ABSTRACT

Title of Document: MOVING SOCIAL DISORDER AROUND

WHICH CORNER? A CASE STUDY OF

SPATIAL DISPLACEMENT AND

DIFFUSION OF BENEFITS

Laura Ann Wyckoff, Doctor of Philosophy, 2011

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Prior research seeking to understand the spatial displacement of crime and diffusion of intervention benefits has suggested that place-based opportunities – levels and types of guardianship, offenders, and targets – explain spatial intervention effects to places proximate to a targeted intervention area. However, there has been no systematic test of this relationship. This dissertation uses observational and interview data to examine the relationship, in two street-level markets, between place-based opportunities and spatial displacement and diffusion of social disorder. The street segment is the unit of analysis for this study, since research shows crime clusters at this level and it is a unit small enough to accurately represent the context for street-level crime opportunities.

The study begins by investigating if catchment area (an area proximate to an intervention area) segments with similar opportunities to the target area segments differentially experienced parallel intervention effects as compared to segments with dissimilar opportunity factors. These analyses resulted in null findings. The second set

of analyses examined if place-based opportunities predicted the segments which fall into a high diffusion group or a displacement group, as compared to a low/moderate group. These analyses resulted in primarily null findings, except for the measures of public flow and the average level of place manager responsibility which positively predicted the segments in the high diffusion group, as compared to the low/moderate diffusion group. A third set of analyses was also performed where the outcome measure was the odds of the occurrence of a social disorder incident in a measured situation period in the segment during the intervention. These analyses revealed that the situations within segments which had a greater number of possible targets and offenders with a lack of guardianship were more likely to experience incidents of social disorder, reinforcing past findings about the relationship between social disorder and opportunities at place. Place-based opportunity factors are likely important factors in understanding parallel spatial intervention effects, but the null findings suggest additional research is needed to better understand these effects.

MOVING SOCIAL DISORDER AROUND WHICH CORNER? A CASE STUDY OF SPATIAL DISPLACEMENT AND DIFFUSION OF BENEFITS

By

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Chapter 1: Introduction and Theoretical Foundations

Research on crime at place has found that crime is "tightly coupled" at the street segment level, clustering at place and remaining relatively stable at place over long periods of time (Weisburd, Bushway, Lum, and Yang, 2004; Weisburd, Groff, and Yang, 2010; Weisburd, Morris, and Groff, 2009; Weisburd and Telep, forthcoming). These high crime places, or hot spots, have a unique balance of crime opportunities, which make these places optimal for crime (Weisburd, Wyckoff, Ready, Eck, Hinkle, and Gajewski, 2004, 2006). Hot spots policing strategies focused on these high crime places have been highlighted as promising techniques for deterring crime (Braga, 2001, 2005, 2007; Weisburd and Eck, 2004). Critics of hot spots policing techniques have suggested that these strategies may result in offenders continuing their crime by moving to places proximate to these targeted areas, termed spatial displacement of crime. Research has found evidence of spatial displacement, although this outcome is rare as compared to spatial diffusion of benefits; a process by which the places neighboring the targeted areas experience crime reductions during the intervention (Bar and Pease, 1990; Eck, 1993; Guerette and Bowers, 2009; Hesseling, 1994).

These findings suggest that there are features of hot spots that provide a "comfort" for crime, which are not present in places proximate to these hot spots.

Qualitative work has pointed to routine activities theory as a theoretical explanation for why hot spots are optimal for crime while places neighboring these hot spots are not optimal for crime (Weisburd et al., 2006). Routine activities theory specifies the crime opportunities – offenders, targets, guardians – which must be present in time and space for a crime to occur (Cohen and Felson, 1979). High quality, quantitative research has

found that crime opportunities cluster at place, are relatively stable over time, and predict the "tight coupling" of crime at place (Weisburd et al, 2010; Weisburd, Morris et al, 2009). Quite simply, hot spots of crime and social disorder have a balance of targets and offenders and a lack of guardianship that allows crime to fester. Qualitative research has suggested that during an intervention, place-based opportunities may help explain the presence or absence of spatial displacement of crime or social disorder at these proximate places. To this point, there has not been a systematic examination of the relationship between place-based opportunities and the parallel spatial intervention effects felt at the places proximate to hot spot policing interventions.

In order to understand the outcome of spatial displacement and diffusion to a place from the offender perspective, inductive theorizing and qualitative research suggest looking to an integration of routine activities theory with rational choice theory while also applying elements of crime pattern theory. Rational choice theory specifies that an offender's crime decision framework is structured around his/her perceptions of risks, benefits, and efforts for committing crime. Integrating rational choice theory with routine activities theory, place-focused police interventions change offenders' perceptions of opportunities within targeted places, influencing their perceptions of the risks, benefits, and efforts related to committing a crime within these places. As such the intervention may impact an offender's *comfort* of committing a crime in the target area, which may result in the offender seeking a new place for the commission of their crime. Offenders may also have an inaccurate perception of the scope of the intervention, judging that the intervention is also focused on places outside the intervention area and the crime

commission in these areas, which may deter offenders from committing crimes in these proximate places, resulting in diffusion of benefits to these places.

Looking to crime pattern theory provides further theoretical understanding of the way in which offenders adapt to an intervention and possibly choose alternate crime locations. Crime pattern theory integrates rational choice theory and routine activities theory, while also including elements of environmental criminology, as a means to examine the relationship and interaction of opportunity constructs and crime incidents across places (Brantingham and Brantingham, 1999). Crime pattern theory posits that offenders go through a dynamic and rational process in deciding on a crime target within place, likely searching for targets in or close to their regularly traveled places, their awareness space, while considering the opportunities for the crime and the risks and benefits of the crime at these regularly traveled places (Wright and Decker, 1997; Bernasco and Block, 2009; Wiles and Costello, 2000). Offenders travel outward from their awareness space to seek targets, but research has suggests a possible distance decay function; as offenders move to less familiar places, further from their routine activity places, they are less likely to commit a crime (Rhodes and Conley, 1981; Rossmo, 2000; Wiles and Costello, 2000).

The application of this integration of rational choice theory and routine activities theory provides a dynamic theory in which offenders are in constant adaptation.

Therefore, as an intervention progresses an offender may become more familiar with – gain a more accurate perception of – the intervention and return to offending in their regular place or become more comfortable offending in alternate locations (Weisburd, Wyckoff et al, 2004; 2006). This means that offender adaptation to the intervention

likely varies throughout the span of the intervention, differentially effecting crime and disorder at the intervention target area and proximate locations throughout the span of the intervention. Quantitative research does hold some limited support for this idea, finding that the effects felt in hot spot intervention areas and the parallel spatial effects felt in the areas proximate to these places have a steep decline in crime at the beginning of interventions, but a progressive decrease in crime control benefits over time (Nagin, 1998; Sherman and Rogan, 1995a; Weisburd, Wyckoff et al, 2004; 2006). Additionally, the theoretical framework presented here, the integration of routine activities theory and rational choice theory, with the additional application of crime pattern theory, has some support from qualitative work investigating offender adaptation to focused interventions, which will be presented later in this document.

Despite the qualitative support, this theoretical framework has a lack of systematic testing in relation to spatial displacement and diffusion of benefits to places proximate to targeted police interventions. As such there is little understanding of which opportunities at place may explain the presence of spatial displacement of crime or diffusion of crime control benefits to these places neighboring focused intervention target areas. Nor is there shared consensus of how these place-based opportunities help to specify this process considering the relative location of the target area or the period of the intervention (i.e., beginning, end). With little understanding of this process, research has little practical recommendations for controlling these side effects of police interventions.

