

Table 17. Conditional Model (Longitudinal)

	Violent Crime 2005				Property Crime 2005			
Fixed Effect	Log	Count	Se	p	Log	Count	Se	P
Model for Block Group Means								
INTERCEPT, γ_{00}	-.78	.46	.11	.000	.33	1.39	.09	.001
CD, γ_{01}	.03	1.03	.08	.688	.10	1.10	.07	.161
IC, γ_{02}	.13	1.14	.07	.048	-.04	.96	.06	.520
RI, γ_{03}	.17	1.18	.08	.030	.24	1.27	.07	.001
LU, γ_{04}	.02	1.02	.01	.029	.01	1.01	.01	.406
W(Crime Change), γ_{05}	.17	1.19	.12	.168	.09	1.10	.06	.142
Model for PD Change Slope								
INTERCEPT, γ_{10}	-.11	.90	.07	.126	-.13	.88	.05	.012
CD, γ_{11}	-.12	.89	.06	.043	.03	1.03	.04	.466
IC, γ_{12}	.06	1.07	.05	.153	.06	1.06	.03	.065
RI, γ_{13}	.08	1.09	.06	.154	.02	1.02	.04	.646
LU, γ_{14}	.01	1.01	.00	.075	.00	1.00	.00	.232
Model for SD Change Slope								
INTERCEPT, γ_{20}	.01	1.01	.05	.850	.02	1.02	.04	.534
CD, γ_{21}	-.04	.96	.04	.351	-.01	.99	.03	.675
IC, γ_{22}	-.07	.93	.03	.045	-.02	.98	.03	.350
RI, γ_{23}	.06	1.06	.04	.116	-.06	.94	.03	.031
LU, γ_{24}	.01	1.01	.01	.051	.00	1.00	.00	.435
Model for LU Slope								
INTERCEPT, γ_{30}	.01	1.01	.00	.001	.01	1.01	.00	.005
Model for Previous Crime Slope								
INTERCEPT, γ_{40}	.23	1.26	.03	.000	.04	1.04	.01	.001

[75] Although the effect of physical disorder change on property crime change was significant, it was negatively so. And thus, the author lest it out of the discussion.

As to the fourth hypothesis, three cross-level interaction effects were discovered. First, the effect of physical disorder change on violent crime change was moderated by concentrated disadvantage. Put in detail, one unit increase of concentrated disadvantage reduced the influence of physical disorder change on violent crime change by .12 log. The result implied that physical disorder has a stronger impact on violent crime in less disadvantaged neighborhoods. Second, the relationship between social disorder change and violent crime change was negatively influenced by immigrant concentration. Put more specifically, one unit increase of immigrant concentration lessened the impact of social disorder change on violent crime change by .07 log. It suggested that social disorder has a stronger effect on violent crime in less heterogeneous neighborhoods. Third, the slope for social disorder change and property crime change varied significantly across block groups, depending on the level of residential instability. Put in more detail, one unit increase of residential instability lowered the influence of social disorder change on property crime change by .06 log, which implied that social disorder has a stronger impact on property crime in more stable neighborhoods.

Regarding the fifth hypothesis, the level of crime change in neighboring block groups (i.e., spatial lag of crime rates) did not have a positively significant effect on any type of crime change. Like the result of the cross-sectional model, the hypothesis on spatial lag was not supported.

In sum, the longitudinal analysis generated a few noteworthy results. (1) While violent crime change appeared to be significantly associated with immigrant concentration, residential instability, and land use, property crime change seemed to be significantly related only to residential instability. (2) No relationship between disorder change and crime

change remained significant after controlling for the community characteristics. (3) Concerning the cross-level interaction effect, the impact of physical disorder change on violent crime change appeared to become weaker as the level of concentrated disadvantage rose. Meanwhile, the effect of social disorder change on violent crime change got weaker in more heterogeneous neighborhoods. Lastly, the influence of social disorder change on property crime change became weaker as the degree of residential mobility increased. (4) Like the cross-sectional model, no significant spatial lag effect was found.

Summary

A variety of analyses were conducted to examine what the data and models demonstrate about the relationship between disorder and crime in Lansing communities. Some results were as expected but others were not. Several notable findings are summarized. (1) No consistent pattern of change in disorder and crime was found at either the high physical disorder segments (n=38) or the low physical disorder segments (n=38). (2) Non-significant Moran's I indicated that crime was not spatially autocorrelated. Further multivariate tests for the spatial diffusion process (hypothesis 5) confirmed the result. (3) While the first hypothesis (i.e., significant relationship between disorder and crime at segment level) was generally supported by the cross-sectional random coefficient model, the longitudinal random coefficient model produced opposing results. (4) Regarding the second hypothesis (i.e., significant relationship between community characteristics and crime at block group level), the cross-sectional model and the longitudinal model turned out different findings for violent crime: while concentrated disadvantage appeared to exert the strongest effect on violent crime in the cross-sectional model, all of the structural covariates except concentrated disadvantage (i.e., immigrant concentration, residential instability, and

land use) significantly increased violent crime in the longitudinal model. On the other hand, both models produced the same results for property crime, namely, that it was significantly influenced only by residential instability. (5) Concerning the third hypothesis (i.e., multivariate significance of the impact of disorder on crime), the impact of social disorder on all outcome measures remained significant in the cross-sectional model. However, no relationship between disorder and crime stayed significant in the longitudinal model. (6) Differential types of cross-level interaction mechanisms were found for the cross-sectional and longitudinal models. For example, while the impact of physical disorder on violent crime was positively moderated by land use in the cross-section model, it was negatively moderated by concentrated disadvantage in the longitudinal model. Another example was that while the relationship between social disorder and property crime varied significantly across block groups depending on the level of concentrated disadvantage in the cross-sectional model, this varied significantly, relying on the degree of residential instability in the longitudinal model. However, the relationship between social disorder and violent crime was similarly moderated by immigrant concentration in both the cross-sectional and longitudinal models.