To this point quantitative research in this area has focused on examining the *net* effects of spatial displacement or diffusion to large geographic areas, target areas and neighboring catchment areas, made up of multiple street segments. By focusing on large

geographic units of analysis (e.g., catchment areas) prior research may have masked the variability of spatial displacement and diffusion effects across smaller more theoretically and practically salient places, such as street segments. It may be that parallel spatial intervention effects, similar to crime in general, occur at a minority of street segments, which may be exposed by examining this phenomena at the street segment level. Even if the majority of places experience diffusion of benefits, the level of diffusion effects may vary dramatically by street segment, an important variability to understand. If heterogeneity of parallel intervention effects is present across smaller geographic units, such as street segments, within these catchment areas, studies measuring *net* intervention effects may be largely influenced by which street segments are included in the catchment areas surrounding these targeted hot spots (see Guerette and Bowers, 2009).

Considering the methodological limitations measuring parallel spatial intervention effects to large geographic areas, it seems more advantageous to focus on the street segment; unlike large catchment areas, the street segment provides a level of measure that is theoretically based in routine activities theory and may be applied in police practice. This is especially the case for studies concerned with street level crime and disorder, where it can be argued the street segment is a conceptual and bounded measure within an offender's awareness space. Finally, the street segment focus provides an opportunity to explore the variability of parallel intervention effects in relation to other place-based measures, so these outcomes may be better understood. To put it simply, it seems that rather than trying to understand the trees by looking at the forest, we should first focus on the trees.

THE CURRENT STUDY

Building upon prior research of spatial displacement of crime and diffusion of crime control benefits, the current study investigates the relationship between parallel intervention effects and place-based opportunities – targets, offenders, and guardians – for segments proximate to a focused intervention.

Study Data

This research is conducted with data from the Jersey City Displacement and Diffusion Study (JCDDS) (Weisburd, Wyckoff et al, 2004; 2006; Ready, 2009). The JCDDS is unique, as it is the only study planned and conducted with the sole purpose of accurately measuring and understanding displacement of crime and diffusion of crime control benefits. The two intervention hot spots targeted for this study – a prostitution hot spot and a drug hot spot – were flooded with focused resources to severely limit the opportunities for crime in the target areas. Examined together, the study target areas and proximate areas, two catchment areas for each site, provide a total of 163 street segments (33 in the target areas), which vary in their level of crime and opportunity measures. An unmber of rich data sources were collected to capture measures of crime and opportunity at the street segment level, including social observations, physical observations, place manager interviews, and official police calls for service. Offender interviews and ethnographic work were also conducted to provide a qualitative understanding of the processes underlying parallel spatial intervention effects.

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¹ A total of 163 street segments are included in the study; however, the pre-intervention phase of the social observation data has 151 street segments represented, while the intervention phases have all 163 street segments represented. The post-intervention phase of the social observation data has 153 street segments represented, but some of these street segments are different than the 151 street segments represented in the pre-intervention phase of data, so for pre to post phase analyses 143 street segments are represented.

Past research using JCDDS data found little evidence of spatial displacement and greater evidence of diffusion of crime control benefits, establishing that for the two study sites crime does not simply move around the corner (Weisburd, Wyckoff et al, 2004, 2006; Ready, 2009). Using various data sources to systematically examine parallel intervention effects, this research is quite convincing. However, this research focused on large geographic levels, possibly washing away the variability of crime and parallel intervention effects across the street segments. As such, the relationship between opportunities and parallel intervention effects was not investigated at the street segment level. Work using this data by Ready (2009) does touch on offender adaptation to the intervention considering the street segment, but does not fully examine place-based opportunity measures. The qualitative research of offenders conducted for the JCDDS does reinforce a dynamic model of offender adaptation considering opportunities at place, which fits well within the theoretical framework discussed, integrating routine activities theory and rational choice theory, while including aspects of crime pattern theory. This past research from the JCDDS provides a foundation for a more systematic examination of place-based opportunities using the unique and rich measures from the JCDDS data.

The Street Segment: An Optimal Level of Measure

The place focus and level of measure for the study at hand is the street segment.

The street segment unit of analysis complements this study, which focuses on the observation of street level disorder, including drug crime and prostitution activities, all of which are expected to have relationships with the micro-level street segment environment. Compared to larger units of analysis, the street segment represents a geographic unit which has clear boundaries of an offender's knowledge of space, but also

presents a relatively homogenous measure of socially shared norms, social activity rhythm, and built environment (see Felson and Boba, 2010; Taylor, 1997). As such, the street segment provides a defined level of measure with distinct boundaries of human interaction, including opportunities for crime and disorder. Results from prior research reinforce the salience of this level of measure, finding that opportunities cluster at the street segment level, significantly vary across street segments, even segments in close proximity to one another, and have a significant relationship with the distribution of crime across places (Weisburd, Bushway et al, 2004; Weisburd et al, 2010; Weisburd, Morris et al, 2009).

<u>Testing the Relationship between Place-Based Opportunities and Parallel Spatial</u> <u>Intervention Effects</u>

Building on place-based opportunity research and previous research examining spatial displacement of crime and diffusion of crime control benefits, including the JCDDS, the present study seeks to improve our understanding of these parallel spatial intervention effects. The study begins with analyses which provide a base understanding of the net effects – a net increase or decrease in social disorder – for each of the study areas (targeted area and catchment areas). These analyses are similar to others conducted in prior JCDDS research; however, for this study they are conducted using the street segment as the unit of analysis and employ the primary social disorder measure operationalized for the current study. These analyses, as well as subsequent analyses, also considers the timing of the intervention, since rational choice theory assumes offenders would adapt to an intervention as it progresses, suggesting that the parallel intervention effects experienced by segments may vary as the intervention unfolds. The location of the segment to the target area is also considered in this and subsequent

analyses, testing ideas from offender level research that suggests parallel intervention spatial effects experienced by segments may vary by distance from the target area. This research suggests offender travel patterns may result in greater displacement in places closer to the target area, as offenders are more easily able to access these places and are likely more familiar with these places, suggesting a displacement gradient for places further from the target area. In contrast, offender level research also suggests segments closer to the target area may experience the greatest diffusion effects, since offenders are not fully aware of the scope of the intervention's target area.

After determining the net-benefits of the intervention, an examination of the differential distribution and variability of spatial displacement of social disorder and diffusion of intervention benefits across the street segments in the catchment areas, the areas proximate to the targeted areas, is conducted. Findings a differential distribution and variability of these effects across segments suggests that place-based characteristics may explain these differences. The subsequent analyses seek to identify place-based opportunities which may explain the differential distribution and variability of spatial displacement and diffusion of social disorder across the street segments. Finding segments proximate to the target area which have opportunity features which are similar to the target area segments, the first opportunity set of analyses investigate whether these similar catchment area segments experience differential parallel spatial effects as compared to catchment area segments with dissimilar place-based opportunities. Considering change in adaptation techniques of offenders, the timing of the intervention and the relative location of the segments are also considered in this analysis. The second set of opportunity analyses use multinomial logistic regression techniques to determine if there are specific segment opportunity factors which explain whether segments fall into a social disorder displacement segment group, a low/moderate diffusion segment group, or a high diffusion segment group. The final set of analyses draw on the idea that routine activities theory is considered a situational theory, dependent on the presence of different opportunity characteristics within a situation. These analyses examine the likelihood of an event of social disorder during the intervention in a situation on a street segment within the target areas and catchment areas; this likelihood is dependent on the opportunity measures present in the situation at place, while also considering each segment's relative location to the targeted intervention.