CHAPTER VII: CONCLUSION

Researchers have had high interest in many key theoretical disputes related to crime and disorder. However, it is surprising that, despite such high interest, only slightly more than 10 studies have been conducted to examine the theoretical link between disorder and crime since the publication of Wilson and Kelling's work in 1982. Thus, before taking any side, either pro or con, the author believes more studies need to be performed, which was the main motivation of this study. Going one step further, this dissertation attempted to clarify sensitive, mostly methodological, issues that would help researchers to perform more systematic research. This was necessary because the past studies had adopted inconsistent procedures for measurement, design, and model specification, which, in turn, resulted in various, inconsistent results above and beyond such substantive factors as sample characteristics. For these reasons, the author wanted this dissertation to serve as a valuable addition to the broken windows literature.

As a conclusion, this chapter deals with four topics. First, the results of diverse analyses are summarized and their implications for theory, research, and policy are discussed. Next, the limitations of the models and analyses are presented to ensure that the readers correctly understand the results. Third, the author explains what contributions this study made to the broken windows field regarding theory, research, and policy. Finally, the author presents a humble opinion for the future directions of the broken windows research.

Summary and Implications for Theory, Research, and Policy

As a branch of the ecological perspective, the broken windows thesis shares the assumption that crime is influenced by the structural covariates of neighborhoods, such as concentrated disadvantage, residential instability, immigrant concentration, and land use. In

the broken windows model, however, the relationship between community factors and crime is mediated by social and physical disorder. This conceptual model highlights the importance of dealing with disorderly conditions as an effective alternative to confronting serious crime.[76]

A hierarchical multivariate approach was taken to test the effectiveness of the alternative, with special attention to the contextual effect. The hierarchical mixed Poisson model discovered several notable findings. The author describes each finding and discusses its implications for theory, research, and policy. First, the results for violent crime were different from those for property crime. This finding appeared to be supportive of Clarke's (1997) notion that more crime-specific approaches need to be taken in research and crime prevention policy. For example, while concentrated disadvantage had the strongest effect on violent crime, property crime was most significantly influenced by residential instability (in the cross-sectional model). The findings suggested that violent crime could be effectively controlled by improving socioeconomic conditions, but property crime would be better dealt with by reducing residential instability. With more evidence accumulated,[77] this would further stimulate theoretical elaborations of the broken windows theory just as the situational theories postulate crime-specific propositions.

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[76] It must be noted, however, that the study model in this dissertation does not explicitly test the mediating role of disorder in the link between neighborhood characteristics and crime rates. Instead, this study attempted to test the multivariate direct effect of disorder on crime, after controlling for the structural covariates, and cross-level interaction effect of disorder and structural covariates on crime. Nevertheless, the author would say the former test was able to serve as an alternative to the mediating model in that the multivariate significance implied that serious crime can be effectively handled by dealing with disorder.

[77] To give another example, Weisburd and his colleagues (1993) found that calls for service for such minor offenses as public morals and drunks are more strongly correlated with certain serious crimes such as robberies than with other types of serious offenses in crime hot sopts (Sousa & Kelling, 2006).

Second, and related to the above discussion, property crime appeared to be most significantly related to residential instability in both the cross-sectional and longitudinal models. The consistently significant influence of residential instability on property crime implied that the lack of social bonds from residential anonymity may be the most critical factor leading to crime. It further seemed to be related to the issue of contextuality. That is, while a measure of economic devastation such as concentrated disadvantage is generally regarded as the first candidate in metropolitan urban areas (e.g., Chicago neighborhoods), a neighborhood bond measure such as residential instability might well deserve more attention in mid-sized cities where the residential bond and cohesion is still widely believed to be an indispensable element in living a high-quality life. The author believes that something unfamiliar to the residents in a neighborhood or inconsistent across near areas (i.e., highly variable across nearby neighborhoods) has more psychological and behavioral impact on them than do things well-known to them or consistent throughout neighboring areas. Accordingly, residential mobility, which metropolitan urban residents have already become used to, would not have much influence on their mindset and behavior. Neither does socioeconomic devastation in mid-sized city neighborhoods have a big impact on residents' attitude and conduct, assuming the economic conditions are relatively similar across near areas. Although not explicitly modeled, one could further speculate that, while the neighborhoods' capacity of informal social control in metropolitan urban neighborhoods is mostly dependent on the degree of concentrated disadvantage, in mid-sized cities with urban and suburban areas, it is mostly influenced by residential instability, which in turn influences the crime rates.

Third, the results of the test of the cross-sectional model and the longitudinal counterpart were not consistent. It was particularly notable that, while the effect of social disorder on all types of outcome measures remained significant in the cross-sectional model, no significant multivariate effect of disorder change on crime change was discovered in the longitudinal model. Since a longitudinal model is generally regarded as a more explanatory model, better reflecting the real world than its cross-sectional counterpart does, a plausible conclusion would be that disorder does not have a causal impact on crime.[78] Such a conclusion would be somewhat hasty, however, since the longitudinal model itself has weaknesses as was discussed in Chapter IV[79]. A more convincing conclusion would have been possible from a more systematic longitudinal model such as the growth curve model. Further, considering the reciprocal relationship suggested by the contemporary broken windows theory, it would also be possible to argue that crime occurred first and then influenced social disorder. It must be noted that the cross-sectional model could suggest that some other things that the longitudinal model does not show might be working in the real world. Therefore, the author decided to discuss the results of both the cross-sectional and longitudinal analyses with an equal weight. It is simply recommended that more effort be exerted to systematically collect and analyze data in order to reach a more persuasive conclusion relying on the longitudinal model.

Fourth, social disorder had a stronger impact on both types of crimes than physical disorder did, regardless of temporal types of models. In the cross-sectional model, put in more detail, the impact of social disorder on crime remained significant after controlling for the structural covariates, but that of physical disorder stayed significant only for property

[78] In other words, the lack of collective guardianship is not causing serious crime.
[79] See pages 73-74.

crime 2005 (conditional model). Meanwhile, the longitudinal model found that only social disorder change was significantly related to violent crime change, with the other three models having null results (random coefficient model). Such results were somewhat anticipated by the same data source issue and by a commonly accepted sense in the field as well. It had a policy implication that focusing solely on physical disorder might have a limited utility in reducing crime, and thus, it might be more effective to deal with social disorder as well as physical disorder.