This research provides a *theoretical booster shot* to the study of spatial displacement and diffusion of intervention benefits, highlighting the need to focus on more than net-intervention effects to truly understand the theoretical process leading to these parallel spatial intervention effects. In addition, the measures constructed at the street segment level for this analysis are quite unique, so hopefully others will draw upon this research to further improve place-based opportunity measures. Finally, this study will provide guidance to police practitioners on how to understand, plan for, and harness parallel spatial intervention effects, so focused place-based interventions may improve their overall deterrence effects.

OUTLINE OF RESEARCH

The remainder of this document provides a review of relevant literature and research methods for testing the research hypotheses presented, which is followed by the testing of these hypotheses using the JCDDS data. Chapter two discusses criminal opportunities at place, which provide the foundation for present place-based policing

techniques and the proposed causal mechanisms for spatial displacement and diffusion of intervention benefits. This chapter includes a review of routine activities theory, a discussion of the integration of routine activities theory and rational choice theory, and a review of the theoretical constructs that will be used in the study at hand. Chapter three of this manuscript focuses on the application of opportunity theories in place-based policing, the literature describing spatial displacement and diffusion, including a more extensive review of the processes that support these parallel intervention effects. Chapter four lists the research hypotheses and analytic strategy for this research. Chapter five is a discussion of the original JCDDS methodology, containing a basic description of the Jersey City Displacement Study's data collection methodology, police interventions, separate data sources, and how the data are structured for the present research. Chapter six presents specific measures used to test each of the study hypotheses and includes a discussion of strengths and weaknesses of these measures. Chapters seven through nine detail the analyses conducted to test the hypotheses, including a discussion of the findings from these analyses. The final chapter concludes this manuscript, summarizing the findings and discussing their place in the literature, noting study limitations and room for future research, and finally policy implications of the research at hand.

Chapter 2: Theoretical Foundation: Opportunity Theories and the Salience of Place

As discussed in the introduction, qualitative research has suggested place-based opportunities may explain spatial displacement of crime and diffusion of crime control benefits to places proximate to a targeted intervention. This chapter provides the theoretical foundations for the current research, describing the applicable theories. The chapter begins with a discussion of the constructs of routine activities theory: crime is dependent on the convergence of an offender and target in time and space with the lack of a capable guardian (Cohen and Felson, 1979). The discussion then moves into the integration of routine activities theory with rational choice theory, providing the foundation for additional theorizing. Combining these two theories provides a broader opportunities perspective, which examines, among other things, the interaction of targets and offenders across places and the role of the built environment at place in providing opportunities for crime (Brantingham and Brantingham, 1993; Felson and Boba, 2010). The chapter ends with a focus on specific place-based opportunity measures and their relationship to crime, including the measures which are the independent variables for the current study.

OPPORTUNITY THEORIES: A BRIEF REVIEW

Routine activities theory serves as the foundation of the opportunities perspective. Contrary to traditional criminology theories, routine activities theory shifts focus from understanding criminal motivation to examining crime as the outcome of the convergence in time and space of a motivated offender and suitable target with the absence of a capable guardian (Cohen and Felson, 1979). The theory is quite versatile, it is applicable as an explanation of crime "in each situation but also the population of situations," at one

time period or over time, and at different geographic levels (e.g., street segment, state, country) (Felson, p.43, 2001). In their seminal piece establishing the theory, Cohen and Felson (1979) illustrate that the increase in residential burglary in the US had a relationship with the reduction in guardianship (the increase in single person households) and the increase in suitable targets (increase in portable items like electronic goods) from 1960 to 1970. The theory has been tested and found applicable in numerous contexts, finding crime opportunities do cluster by time and place and are significantly related to crime and social disorder (see Clarke and Felson, 1993; Roncek and Maier, 1991; Weisburd et al., 2010; Weisburd, Morris et al., 2009).

The structure of routine activities theory takes "criminal inclinations as given and examine[s] the manner in which the spatio-temporal organization of social activities helps people to translate their criminal inclinations into action" (Cohen and Felson, 1979, p. 589). In the context of routine activities theory, crime occurs when an offender and target converge in space and time in the absence of a capable guardian. The spatio-temporal nature of the theory suggests that the differential distribution of crime across place is due to the differential distribution of opportunities across place – targets, guardians, and offenders.

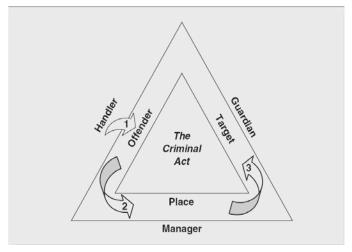
Two of the most important elements in this equation are offenders and targets. In a recent work, Felson has referred to offenders as "likely" offenders rather than as "motivated" offenders (Felson and Boba, 2010). Describing the "likely" offender as "anybody," Felson and Boba (2010) explain, "Daily life helps some people reach their full criminal potential, whereas others have a stunted criminal growth" (p. 28). They go on to state, "The march of life provides new criminal opportunities, hence changing the

pool of likely offenders as time goes on, while making some previous offenders more efficient or less so" (p. 28). This explanation illustrates the dynamic nature of an offender's motivation, which is not necessarily fixed, but dependent on their exposure to criminal opportunities since "opportunities make a thief" (Felson and Clarke, 1998). Literature explaining the idea of "motivated" offender, however, is not so clear. Weisburd and colleagues (2010) note, "There is, it should be noted, some theoretical confusion among scholars in this area regarding the extent to which the environment acts upon individuals to become 'offenders' and the extent to which offenders enter a crime situation with such motivations" (p. 102). They explain that although there may not be consensus on this topic, opportunity theories still recognize that crime is likely if a motivated offender is present (2010).

Within routine activities theory, a suitable target is considered "any person or thing that draws the offender toward a crime, whether a car that invites him to steal it, some money that he could easily take, somebody who provokes him into a fight, or somebody who looks like an easy purse-snatch" (p. 28). Weisburd and colleagues (2010) note that places with greater numbers of people or targets normally have more crime. The target in the study at hand, drug crimes or prostitution crimes committed in an open air drug market, is not as clearly defined as in other crime types, since these crimes are considered consensual. As such the "buyers and sellers are cooperating" and "...depend on each other like flowers and bees" (Felson and Boba, 2010, p. 35). In addition, as compared to other types of crime these consensual crime markets, if relatively stable, may be less dependent on places with high numbers of people for the crime to occur, especially if the market has a secure customer base.

To specify guardianship within the routine activities framework, Felson and Boba (2010) explain that any citizen is a guardian but "you are the best guardian of your own property" (p.28). The construct of guardianship draws upon the salience of informal social controls in the recipe for crime (See Felson, 1995; Felson, 1986; Felson and Gottfredson, 1984). Quite simply, offenders, fearful of being captured and suffering the consequences of capture, are less likely to commit crime in the presence of a guardian. As routine activities theory has developed guardianship has been elaborated, specifying that guardians can curb offending at three different points: (1) by supervising potential offenders, termed handlers; (2) by providing supervision of targets or possible victims, maintaining the term guardian; and (3) by monitoring places, termed place management (see Eck, 1994; Felson, 1995; Felson and Boba, 2010). Felson (1995) explains that in order for a crime to take place "an offender has to get loose from his handlers, then find a target unprotected by guardians in a place free from intrusive managers" (p. 55). Image 2.1 is a graphic of the "Dynamic Crime Triangle," which was created by Felson and Boba with assistance from John Eck to illustrate the "mix of divergences and convergences" involved in this crime process (Felson and Boba, 2010, p. 30).

Image 2.1: The Dynamic Crime Triangle (Felson and Boba, 2010, p. 30)



In the context of a place, the guardian of interest is a place manager. That being said, this does not mean places do not have the other types of guardians present, but that these other guardians do not have direct responsibility over a place. In many cases, such as in a person's home or place of business, the guardian of a place may also be a guardian of a target.

There has also been a typology presented to better understand the idea of "capable" in the construct of capable guardianship. Felson (1995) presented a parsimonious categorization of a guardian's responsibility level over a place, target, or offender (also see Clarke, 1992). In the context of place managers, there are four levels of responsibility including: (1) personal, such as people who own a place and have investment in the safety of the place and the things and people in that place; (2) assigned, an example would be someone who manages a place and has a high level of responsibility through their assigned position; (3) diffuse, an employee who has moderate responsibility for a place, such as a cashier; and (4) general, such as a stranger or bystander who may discourage crime by being present but have little responsibility. Felson (1995) explains that in applying these levels of responsibility "extra emphasis is given to personal ties, which impels more responsibility than any of the other categories" (p.56).

Police do not fit easily into the place manager responsibility level typology (Felson, 1995). It is likely a police officer's level of responsibility for managing a place varies by their assignment, since police can be assigned specifically to watch a place, a large area of places, a specific target, a specific offender, or groups of offenders. Boba and Felson (2010) do not consider police as guardians because they are unlikely to be in a

specific place when a crime occurs. Considering the responsibility typology of "capable" guardians, it may be more useful to not dismiss police as guardians altogether, but to consider their level of capability based on the level of responsibility assumed within the situation, with an assumption that with place-based policing and the increased focus on specific places, police are being given greater responsibility as place managers.

Theoretical Integration of Routine Activities Theory

Integrating routine activities theory with rational choice theory provides a means to understand how opportunities play into an offender's decision process – within a situation or more generally. In the context of rational choice theory, an offender's purpose for committing a crime is to gain a benefit. To assure there is a benefit, the choice process involves weighing the perceived rewards of the crime against the level of efforts and risks involved in committing the crime (Clarke and Cornish, 1985, 2001). This decision process is influenced by an offender's background factors (e.g., upbringing, impulsivity), experience and learning (e.g., experience with the crime, skills), current circumstances in life (e.g., unemployed), and the situational factors "that include current needs and motives, together with immediate opportunities and inducements" (Clarke and Cornish, 2001, p.27).

According to rational choice theory, the elements an offender includes in their decision process are limited by their knowledge of the facts involved and their ability to process the information available, termed bounded rationality (Simon, 1991). Cornish and Clarke (1985) explain that "even if the decision processes themselves are not optimal ones, they may make sense to the offender and represent his best efforts at optimizing outcomes" (p. 163). Clarke and Cornish (2001) suggest that, because their decision

process is limited, offenders' decision making is "satisficing rather than optimizing – it gives reasonable outcomes ('it seems to get me mostly what I want') rather than the best that could be achieved ('all I can get with the least effort') (p. 25).

A theory which more fully specifies an offender's choice for crime is crime pattern theory, which integrates rational choice theory and routine activities theory (Eck and Weisburd, 1995; Rossmo, 2000; Weisburd, Bruinsma, and Bernasco, 2009). Brantingham and Brantingham's (1999) crime pattern theory examines the distribution and interaction of targets, guardians, and offenders within time and space, incorporating important environmental aspects into the offender's crime-decision making framework. In contrast to routine activities theory, crime pattern theory places a focus on the means in which offenders are aware of activity space (and their opportunities) and gain access to places. Crime pattern theory makes an assumption that offenders have a normal routine to their activities, going from home to work and to recreation, in which they become aware of the opportunities for crime. As such, offenders do not choose their site for crime randomly, but choose a site from their own awareness space, in which they are familiar, rather than traveling to an unfamiliar, new location. The familiarity allows offenders to have more information about the risks, benefits, and opportunities present in the acquisition of a target.

Research examining crime pattern theory has found that offenders travel outward from their awareness space to seek targets. However, research suggests a possible distance decay function; as offenders move to less familiar places, further from their routine activity places, they are less likely to commit a crime (Bernasco and Block, 2009; Wiles and Costello, 2000; Wright and Decker, 1997). Offenders tend to commit crimes

within a small geographic area and relatively close to home (Wright and Decker, 1997; Bernasco and Block, 2009), but likely abstain from committing crimes in a small buffer area around their homes, likely uncomfortable taking the risk of committing a crime so close to their home (Wright and Decker, 1997; Bernasco and Block, 2009; Wiles and Costello, 2000).

SALIENCE OF PLACE IN CRIME OPPORTUNITIES THEORIES

Focusing on the relationship between place attributes and crime is not new. However, criminology has traditionally focused on examining crime and associated attributes in large geographic areas. As early as 1829, Balbia and Guerry examined the variation of crime across French administrative areas, and they were surprised to find that the areas with higher property crime had higher levels of education (see Weisburd et al, 2009). In the 20th century, criminologists at the University of Chicago focused on communities and neighborhoods, presenting characteristics of social disorganization and poverty in the urban environment as explanations for crime problems in American cities (Shaw and McKay, 1942). This early research examining the relationship between crime and place set the foundation of the salience of place from a macro perspective, but more recent research theoretically driven by routine activities theory has noted the importance of places at a smaller level of analysis. These places have been referred to as microplaces and can be defined as street segments, blocks, or other smaller units of analysis falling within larger geographic areas, such as neighborhoods (see Sherman, Buerger, and Gartin, 1989; Sherman, Gartin, and Buerger, 1989; Weisburd, Bruinsma, et al, 2009). Sherman, Gartin, and Buerger (1989) note "focusing on variation across smaller spaces opens up a new level of analysis that can absorb many variables that have previously

been shunned as too obvious or not sufficient sociologically: the visibility of cash registers from the street, the availability of public restrooms, the readiness of landlords to evict problem tenants" (p. 29). This focus on the micro-place, grounded in routine activities theory, has become known as the "criminology of place" (see Weisburd et al, 2009; Sherman, Gartin et al, 1989).

Sherman, Gartin, and Buerger (1989) explain that places are defined by society by the way the places organize behavior and places can bring with them a specific connotation. For example, a place may be a facility, such as a church which presents a spiritual connotation. Or places can also be street segments or street corners, which comprise a number of facilities or buildings, such as public housing units. Sherman, Gartin, and Buerger (1989) explain a "place can be defined as a fixed physical environment that can be seen completely and simultaneously, at least on its surface, by one's naked eye" (p. 31). As described in relation to guardianship, these places can be regulated by those who use, frequent, or own them.

According to the opportunities perspective, the occurrence of crime at a place is dependent on the opportunities present at a place and an offender's perceptions of these opportunities. Crime pattern theory elaborates on routine activities theory in that it "links places with desirable targets and the context within which they are found by focusing on how places come to the attention of potential offenders" (Eck and Weisburd, 1995, p.7). As such, offenders are most familiar with the opportunities at places in their regular activity space, and these places are where they prefer to commit their crimes (Eck, 1993). According to offender-level research in the context of perceptual deterrence and offender adaptation, offenders may learn about place-based opportunities in a number of ways:

from personal observation, previous crime success, word-of-mouth from other offenders, and/or media reports (to name a few). Perceptions of the opportunities at place in general may be built over time, influencing their choice of regular crime appropriate places. This being said, according to the integration of routine activities theory and rational choice theories within a situation at a place, even a regular crime place, an offender will read the opportunities using the present environmental cues, to make their crime decision.