Fifth, a variety of cross-level interaction effects were discovered, each of which contained an important policy implication. (1) Physical disorder and land use had a positive interaction effect on violent crime in both years (cross-sectional model), which indicated that the link between physical disorder and violent crime may be less valid in neighborhoods with fewer crime-attracting business properties, or more valid in neighborhoods with more crime-attracting businesses. It further implied that dealing with physical disorder would be more effective in handling violent crime in neighborhoods with many commercial properties, and less useful in neighborhoods with a few businesses.

(2) The effects of social disorder 2003 on violent crime 2003 and property crime 2003, and those of social disorder change on violent crime change, were negatively moderated by the level of immigrant concentration (cross-sectional and longitudinal model). In other words, the effects of social disorder 2003 on violent crime 2003 and property crime 2003 became stronger as the level of racial heterogeneity decreased, which implied that a policy to reduce crime by dealing with social disorder might be less effective in heterogeneous neighborhoods than in homogenous ones.

(3) The relationship between social disorder 2005 and property crime 2005 became less valid as the level of socioeconomic disadvantage increased (cross-sectional model). That is, the influence of social disorder on property crime was weaker in disadvantaged neighborhoods than in prosperous counterparts. And thus, it was suggested that an order-maintenance or control-oriented policy in poor neighborhoods would not be as successful as is suggested by the theory.

(4) The influence of physical disorder change on violent crime change was negatively moderated by concentrated disadvantage (longitudinal model), which showed that the link between physical disorder and violent crime is less valid in prosperous neighborhoods than in disadvantaged counterparts. Thus, strategies focusing only on reducing physical disorder might have little effect on dropping the level of violent crime in poor neighborhoods.

(5) Social disorder change and residential instability had a negative interaction effect on property crime change (longitudinal model). It indicated that the impact of social disorder change on property crime change became weaker as the level of residential instability increased, which further implied that dealing with social disorder might be less effective in reducing property crime in non-stable communities than in stable communities.

Overall, the cross-level interaction effects made a common suggestion that the link between disorder and crime could be different depending on various community contexts, and thus more context-specific programs need to be developed. More specifically, the negative interaction mechanisms seemed to suggest that improving structural conditions may be a more valid approach to reducing crime in poor, heterogeneous, or non-stable neighborhoods, but restoring order would be more effective in affluent, homogeneous, or

stable communities. On the other hand, the positive interaction dynamics involving physical disorder, land use, and violent crime appeared to imply that, in high-density neighborhoods with lots of businesses, physical disorder tends to develop more easily into serious violent crime than in residential areas with few, if any, commercial properties. Thus, a proactive approach to improve the physical environment would be a good strategy for solving serious crime problems. However, the results do not necessarily support for one approach to the exclusion of the other. Approaches for both structure and disorder would have to be taken in order to obtain better results.

The broken windows theory suggests that the link between disorder and serious crime is mediated by neighborhood processes such as fear of crime and/or self-regulation capacity. In that case, one plausible question related to the above negative cross-level interaction dynamics is: why is the relationship between disorder and crime weaker in structurally disadvantaged neighborhoods than in advantaged counterparts? There could be two answers. One answer could be found in the theoretical model including the self-regulation capacity: it may be because the self-regulation capacity is stronger in disadvantaged neighborhoods than in advantaged ones. In other words, a disorder problem does not easily develop into a crime problem in disadvantaged neighborhoods due to the strong informal social control. In contrast, disorder is strongly connected to crime in prosperous neighborhoods because of the weak self-regulation capacity. However, this is less likely to be the case, although the author cannot say with certainty.

The other and better answer would be that the weak link between disorder and crime in disadvantaged neighborhoods is because the crime problem is already prevalent in the disadvantaged neighborhoods, and thus the crime rates of such areas are not much

influenced by the level of disorder. In other words, it could be a statistical issue that the slight variation of the crime rates in disadvantaged neighborhoods tends to produce little association between disorder and crime regardless of the level of disorder.[80] In contrast, assuming that the crime problem is generally rare in affluent neighborhoods, even one incident could have a big impact on the crime rates of those neighborhoods, and thus the crime rates could be highly variable probably depending on the level of disorder, which is likely to produce a high correlation between disorder and crime. Also, as suggested above,[81] it is possible that disorder causes little fear in those disadvantaged neighborhoods simply because disorder (and possibly crime) is so prevalent that people have already become accustomed to such situations. But, even a low level of disorder could make people in affluent neighborhoods feel a lot of fear, which in turn lowers the self-control capacity and increases crime rates. At any rate, this explanation suggests the same policy implication as above: improving structural conditions would be a better approach to deal with serious crime problems in disadvantaged neighborhoods. In contrast, solving disorder is important in reducing crime in advantaged counterparts. As a matter of course, taking both approaches together would have a synergy effect. In addition, as the theory suggests, collective efforts among the residents, local governments, businesses, and police to improve the structural conditions and deal with disorder and crime problems would eventually strengthen the neighborhood informal social control, which could serve as a long-lasting strong factor in curbing the serious crime problem.

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[80] In fact, it appears that the initial status of crime is one of the strongest and most consistent predictor of later crime (e.g., Taylor, 2001). The longitudinal (random coefficient) model in this study showed that the previous crime in 2003 is the best predictor of the crime in 2005 (see Table 16).

[81] See the first paragraph, p. 133.

Sixth, no spatial effect was detected, which showed that the level of crime in a neighborhood (i.e., block group) in Lansing is not dependent on that of its neighboring areas. Although not explicitly modeled, no spatial diffusion (or displacement) effect was expected either. However, the results were not that credible, since the crime rates of block groups were measured by the averaged sum of crime rates of street segments within each block group. As shown in the previous chapter, for example, 18 block groups had only one study segment and 11 block groups contained two segments,[82] which made the reliability and validity of crime rates in many neighborhoods doubtful.