In the application of routine activities theory, the recipe for crime is dependent on the context of the crime; as such, the type of place examined is dependent on the type of crime being examined. For instance, the street segment, or a block face, is a unit of analysis that has been used to examine a number of different street level types of crimes, such as robbery, drug dealing, and prostitution (to name a few), as well as the social disorder activity for the study at hand (Smith, Frazee, and Davison, 2000; Weisburd et al, 2004; 2006). In this context, the street segment is perceived by residents as a representation of their neighborhood, including a "recurring rhythm of activity" (Smith et al, 2000; Taylor, 1997). The street segment also serves as a setting for environmental cues, which offenders use to determine the opportunities for crime at the place. The street segment and the buildings present on the segment provide the context for social cues representing the opportunities for crime. Social cues of opportunities for crime may be built from the social rhythm, types of social interactions, and social behavior in the area, such as a low level of pedestrian traffic, people loitering, or people playing a basketball game (see Bevis and Nutter, 1978; Beavon, Brantingham, and Brantingham, 1994; Perkins, Wandersman, Rich, and Taylor, 1993). The buildings and use of these buildings (e.g., bars, banks, apartments) provide offenders additional information about

the crime setting (see Perkins et al, 1993; Taylor, Koons, Kurtz, Greene, and Perkins, 1995). The physical design and accessibility of a place may also play into an offender's perception of crime opportunities (Johnson and Bowers, 2010; Van Wilsem, 2009). Even the level of physical incivilities of a place may shape an offender's perception of a place as a suitable place for crime, as a regularly targeted place within their activity space or even within a specific situation at that place (see Hunter, 1978, Wilson and Kelling, 1982; Kelling and Coles, 1996; Skogan, 1990).

The Relationship between Specific Characteristics of Place and Crime

Research on environmental factors provides guidance for how different place, street segments for the current study, characteristics may influence offender perceptions of crime opportunities and subsequently impact an offender's perception of a suitable crime setting. These factors include, but are not limited to, the way in which streets are networked and how easy these streets are to access, as well as the amount of people and traffic flowing through the street; the way the places are used by the public, for instance how the character of a segment with industrial buildings may be different than one with residences; the type of people who frequent the area by social economic status; and the upkeep of the area.

Street network, public flow, and accessibility. Street network design, including a street segment's location within the street network and the layout of the street segment, can influence its opportunity for crime and its crime rate (see Bevis and Nutter, 1987; Beavon et al, 1991; Perkins et al, 1993). Van Wilsem (2009) explains, "If a place is easily accessible, because of its position in the urban street network for example, a lot of people will visit that place, which increases the risk of offenders and targets converging"

(p. 200). Street segments that are more accessible to the public are better known by both residents and non-residents and are more likely to have higher burglary rates and increasing crime rates (see Bevis and Nutter, 1977; Johnson and Bowers, 2010; Beavon et al, 1994; White, 1990). Bus stops provide a means for offenders and targets to easily access specific streets and also provide a gathering place for potential targets and offenders on specific street segments (Brantingham, Brantingham, and Wong, 1991). The width and number of lanes of a segment may also impact opportunities for crime, since these segments are likely to have greater flow and convergence of targets and offenders (Perkins et al, 1993). It may also be the case that offending is less likely to be seen on streets with more lanes, which may also provide a greater ease of escape (Loukaitou-Sideris, 1999).

Place use. A number of studies have provided evidence of a variation in crime across place use settings, indicating specific types of places are more attractive for crime (see Perkins et al, 1993; Taylor et al, 1995). Sampson and Raudenbush (1999) explain, "...illegal activities feed on the spatial and temporal structure of routine legal activities (e.g., transportation, work, and shopping), the differential land use of cities is a key to comprehending neighborhood crime, and, by implication, disorder patterns" (p.610). For instance, it has been suggested non-residential street segments provide a greater number of targets and attract more offenders than residential street segments (Perkins et al, 1993). Certain types of buildings located in non-residential street segments, such as public service buildings (e.g., hospitals and schools), also may indicate a higher number of possible targets to an offender; these places have been shown to be related to higher rates of crime (see Roncek, 2000; Smith, 1996). Quite simply, places more attractive for non-

criminal reasons have a greater number of offenders and possible targets present, so they are more likely to have crime incidents.

Some specific types of places have been termed crime generators. For instance, places with bars or liquor establishments are attractive to victims and offenders and have higher rates of crime as compared to places without such establishments (Frisbie, Fishbine, Hintz, Joelson, and Nutter, 1978; Gorman, Speer, Gruenwald, and Labouvie 2001; Peterson, Krivo, and Harris, 2000; Roncek and Maier, 1991). Roncek and Maier (1991) explain that, "the patrons and the business have all of the components of target suitability...value, visibility, low inertia, and accessibility" (p.726). These locations and patrons are attractive targets for many reasons: the patrons and taverns are likely to have cash available; the patrons, likely affected by alcohol use, are prone to move at a slow pace; and the locations have other attractive goods. These bars or liquor stores often have inviting signs and displays and are easily accessible, especially if they do not have dress codes or a cover charge for entry (see Roncek and Maier, 1991, p.726; Frisbie et al, 1978, p. 223-224).

Socioeconomic status. The socioeconomic conditions of a street segment serve as another indicator to offenders of the suitability of targets. Felson and Boba (2010) explain that poor people make good targets, since they are more likely to carry a greater amount of cash and to have "light weight electronics as their best luxuries" compared to people from the middle class (p. 85). Felson and Boba (2010) also suggest that low income areas have less guardianship, since there are fewer "homeowners or long-term residents to watch over people, places, and things" (p.85). Higher property values have been found to be negatively associated with both soft and hard crime (see McCord,

Ratcliffe, Garcia, and Taylor 2007; Roncek and Bell, 1981; Roncek, 2000; Roncek and Faggiani, 1985; Roncek and LoBosco, 1983; Roncek and Maier, 1991).

Physical disorder. Physical disorder at place, also termed physical incivilities, may serve as an indicator to offenders that residents have little attachment to their neighborhood, symbolizing to offenders a lack of capable place guardianship (Bursik, 1988; Kurtz, Koons, and Taylor, 1998). Physical disorder items have been cited as a possible mechanism of social decline and decay of neighborhood social controls (see Hunter, 1978; Kelling and Coles, 1996; Skogan, 1990; Wilson and Kelling, 1982). The literature references a number of possible items which may be categorized as physical disorders or physical incivility measures. Skogan (2008) states that "in various studies, physical disorders included dilapidation, abandoned buildings, stripped and burned-out cars, collapsing garages, broken streetlights, junk-filled and unmowed vacant lots, litter, garbage-strewn alleys, alcohol and tobacco advertising, graffiti, and the visible consequences of vandalism" (p. 401).