In sum, although one of the main hypotheses, the multivariate significant effect of disorder on crime was only half-supported in this study, various models of this research produced several noteworthy findings, which further suggested viable directions for future research and policy and theoretical elaboration. Put briefly, crime-specific and context-specific understanding is required for theory, research, and policy. As Thacher (2004) noted, scholars of the broken windows research appear to have been "preoccupied with the search for strong causal relationships between disorder and criminal activity" (Sousa & Kelling, 2006, p. 88). Although it is important, the author would say understanding the complex and curvilinear real world dynamics under the seemingly simple and linear causal processes suggested by the broken windows logic is more valuable.

Meanwhile, the suggestions made above should be interpreted with a caveat, for the results were not consistent across the models, especially depending on temporal types. Additional discussions on some other limitations need to be made to help readers interpret the findings of this dissertation. The next section explains some of the important constraints of this study.

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[82] See pages 78-79.

Limitations

Two representative limitations of this study were briefly introduced already - no control for psychological process and non-systematic longitudinal analysis. This section presents a more detailed discussion of them. An additional discussion on spatial analysis is made to highlight the importance of understanding spatial dynamics. Meanwhile, it must be noted that there could be other dimensions that undermine the validity of our findings and policy implications.

Psychological Process

The models of this dissertation did not control for the psychological process that is considered to be a mediator linking disorder and crime. One contemporary measure that is widely accepted to be representative of the psychological process is collective efficacy as developed by Sampson and his colleagues (1997, 1999). Collective efficacy refers to underlying mechanisms of social control, including mutual trust and shared expectations and willingness to intervene in antisocial activities for the common good. Although social networks (ties) and resources (social capital) are important, they are not sufficient conditions for social control to confront neighborhood problems (Kubrin & Weitzer, 2003b). Interestingly, some forms of social networks (e.g., gangs and drug dealers) even impede the efforts to fight crime (Pattillo-McCoy, 1998). Hence, Sampson (2002) argued that collective efficacy, highlighting informal norms and expectations about the exercise of social control without regard to the level of social bonds, must be the focal point of neighborhood processes, particularly in modern urban areas in which the romantic definition of neighborhood as a primary group based on intimate relations and social bonds is not relevant at all. Accordingly, the control for collective efficacy could have provided a useful

opportunity to test whether the effect of disorder on crime is still significant or not. If it had remained significant, the policy implication would have been given more credit.

Temporal Dynamics

As mentioned in Chapter IV, although this study tried to control for the temporal order by following the approach of previous studies (i.e., controlling for the previous year's crime rates as was done in Markowitz et al., 2001 and Sampson & Raudenbush, 1999), the approach had certain limitations that did not fully incorporate the theoretical notion. The ecological perspective has a clear implication for the temporal change of neighborhood characteristics and mechanisms. This theme dates back to the thesis of Shaw and McKay (1942), who argued that the changing nature of crime distribution in urban areas is the product of larger socioeconomic processes that influence the formation and change of neighborhood characteristics and processes (Sampson et al., 2002; Kubrin & Weitzer, 2003b). Applying the idea of criminal careers (Blumstein & Cohen, 1987; Blumstein, Barnett, & Farrington, 1987) to ecological studies, Albert Reiss, Jr., and others worked intensively on writing about the longitudinal change in crime rates responding to the long-term pattern (trajectory) and short-term change (transition) in community characteristics (Bottoms & Wiles, 1986; Reiss, 1986; Schuerman & Kobrin, 1986). Their efforts directed more attention to the theoretical viability of community crime careers (Williams & McShane, 2003). To the author's knowledge, the best statistical model for describing and testing the idea of community crime careers is the growth curve model, which requires sequential data with at least three time points.[83] Unfortunately, however, only two waves of

[83] It applies to the dependent variable. In other words, the independent variables need not to be sequential data. As a matter of course, the more time points the data have, the better results the model will produce.

data were available to this study and thus the technique could not be applied. Assuming it takes time, say more than two years, for the change in disorder to affect the change in crime, applying the growth curve model might have discovered different results.

Spatial Dynamics

As mentioned above, the spatial analysis of this study was quite limited because the measure of the dependent variable, or crime rates of block groups, was simply the averaged sum of crime rates of street segments within each block group, which might well cast doubt on the reliability and validity of outcome measures. More reliable and valid measures of crime and systematic models are required for future research to get a better understanding of the spatial dynamics of crime, disorder, neighborhood process, and structural characteristics. As explained in the previous chapter, the theoretical factors do not exist independent of those of other neighborhoods, however defined. Thus, the assumption of spatial independence must be corrected in theory and research (Sampson, 2002). For instance, residents who live right across the street and thus feel like the most intimate neighbors to each other could be divided into different census tracts. Moreover, many interpersonal crimes are rooted in social interactions that tend to cross neighborhood boundaries, which causes spatial diffusion (e.g., Rosenfeld et al., 1999). Therefore, spatial models that reflect and correct the influence of surrounding neighborhoods (i.e., spatial dependence) must be counted on (Kubrin & Weitzer, 2003b).[84] Such a mechanism of spatial interdependence has further implications for understanding residential stratification. That is to say, two neighborhoods that have similar characteristics and processes could have different levels of

[84] Baller et al. (2001) provide the most complete analysis of spatial dependence to date by comparing findings from a spatial lag and spatial error model in their analysis of structural correlates of county homicide rates from 1960 to 1990 (Kubrin & Weitzer, 2003b: 395)

crime rates depending on their surrounding communities, which fosters the need for contextual analysis using a method such as HLM (Sampson et al., 2002). On the other hand, it is notable that the recent development of methods for the spatial econometrics of panel data is very promising (Messner & Anselin, 2004) in that it accounts for both spatial and temporal dynamics.