<u>Place, Offender, and Crime – A Dynamic Relationship</u>

Offenders may be attracted to specific places due to the location of the place in relation to their routine activities area, the place characteristics, the offender characteristics, and even the offender's crime of choice. The relationship between offenders, their crime, and their place for crime is dynamic. Bernasco and Block (2009) tested what they term "a dynamic choice theory," measuring the relationship between attributes of the offender, the places they live, and the places they target. They (2009) find support for this model in the context of robberies, measuring types of places (businesses, schools) as crime attractors and collective efficacy (a measure of

guardianship) as a crime detractor. They (2009) also find that offenders restrict their movement dependent on the racial and ethnic make-up of places in addition to the travel distance of these places from their homes. In essence, offenders commit their crime at places that are easier for them to reach and for which they are more likely to have a level of familiarity – closer to their homes and of similar racial and ethnic make-up to the place in which they live. These types of places appear more attractive to offenders. Bernasco and Block (2009) explain that these findings "statistically verified previous ethnographic research on targeting decisions of robbers" (p.121).

In sum, this chapter has provided a review of the primary constructs of the opportunities perspective both generally and more specifically at place. The following chapter will provide a review of spatial displacement, including a theoretical explanation of how place-based opportunities explain these phenomena. Although there is a lack of research systematically testing place-based opportunities in the application of spatial displacement and diffusion, these theories have been referenced as supplying the most logically consistent explanation for these parallel spatial intervention effects.

Chapter 3: A Theoretical Review of Police Interventions at Place and Spatial Displacement and Diffusion of Benefits Outcomes

Considering the discussion in chapter two, the opportunity perspective provides a dynamic way of understanding the occurrence of crime at place. This chapter briefly reviews the practical application of opportunities within place-based policing strategies and subsequently brings focus to the possible parallel spatial effects of these focused strategies – spatial displacement of crime and diffusion of crime control benefits. In focusing on these parallel intervention effects, this chapter discusses the presence of spatial displacement and diffusion and highlights how the theoretical basis for these effects at place is nested in the opportunity perspective. The chapter continues with a discussion of the difficulty of measuring displacement and diffusion, criticizing past research for a lack of focus on a theoretically important unit of analysis – the street segment. Finally, the JCDDS is presented as a study of higher methodological quality, which has been used for two studies that touch upon opportunity constructs at the street segments level as important for understanding displacement of crime and diffusion of benefits to places proximate to an intervention.

PLACE-BASED CRIME PREVENTION AND INTERVENTION STRATEGIES

Recent research about the distribution of crime across small units of geography – such as the street segment – highlights an opportunity for crime reduction. This research has revealed that crime is not randomly distributed across the geographic landscape, but rather, it is clustered together at a small proportion of places (Sherman and Weisburd, 1995; Sherman, Gartin et al, 1989; Weisburd and Mazerolle, 2000). These high crime places are relatively stable over long periods of time (Weisburd, Bushway et al, 2004). In the context of a city setting, these hot spots are relatively small, such as an address, a

concentration of addresses, or a street block (see Block, Dabdoub, and Fregley, 1995; Green, 1996; Sherman, Gartin et al, 1989; Sherman and Weisburd, 1995; Taylor, 1997; Weisburd and Green, 1995a). These small units of geography are located within larger social environments (i.e., neighborhoods) or policing geographic units (i.e., beats). High crime street segments are spread widely across the city landscape and there is a clear heterogeneity of crime levels between street segments, even in busy city districts (Weisburd, Morris et al, 2009). In fact, a focus on place could have greater crime reduction benefits than a focus on individuals, since crime has a greater stability, a greater concentration, and is easier to predict at place than it is among individuals (see Bushway, Thornberry, and Krohn, 2003; Horney, Osgood and Marshall, 1995; Sherman, 1995; Nagin, 1999; Weisburd, 2008; Weisburd, Bushway et al, 2004).

These simple, yet significant, findings about the distribution of crime at place reinforce that there is something about "place", above and beyond the individual, which may explain crime. Cohen and Felson's (1979) research, and numerous studies since, has illustrated that the criminal opportunities at place, the convergence of a motivated offender and suitable target in the absence of a capable guardian, are significantly related to victimization at place (Weisburd et al, 2010; Weisburd, Morris et al, 2009). The theoretical research within the opportunity perspective has been embraced and reinforced in place-based crime-prevention and reduction strategies, including situational crime prevention and place-based policing techniques.

Place-Based Policing Techniques

In contrast to random patrol of the professional era of policing, present placebased policing techniques are built on the assumption that opportunities are not randomly

distributed across the geographic landscape. Instead, opportunities and crime clusters at a small proportion of places, called hot-spots, providing police agencies a relatively small area for focus. A number of proactive policing techniques focus on place and may be considered under the hot-spots policing umbrella; including but not limited to problemoriented policing, broken windows policing, community policing, and even general hotspots policing, which employs an increase in traditional policing techniques of arrest and patrol at specific places. The transition to a place-based crime focus is *not* about merely geographically deploying police resources, but rather about how police may understand and most optimally address this crime geographically. At their core, place-based policing techniques are "theoretically based on routine activities theory" (see Weisburd et al, 2010). All of these place-based policing techniques in some way change the opportunities for crime at place, impacting an offender's decision to commit crime at that place. Place-based policing techniques commonly draw upon situational crime prevention techniques, which focus on understanding the situational context of crime, including the place, the offender, and the opportunities involved in the crime (Clarke, 1997; Clarke and Cornish, 1985, 2001). By understanding and subsequently changing one of these elements (i.e., an opportunity at place) the situational prevention technique may impact the offender's decision to commit the crime, thereby curbing offending.

These place-based policing techniques focus on relatively specific high crime places, spurring police organizations to understand the differential distribution of crime and opportunities across their jurisdictions and allocate their resources as such. This shift in the geographic perspective of police organizations has paralleled an increase in police agencies' crime analysis capabilities and organizational management and accountability

strategies (i.e., CompStat, Stratified Model of Problem Solving and Accountability²), which are based on proactively understanding and addressing the opportunity constructs underpinning crime problems in general and at place (Boba, 2011; Boba and Santos, 2011; Weisburd and Lum, 2005; Weisburd, Mastrofski, McNally, and Greenspan, 2001). Although anecdotal, many police executives have credited this "smarter" way of policing as the reason for the recent drop in crime across urban jurisdictions (Kelling and Sousa, 2001; Zimring, 2006).

Hot-spots policing techniques have been the subject of relatively supportive evaluation research, as reported by a number of rigorous reviews (for reviews see Braga, 2001, 2005, 2007; Weisburd and Eck, 2004). In 2004, the National Research Council Committee to Review Research on Police Policy and Practices published these findings: "...policing crime hot spots has become a common police strategy for reducing crime and disorder problems. While there is only preliminary evidence suggesting effectiveness of targeting specific offenders, a strong body of evidence suggests that taking a focused geographic approach to crime problems can increase the effectiveness of policing" (p. 35). Although traditional policing strategies focused at place have been found to be effective, there is evidence that strategies with an increased focus on changing opportunities for crime may result in greater reductions in crime. In a randomized experiment, Braga and Bond (2008) found evidence that place focused implementation strategies akin to traditional policing strategies were effective in reducing crime and disorder at place; however, those strategies incorporating situational techniques, rather than misdemeanor arrests or social service strategies, had the greatest crime and disorder

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² For additional information on the Stratified Model of Problem Solving and Accountability see Boba (2011) and Boba and Santos (2011).

reductions. In sum, focusing on changing the opportunities for crime at place has become a widely supported strategy within police practice, with convincing evidence of objective deterrence effects at place.