Contributions to the Broken Windows Field

Despite these limitations, the study made several contributions to the broken windows research. First, the author attempted to refine and distinguish the two key concepts of disorder and crime. Since the concepts were very close to each other, it was necessary that researchers use clearly distinguished measures for each of them. Otherwise, there was a high chance of tautological findings. Further, as a methodological buffer, the author suggested that an exploratory factor analysis should be conducted to statistically tell whether the measures of disorder and crime represent their corresponding concepts. Finally, another suggestion was made that different data sources be used to measure disorder and crime in a clearly distinguished manner.

Second, besides the measures for disorder and crime, an enthusiastic attempt was made to suggest a methodological standard for future quantitative research. As mentioned before, the lack of methodological standard appeared to have influenced the study results, which, in turn, heated the controversies on the authenticity of the broken windows theory and policy. Several examples of the standard included how to define and measure neighborhood, the necessity of controlling neighborhood process as a mediating factor, the necessity of controlling neighborhood structure as a confounding factor, the necessity of a systematic longitudinal design, and the necessity of examining spatial dynamics. It must be

noted that they were mostly identified via deep theoretical considerations. Therefore, even though meeting all the criteria seems to be extremely difficult, it is expected that even a minor consensus would facilitate more theory-driven research and policy.

Third, the author tried to understand the broken windows theory within the ecological framework. By doing so, the interconnectivity of the broken windows theory with the other ecological theories, such as new social disorganization, defensible space, routine activity, and rational choice, were clarified, as was its uniqueness among the diverse explanations. Figure 2 in Chapter 2 represents the outcome of the author's effort, which is expected to help readers clearly understand the theoretical model of this study as well as the other studies on neighborhood structure and process.

Fourth, the efforts to understand contextual dynamics through multilevel models were rare, if ever, in the broken windows field. To the best knowledge of the author, only one study (i.e., Rountree et al., 1994) modeled cross-level interaction relationships among disorder, crime, and community characteristics. Further, the study setting of Lansing, a mid-sized city with urban and suburban neighborhoods, provided a unique chance to examine how differential settings produce differential outcomes. Considering the importance of contextual understanding in theory development and policy implementation, the hierarchical models with various cross-level interaction results and the study setting of this study were highly valuable. Context-specific understanding would be much more effective and efficient in crime prevention than a rather general approach.

Future Directions of the Broken Windows Research and Policy

More Emphasis on the Role of Formal Social Control

It is true that Shaw and McKay's social disorganization theory and contemporary variations of it highlight the central role of informal social control in mediating the effects of community characteristics on crime, largely ignoring the possible effectiveness of formal control such as police law enforcement. Such a theoretical formation is understandable in that informal control is an expression of the community-based self-regulation and prevention mechanism, whereas formal control is mostly exercised after the event by institutions placed outside the community. However, formal control may add valuable insights to neighborhood research including the broken windows field by influencing crime rates both directly and indirectly (Kubrin & Weitzer, 2003b, p. 381-382).

Direct effects of formal control on crime and victimization rates are well-documented. For example, Smith (1986) found that police activity varies significantly across neighborhoods. Police tend to underpolice disadvantaged high-crime neighborhoods because they think the residents in those communities deserve victimization in light of their lifestyles (Klinger, 1997). High levels of police misconduct and abuse in those areas (Fagan & Davies, 2000; Mastrofski, Reisig, & McCluskey, 2002) further lowers residents' satisfaction with the police, which in turn may hamper residential efforts to reduce crime. On the other hand, vigorous law enforcement seems to be effective in reducing crime by increasing the perceptive probability of arrest for illegal activities (Sampson, 1986, p. 281; Sampson & Cohen, 1988; Stark, 1987). Velez (2001) further discovered that the effects are more salient in poor neighborhoods than in affluent communities (Kubrin & Weitzer, 2003b, p. 382-383).

Formal control may have indirect effects on crime by influencing or interacting with residents' informal control practices. It seems to be obvious that proactive police control strengthens the willingness and capacity of residents to fight crime. Community policing is based on the theoretical premise that informal norms and rules set by residents can be effectively realized and maintained by cooperative efforts between residents and police. Although there is little empirical evidence on the relationship between formal and informal social control, community policing literature illustrates the possible linkage (Greene, 1999; Skogan, 1990; Skogan & Hartnett, 1997): "Community policing thus illustrates one way in which formal and informal social control can reinforce each other, helping to reduce crime" (Kubrin & Weitzer, 2003b, p. 383). In contrast, inadequate policing in highly disadvantaged neighborhoods would undermine the informal control capacity of residents and could further allow offenders to set their own norms and rules in the communities. Kubrin and Weitzer's (2003a) study on retaliatory homicide demonstrates that residents in poor neighborhoods have little expectation of proactive police intervention, which fosters retributive justice by some residents.

Another mechanism of indirect effects of formal control is suggested by incarceration research. That is, high incarceration rates could undermine neighborhood cohesion and social control by causing a variety of unintended consequences such as "(1) disrupting family cohesion and financial resources, (2) reducing the supply of marriageable partners, (3) depleting labor markets, (4) decreasing the number of adults available to supervise neighborhood youth and intervene in neighborhood problems, and (5) compounding neighborhood problems after these incarcerated offenders are released into the

community" (see Clear et al., 2003; Rose & Clear, 1998, in Kubrin & Weitzer, 2003b, p. 384).

The author is particularly interested in the interaction dynamics of formal and informal controls, which have been little studied to date. Although several studies on formal control in the field, or broken windows policing, have been conducted, none of them consider the possible link between formal and informal controls. Thus, the author suggests that more interest be paid to the role of formal control in strengthening the self-regulation mechanism among residents. This way, the zero tolerance approach to disorder would fade away and the critics of the broken windows idea and policing would begin to appreciate the true underlying idea of the theory and policy.

Comparative Study with another Country

The second purpose of this dissertation was to examine whether the relationship between disorder and crime was dependent on neighborhood characteristics, which was expected to facilitate contextual understanding. The results suggested that a context-specific policy would be more effective in reducing crime than a general one. It further encouraged theoretical elaborations to the direction that the relationships among structure, disorder, process, and crime might depend on various neighborhood contexts. For instance, while concentrated disadvantage appeared to be a leading factor in crime in metropolitan urban areas due to its rareness and inconsistent distribution across neighborhoods, residential instability seemed to be the best indicator of crime (especially property crime) for similar reasons. Also, the theoretical link between disorder and crime appeared to be weaker in structurally disadvantaged neighborhoods than in advantaged counterparts, the reasons for which, the author speculated, was because crime and

possibly disorder was so prevalent in disadvantaged areas that the level of disorder did not have a statistical impact on the link between disorder and crime, and relatedly, disorder did not increase fear of crime among residents.

In this vein, it would be valuable to apply such contextual understanding to another setting, or another country. Compared to the U.S., for example, South Korea tends to be more tolerant toward disorderly behaviors and conditions. One plausible reason is that, notwithstanding the rapid economic growth of recent years, Koreans are still oriented more toward economic prosperity than toward quality of life, which makes disorder not as problematic to Koreans as to Americans. Therefore, the author speculates that the link between disorder and crime would be weaker in Korean communities than in American counterparts, an idea which well-deserves empirical research.

Within Korean society, however, there must be a large variation of tolerance toward disorder across various types of communities, just as within the U.S. Also, it is obvious that the relationship between disorder and crime is open to temporal change. The cross-sectional variation and longitudinal change in disorder and crime seems to be getting more apparent within Korean society in light of the fact that residential segregation or stratification has been becoming more and more serious in recent years. That is, people with similar socioeconomic backgrounds cluster together around a certain school district. However close a block is to a school, if residents in that block have a different level of socioeconomic status than others in neighboring blocks, then they cannot send their children to the school. These mechanisms in another country deserve attention in order for the broken windows model to be more thoroughly tested within and

across various contexts. This way, the idea and policy would be able to contribute to the gradual improvement of human society.

APPENDICES

APPENDIX A

Coding Sheet for Street and Housing Survey

Table 18. Coding Sheet for Street Survey

City of Lansing=s Tagged Housing Revitalization Program (MSU, CJ)			
Observer: Date:_____ Time:_____ Block Number: _____ Street Name _____ Street Segment #_____			
	Street Segment Measurements		
1	Presence of a *Neighborhood Crime Watch* sign	Yes	No
2	Vehicular traffic direction	1-way	2-way
3	Number of traffic lanes		
4	Number of overhead street lights		
5	Number of traffic control lights		
6	Volume of motorized traffic (number of cars per minute)		
7	Condition of the street (1=all very poor 5 =Ave 10=All very good)		
	Block Face Measure	Odd Side	Even Side
8	Number of houses		
9	Extent of cigarettes and/or cigars on sidewalks, street or in gutters (e.g. public space) 0=None 1=Very light 2=Light 3=Moderate 4=Heavy 5=Very Heavy		
10	Number of houses with litter in front (smaller than newspaper size)		
11	Number of houses with garbage in front (larger than newspaper size)		
12	# of empty liquor and beer bottles or cans on sidewalks, street or gutters		
13	# of cars parked on the street		
14	# of abandoned cars visible from the street		
15	# of cars appearing from the street to be disabled		
16	# of cars with parking violations		
17	# of condoms on sidewalks, street or in gutters (e.g. public space)		
18	# of needles & syringes on sidewalks, street or gutters (e.g. public space)		

Table 18. (cont'd)

19	# of incidents of graffiti visible from the street		
20	# of incidents of painted over graffiti visible from the street		
21	Overall condition of most sidewalks		
22	# of houses damaged by fire or vandalism		
23	# of houses with boarded/covered windows		
24	# of houses with broken windows NOT boarded up/NOT covered/NOT		
25	# of houses/property with window bars or other visible security beyond		
26	# of residential units being renovated/rehabilitated/current maintenance		
27	Overall condition of most residential units		
28	# of vacant lots or open/unused lots		
29	# of commercial units being renovated/rehabilitated/current maintenance		
30	# of commercial units/property with window bars or visible security		
31	# of boarded/covered/vacant commercial units		
32	# of commercial units		

Table 19. Coding Sheet for Housing Survey

City of Lansing=s Tagged Housing Revitalization Program (MSU, School of Criminal Justice Evaluation)		
Observer: _____ Date:_____ Time:_____ Street Segment #_____ Building Number: _____ Street Name _____ Parcel #_____		
Type of residence: Single Family, Multiple Dwelling; (other)_____		
Condition of the principal exterior structure/resident		
1	% of roof or drainage that is missing /damaged (e.g., allows in weather or creates nuisance)	___%
2	% of façade/siding that is physically damaged and needing repair	___%
3	% of facade/siding that is defaced with markings, carvings, or graffiti (property defaced)	___%
4	% of facade/siding with absent or peeling paint such that material underneath is visible	___%
5	% of 1st floor window trim with peeling or absent paint	___%
6	% of 1st floor window glass broken (out) or substantially (more than 1") cracked	___%
7	% of 1st floor windows partially or completely boarded or covered by building materials	___%
8	% pathways/walkways leading from sidewalk to entryway needing repair because of hazardous condition	___%
9	% entryway/path/porch/stoops to front door needing repair because of hazardous condition	___%
10	% of front door (main entry way) missing or in poor condition and needing repair	___%
11	Is residence address (premises identification) number in plain view from the street	Yes No
12	Is City Notice/Card that the structure is tagged visible from street (circle)	Red Gray Neither
12a	Is that a building permit on the structure	Yes No
13	General condition of the exterior of the house 1=Very poor 5= Ave 10=Very Good	
14	% of visible (from public place) grass and/or weeds grown to 8+	___%

Table 19. (cont'd)