SIDE EFFECTS TO PLACE-BASED POLICING: DISPLACEMENT OF CRIME AND DIFFUSION OF BENEFITS

Place-based policing techniques have come a long way – theoretically and practically – from random patrol, the optimal policing techniques of the professional era of policing (1960s). Random patrol was based on the assumption that opportunities for crime were plentiful across the city landscape. As such, changing these opportunities at a specific place would merely result in "driven" offenders committing their crime through different means, such as changing the place they commit their crime (Repetto, 1976). With the idea that opportunities for crime were everywhere, agency resources were allocated to specific geographic areas dependent on the population totals and density in those areas (Thurman, Zhao, and Giacomazzi, 2001).

As place-based policing techniques have developed and become widely accepted, the assumptions of the traditional policing model of random patrol have not faded away. Critics of place-based policing techniques (and situational crime preventions techniques more generally) continue to state that *driven* offenders will just adapt to focused interventions; merely changing the means in which they conduct their business (see Guerrette and Bowers, 2009; Repetto, 1976; Weisburd, Wyckoff et al, 2004, 2006). The common term for this offender adaptation outcome is displacement of crime.

relocation of a crime from one place, time, target, offense, tactic, or offender to another" (Guerette and Bowers, 2009, p. 1333; also see Repetto, 1974).³

In the empirical research, the most widely discussed place-based offender adaptation outcome is spatial displacement (Guerette and Bowers, 2009), which is also the focus of the research at hand. Quite simply the idea behind spatial displacement is that once the opportunities for crime are changed in a regular place of crime activity (e.g., hot spot), offenders will simply move their crime activity to another place. The possibility of crime activity simply moving to a new location in reaction to place-based interventions has been noted as a "critical flaw" to the success of place focused crime reduction strategies. If spatial displacement occurs at a high level, this intervention side-effect may erode the applicability of the currently popular place-based policing techniques. Research on displacement has found little evidence of spatial displacement and greater evidence of diffusion of crime control benefits to places proximate to the targeted places, reinforcing a place-based police focus (Bari and Pease, 1990; Eck, 1993; Guerette and Bowers, 2009; Hesseling, 1994).

The Net Intervention Effects Considering Spatial Displacement of Crime and Diffusion of Benefits

There is a wealth of research literature examining the presence of the spatial displacement of crime (see Barr and Pease, 1990; Weisburd, Waring, Mazerolle, Spelman, and Gajewski, 1999; Eck, 1993; Guerette and Bowers, 2009; Hesseling, 1994; Weisburd, Wyckoff et al, 2004, 2006). Research in the 1970s found evidence of crime

³ In a review of the research on displacement of crime and diffusion of benefits Guerette and Bowers (2009) found "temporal displacement was most commonly observed (36 percent), followed by target (33 percent), offense (26 percent), spatial (23 percent), and tactical (22 percent)" (p. 1346). While perpetrator displacement was rarely studied and only found once out of the two instances it was investigated.

displacement to other places; however, over the past two decades research employing improved scientific methods has found little evidence of spatial displacement due to focused initiatives (Braga et al, 1999; Chaiken, Lawless, and Stevenson, 1974; Lateef, 1974; Mayhew, Clarke, Sturman, and Hough, 1976; Weisburd, Wyckoff et al, 2006; Ready, 2009). Although spatial displacement may occur proximate to or distally from the targeted area, studies have focused on examining proximate displacement. As compared to distil displacement, proximate displacement is considered more likely, since research on offender travel patterns has found offenders are unlikely to travel great distances from their normal routine activities areas (Brantingham and Brantingham, 1999; Eck, 1993). Work focused on proximate spatial displacement has predominantly found place-based interventions are more likely to result in the reverse of displacement, a diffusion of their crime-control benefits to proximate places (Braga et al, 1999; Chaiken et al, 1974; Lateef, 1974; Mayhew et al, 1976; Weisburd, Wyckoff et al, 2004, 2006; Ready, 2009). In this case the intervention results in "the spread of the beneficial influence of an intervention beyond the places which are directly targeted" (Clarke and Weisburd, 1994, p.169). The prevailing orthodoxy at this point remains that: "First, there is little evidence of crime prevention strategies that displaced as much crime as was prevented (displacement equal to 100 percent). Second, displacement, when it occurred, is usually less than the amount of crime prevented (displacement less than 100 percent but greater than 0 percent). And, third, for crime prevention evaluations that reported on displacement, the most common finding was that there was no evidence of displacement (displacement equal to 0 percent)" (Weisburd, Wyckoff et al, 2006, p. 556).

Although spatial displacement may be rare and there is greater evidence of spatial diffusion of benefits, spatial displacement has still been found to exist. In a recent comprehensive review of 102 studies examining displacement and diffusion in situational crime prevention evaluations, Guerette and Bowers (2009) found 272 observations that examined parallel spatial effects (47% of the total observations). Of these observations 23% reported spatial displacement, while 37% reported diffusion of crime control benefits. They note, however, that "analysis of 13 studies, which allowed for assessment of overall outcomes of the prevention project while taking into account spatial displacement and diffusion effects, revealed that when spatial displacement did occur, it tended to be less than the treatment effect, suggesting that the intervention was still beneficial" (p. 1331-1332).

To this point the majority of the systematic, quantitative research investigating spatial displacement and diffusion has focused on determining the *net* intervention effects, considering the places proximate to intervention areas, termed the catchment areas. A large proportion of this research has suggested spatial displacement is rare. There has been relatively little research on understanding the reason for these effects. The research that has sought to understand these effects is primarily qualitative, drawing upon offender interviews and ethnographic work, and points to the place-based opportunities as a theoretical basis for spatial displacement and diffusion at place. The following section provides an overview of this theoretical understanding.

<u>Understanding Spatial Displacement and Diffusion: The Possible Causal Mechanisms</u>

Qualitative research employing an inductive analysis process has been the primary method for determining the causal mechanisms underlying the spatial

displacement and diffusion processes (Brisgone, 2004; Holt, Blevins, and Kuhns, 2008; Ready, 2009; Weisburd, Wyckoff et al, 2004, 2006). These few studies have investigated offenders' adaptation processes, which may have the end result of spatial displacement (Brisgone, 2004; Holt, Blevins, and Kuhns, 2008; Ready, 2009; Weisburd, Wyckoff et al, 2004, 2006). Using this qualitative research as a base and pairing this work with findings from quantitative studies focused on crime and place more generally, the current theoretical understanding of the displacement and diffusion process falls within an integration of routine activities theory and rational choice theory. This section provides an explanation of this theoretical understanding, beginning by describing how an offender may perceive an intervention which may spark them to adapt their offending activity (resulting in an outcome of spatial displacement or diffusion). This is followed by a review of our present understanding of the processes which result in spatial displacement or diffusion.

Perception of an intervention. In order to understand offender movement as a result of an intervention, the first aspect to understand is an offender's perception of the intervention. Offenders may learn about the intervention through word of mouth, media reports, or personal observation. Once an offender is aware of an intervention, it is the perception of the intervention which becomes important. Although not specified in the displacement and diffusion literature, the literature on perceptual deterrence describes deterrence as a social psychological process of threat communication in which deterrence is a result of an individual's subjective assessment of the risks, costs, and benefits of punishment (see Geerken and Gove, 1975; Paternoster, Saltzman, Waldo, and Chiricos, 1985; Piquero and Paternoster, 1998). The offender's perception of the risk from the

intervention may influence an offender to adapt their offending, move their crime location, or reduce or end their commission of crime. This decision is "bounded" by the information the offender has about the intervention, which may be flawed or inaccurate – termed "bounded rationality" (see Clarke and Cornish, 2001; Johnson and Payne, 1986; Simon, 1991). Thus, an offender's flawed perceptions of an intervention provides the spark in an offender's decision making process, possibly resulting in a deterrence effect in the catchment area and subsequently parallel spatial intervention effects.