Condition of the grounds/property area:		
15	% of visible property with trash, junk, debris, or garbage on the grounds (newspapers, bags, cans, etc.)	___%
16	# of appliances (e.g. refrigerators) and indoor-type furniture on the grounds	___#
17	# of buildings or structures that are open at a door or window leaving the interior exposed	___#
18	# of abandon or disabled cars (no license, 2+ missing tires, 2+ tickets)	___#
19	# of vehicle, motorized recreation vehicle, watercraft or trailer parked in the front yard	___#
20	# of watercraft or trailers mechanically and structurally unable to operate	___%
21	# of accessory structures (such as a detached garage or shed) in need of repair	___%
22	Any damaged (structurally unsound) fences or structures; or lumber/building materials, hazardous trees, broken and/or hanging tree limbs or hazardous vegetation (text)	Yes No
23	Any object obstructing the vision of motorist including fences, hedges, bushes, trees	Yes No
24	General condition of the grounds (1=Very poor 5= Ave 10=Very Good)	
25	Does residence appear occupied (e.g. someone currently living at the address, looks lived-in/in-use etc).	Yes No

APPENDIX B

Evaluation Guidelines for Street Survey

Street Segment Evaluation Criteria

Street Segment Measurements

1. Presence of a Neighborhood Crime Watch sign : Yes if there is a sign present at either end of the street segment
Code YES or NO

2. Vehicular Traffic direction: 1-way for a one-way road, 2-way for a two direction street
Code 1 or 2

3. Number of traffic lanes: Count of the number of lanes on the street to include a universal turn lane counting as a lane.
Code Number

4. Number of overhead street lights
Code Number

5. Number of traffic control lights: the number of traffic lights including either end of the street segment.
Code Number

6. Volume of Motorized traffic: the average numbers of cars to pass per minute
Code x cars in y minutes (need place for x and y to calc average)

7. Condition of the Street
Code 1 – 10

1 -- Three or more potholes (larger than a basketball)
2 -- one or two potholes
3 -- three or more noticeable patched spaces of asphalt or concrete
4 -- one or two patched areas of roadway
6 -- Three or more noticeable cracks (at least halfway across the width of the road) in the roadway
7 -- One or two cracks in the roadway
8 -- Dirt
9 – Under construction
10 –Excellent Road condition – none of the above listed problems

Block Face Measurements

Odd side refers to the dies of the block face with odd numbers, while even side refers to that which contains the even numbered houses.

8. Number of houses on the street segment (to include corner houses that may fall on either street)
Code Number

9. Extent of cigarettes and /or cigars on sidewalks, streets or in gutters (e.g Public space)
0 – None -- No butts seen when inspecting street
1 – Very Light -- Average one or two butts per 10 feet segment
2 – Moderate -- More than three butts per ten foot segment
3 – High -- More than three butts per ten foot segment with several concentrations of butt disposal along the route
Code 0 or 1 or 2 or 3

10. Number of houses with litter in front (smaller than newspaper size)
Code Number

11. Number of Houses with garbage in front (Larger than newspaper size)
Code Number

12. Number of liquor and beer bottles or cans on sidewalks, streets, or gutters
Code Number

13. Number of cars parked on the street
Code Number

14. Number of abandoned cars visible from the street (missing registrations, missing more than two tires, broken windows, grass growing around the wheels etc)
Code Number

15. Number of cars appearing from the street to be disabled (with license plates but having clear mechanical problems such as flat tires, on blocks, power train items removed)
Code Number

16. Number of cars with visible parking violations posted
Code Number

17. Number of condoms on sidewalks, street or in gutters
Code Number

18. Number of needles and syringes on sidewalks, street, or gutters
Code Number

19. Number of incidents of graffiti visible from the street
Code Number

20. Number of incidents of painted over graffiti visible from the street
Code Number

21. Overall condition of sidewalks
Percentage of Sidewalk with grass growing in cracks
Percentage of Sidewalk with additional cracks

Percentage	**Code**
0	**0**
0-10%	**10**
10-25%	**25**
25-50%	**50**
50-75%	**75**
75-100%	**100**

22. Number of Houses damaged by fire or vandalism
Code Number (Calculation: using number of houses on street this should become a percent)

23. Number of houses with boarded/covered windows
Code Number (Calculation: using number of houses on street this should become a percent)

24. Number of houses with broken windows that are not boarded, covered up or cared for
Code Number (Calculation: using number of houses on street this should become a percent)

25. Number of Houses/properties with window bars or other visible security beyond locked doors
Code Number (Calculation: using number of houses on street this should become a percent)

26. Number of residential units being renovated / rehabilitated / current maintenance activity
Code Number (Calculation: using number of houses on street this should become a percent)

27. Overall condition of most residential units
Code Number (number of poorly conditioned houses.....will turn into percent) (Calculation: using number of houses on street this should become a percent)

Number of houses in visible sign of disrepair, needing maintenance, needing paint, needing lawnwork (greater than 8")

29. Number of vacant lots or open / unused lots
Code Number

30. (Q30) Number of commercial unities renovated/rehabilitated etc.
Code Number

31. (Q31) Number of commercial units/property with window bars or visible security
Code Number

32. (Q32) Number of boarded / covered / vacant commercial units
Code Number

33. (Q33) Number of businesses
Code Number

APPENDIX C

Number of Serious Crime and Social Disorder for Study Segments and Intersections[85]

Table 20. Number of Serious Crime and Social Disorder for Study Segments and Intersections

	2003		2005	
	total : study (percentage 1)	study : inter (percentage 2)	total : study (percentage 1)	study : inter (percentage 2)
Total	16957 : 2356 (13.89)	2356 : 430 (15.43)	16554 : 2310 (13.95)	2310 : 451 (16.33)
Violent Crime	3292 : 449 (13.64)	449 : 42 (8.55)	3668 : 472 (12.87)	472 : 57 (10.78)
Homicide	8 : 1 (12.50)	1 : 0 (0.00)	11 : 0 (0.00)	0 : 0 (0.00)
Rape	251 : 29 (11.55)	29 : 0 (0.00)	262 : 12 (4.58)	12 : 1 (7.69)
Robbery	196 : 28 (14.28)	28 : 6 (17.65)	224 : 16 (7.14)	16 : 11 (40.74)
Assault	2837 : 391 (13.78)	391 : 36 (8.43)	3171 : 408 (12.87)	403 : 45 (10.04)
Property Crime	7737 : 960 (12.41)	960 : 66 (6.43)	7631 : 1015 (13.30)	1015 : 65 (6.02)
Burglary	1591 : 288 (18.10)	288 : 12 (4.00)	1694 : 321 (18.95)	321 : 6 (1.83)
Larceny	4868 : 535 (10.99)	535 : 25 (4.46)	4899 : 550 (11.23)	550 : 34 (5.82)
VT	1260 : 134 (10.63)	134 : 29 (17.79)	1023 : 125 (12.22)	125 : 25 (16.67)
Arson	18 : 3 (16.67)	3 : 0 (0.00)	15 : 0 (0.00)	0 : 0 (0.00)
Social Disorder	5928 : 930 (15.69)	930 : 321 (25.66)	5255 : 823 (15.66)	823 : 329 (28.56)
Drunk subject	393 : 32 (8.14)	32 : 33 (50.77)	347 : 25 (7.20)	25 : 39 (60.94)
Juvenile	1641 : 222 (13.53)	222 : 119 (34.90)	1467 : 189 (12.88)	189 : 106 (35.93)
Noise	2828 : 520 (18.39)	520 : 93 (15.17)	2250 : 439 (19.51)	439 : 71 (13.92)
Panhandling	151 : 29 (19.20)	29 : 2 (6.45)	163 : 22 (13.50)	22 : 4 (15.38)
Loud party	608 : 101 (16.61)	101 : 23 (18.55)	609 : 107 (17.57)	107 : 36 (25.17)
Prostitution	307 : 26 (8.47)	26 : 44 (62.86)	419 : 41 (9.78)	41 : 69 (62.73)

[85] * total: number of serious crime or social disorder for total segments (n=5,953) including intersections
* study: number of serious crime or social disorder for study segments (n=377) excluding intersections (Each case was counted as 1 in this study.)
* inter: number of serious crime or social disorder for intersections that include the study segments (Intersections are generally made up of four segments, and thus technically 'inter' can contain up to four study segments. Actually, one case of social disorder in 2003 and two cases of social disorder in 2005 were recorded on intersections with four study segments. Each case was counted as half.)
* percentage 1: study / total
* percentage 2: inter / (inter + study)

APPENDIX D

Multicollinearity Diagnostics of Level 2 Variables Including Lagged Crime Rates[86]

Table 21. Tolerance and Variance Inflation Factors

Independent Variables	*Tolerance*	*VIF*
Concentrated Disadvantage	.71	1.40
Immigrant Concentration	.68	1.48
Residential Instability	.76	1.31
Land Use	.94	1.06
Lagged Violent Crime Rates 2003	.96	1.04

Table 22. Collinearity Diagnostics

Concept	Eigen-value	Condition Index	Variance Proportions					
			Intercept	CD	IC	RI	LU	Wy
1	2.46	1.00	.04	.00	.00	.00	.06	.04
2	1.84	1.16	.00	.13	.12	.12	.00	.00
3	.64	1.96	.01	.38	.03	.72	.01	.00
4	.52	2.17	.01	.37	.75	.13	.03	.00
5	.37	2.56	.01	.08	.04	.01	.70	.31
6	.16	3.87	.94	.04	.06	.02	.20	.64

[86] The results for the other types of lagged crime rates were almost the same as those in the table.

APPENDIX E

Multicollinearity Diagnostics of Level 1 Variables (2003 and 2005)

Table 23. Tolerance and Variance Inflation Factors (2003)

Independent Variables	*Tolerance*	*VIF*
Physical Disorder	.97	1.03
Social Disorder	.98	1.02
Land Use	.99	1.01

Table 24. Collinearity Diagnostics (2003)

Concept	Eigen-value	Condition Index	Variance Proportions			
			Intercept	PD	SD	LU
1	1.39	1.00	.27	.03	.02	.30
2	1.12	1.12	.06	.38	.41	.01
3	.87	1.26	.01	.54	.57	.00
4	.62	1.50	.65	.04	.00	.69

Table 25. Tolerance and Variance Inflation Factors (2005)

Independent Variables	*Tolerance*	*VIF*
Physical Disorder	.99	1.00
Social Disorder	.94	1.06
Land Use	.94	1.06

Table 26. Collinearity Diagnostics (2005)

Concept	Eigen-value	Condition Index	Variance Proportions			
			Intercept	PD	SD	LU
1	1.42	1.00	.22	.00	.09	.29
2	1.03	1.18	.07	.51	.36	.00
3	.98	1.21	.17	.47	.33	.00
4	.57	1.58	.54	.02	.22	.71

APPENDIX F

Results for Hierarchical Linear Models[87]

Table 27. Unconditional Model (Violent Crime 2003)

Fixed Effect	Coefficient	Standard Error	p
γ_{00}	.46	.03	.00
Random Effect	Variance Component		p
Block group mean, u_{0j}	.01		.11
Reliability of Coefficient Estimate			
β_{0j}	.09		

Table 28. Unconditional Model (Property Crime 2003)

Fixed Effect	Coefficient	Standard Error	p
γ_{00}	.79	.05	.00
Random Effect	Variance Component		p
Block group mean, u_{0j}	.08		.00
Reliability of Coefficient Estimate			
β_{0j}	.42		

[87] Instead of the LaPlace approximation method used in the non-linear model, the reported statistics in the linear model are based on the restricted maximum likelihood estimation.

Table 29. Unconditional Model (Violent Crime 2005)

Fixed Effect	Coefficient	Standard Error	P
γ_{00}	.46	.03	.00
Random Effect	Variance Component		p
Block group mean, u_{0j}	.02		.07
Reliability of Coefficient Estimate			
β_{0j}	.19		

Table 30. Unconditional Model (Property Crime 2005)

Fixed Effect	Coefficient	Standard Error	p
γ_{00}	.85	.05	.00
Random Effect	Variance Component		p
Block group mean, u_{0j}	.07		.00
Reliability of Coefficient Estimate			
β_{0j}	.39		

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