In the Jersey City Displacement and Diffusion Study (JCDDS), Weisburd, Wyckoff, and colleagues (2004) provide evidence of an intervention by presenting an increase in officer initiated calls for service in the target areas, relative to the catchment areas. This information provides evidence that the overall general deterrence found in the target area is from the intervention, but this does not fully explain offenders' perceptions of the intervention. Interviews of offenders in the target areas and ethnographic field work provide evidence that offenders are aware of the intervention and have their own perceptions of the intervention. For instance, an offender arrested stated:

...lately Narcotic come around Monday and Thursday and someone is going to get arrested on those days...that is a sure bet. On these days I just stay underground until the cops go home because I'm not stupid. When the cops are around I stay underground until they leave to go home, then I come out. The rest of the days there are just regular cops. They know me and they don't arrest you. As opposed to narcotics that come and rip things up (Weisburd, Wyckoff et al, 2004, p. 135).

Ethnographic work in the JCDDS also provides evidence that the intervention was a threat that could make offending in the target area no longer worth the risk, finding that "nine of forty-nine prostitutes interviewed in the ethnographic research claimed that they had decided to stop criminal activity altogether" (Weisburd et al, 2006, p.582; also see

Brisgone, 2004). For example, one prostitute who desisted as a result of the intervention explained:

I was tired of being tired. Sick of running. Then it started to scare me. It seemed like there would be stings (police roundups) constantly. I got scared of going to jail. I got tired of hurting my mother – letting her watch me do the things I did. She hated the fact that I worked the street. I got tired of hurting my family in general. I started to dislike myself. I started getting scared. I had a fear in my heart that I was going to die. I felt someone was going to kill me or I would do something terrible to get locked up for a long time . . . I was at the point. I was over the edge. I didn't know how I was doing this job. I had been told that I had a warrant. I didn't want to do it (prostitution) anymore. Or my drug habit anymore (Brisgone, 2004, p. 205).

The JCDDS qualitative research illustrates that a great number of offenders interviewed do indeed have their own perceptions of the intervention and these perceptions are used to make a decision about adapting to the intervention.

Barriers to spatial displacement. Aware of an intervention, one possible barrier to offender adaptation which would result in spatial displacement is that offenders have a great attachment to their routine and familiar places of crime. As previously reviewed, offenders prefer not to move far from their normal market area or crime place (see Weisburd, Wyckoff et al 2004, 2006; Ready 2009). Research on offender movement patterns more generally illustrates that offenders commit crimes at places in which they are familiar. These places are likely to be located in a small activity zone, be relatively close to their home, and provide the most opportune place for their choice to commit crime (Brantingham and Brantingham, 1999). Interviews from the JCDDS reveal that many of the prostitutes and drug dealers lived relatively close to the target area (Weisburd, Wyckoff et al, 2004).

In the context of displacement, research has suggested places further from the target area are less likely to evidence displacement of crime, which Bowers and Johnson

(2003) have termed a displacement gradient. Bowers and Johnson (2003) hypothesize that displacement is more likely to take place in close proximity to the targeted area, since adapting offenders are more familiar with these places. This was the case in the Jersey City Displacement study in which offenders who reported moving their commission of crime did so to areas quite close to their place of regular crime activity (Weisburd, Wyckoff et al, 2004). Traveling a greater distance requires an increase in effort for their crime. As well, as offenders travel a greater distance their familiarity with the areas decrease, termed familiarity decay (Eck, 1993). If these unfamiliar areas happen to have opportunities for the offender's crime, these opportunities are less familiar to the offender, so an offender's perceived risk will be greater in these unfamiliar places.

Offender interviews from the JCDDS suggest that familiarity and travel distance (ease) are not the only reasons for attachment to a place, but offenders adopt a place for their work based on the specific opportunities in that area. Over time offenders create a routine of "doing business" in familiar targeted places, making the place comfortable for their crime activity. So there may be a number of places within their routine activities area which they may choose for crime, but it is the opportunities presented in the context of a specific place which make it opportune for their crime location. For instance, a prostitute in the JCDDS "explained that people work in the area because it is quiet and spaced out enough so that you can work alone or meet up and talk for a few minutes" (Weisburd, Wyckoff et al, 2004, p. 130). An offender's regular targeted area may contain attributes signifying a specific balance of opportunities, such as a lack of guardianship or presence of patrons or victims, which makes the area an attractive crime

place. Such an example is provided by Ready (2009) in his description of the prostitution target area: "the physical layout of the site provides the necessary isolation to meet and negotiate with johns; the scarcity of households and businesses shields the offenders from neighborhood interference; and the geographic location of the target area offers access to commuters and a place to sleep and use drugs" (p. 157).

Another barrier to displacement is the lack of the availability of an alternative crime location for the specific *type* of crime an offender may be accustomed to committing. As implied by the opportunities perspective, if a type of crime at a specific place is dependent on the opportunities available at that place, it is likely that the movement of crime to other places, or even the reduction of crime at other places, would be dependent on the opportunities available for that *type* of crime at these alternative types of places. As such, the spatial displacement of this type of crime will depend on the opportunities present at proximate street segments. For instance, a residential burglary crime is unlikely to move to a street segment dominated by vacant lots, where there is no opportunity for residential burglary.

Compared to their familiar crime place, offenders may have difficulty finding an alternative place with the appropriate opportunities for the *type* of crime they are attuned to committing, a setting in which they are comfortable to commit the crime, and an environment that provides the ability to commit the crime in a familiar fashion. In the context of a market crime (e.g., drugs or prostitution), leaving their target area, in which they have a social network of customers and established co-workers or competitors, will mean going to another place in which the same opportunities are not likely to be present and the market may differ (Weisburd, Wyckoff et al, 2004; Ready 2009). Ready (2009)

mentions that drug dealers may not consider spatial displacement "because of their extensive familiarity with the target area and the difficulties relating to finding a suitable alternative habitat for sustaining the drug trade" (p. 170). In the JCDDS (Weisburd, Wyckoff et al, 2004) prostitutes mentioned an alternative prostitution area in which they were not as comfortable, describing this market "as faster, with hotel rooms, fewer regulars, and not as many drugs" (p. 130). In contrast to this other market, the targeted prostitution market had regular prostitutes and customers, but also "reportedly had[s] plenty of drugs and allowed[s] for a more laid-back atmosphere" (p.130). Understanding how spatial displacement may result from offender movement from one place to another requires a consideration of both the present crime area and the possible new area, for if an offender finds a new possible crime area, they must consider the effort to travel to the new area in conjunction with other perceived risks, benefits, and efforts of that area, all in comparison to the perceptions of these elements in their own familiar target area.

Even if an offender is somewhat familiar with another location and aware the area has the opportunities for their criminal enterprise, this other location could carry with it greater perceived risk. Other places may have defined markets or even similar routines as the offender's regular target area; however, these places may also be claimed by other offenders, another barrier to spatial displacement (Weisburd, Wyckoff et al, 2004; Ready, 2009). A dealer from the JCDDS explained, "You really can't deal in areas you aren't living in, it ain't your turf. That's how people get themselves killed" (Weisburd, Wyckoff et al, 2004, p. 137). A prostitute from this same work explains, "As long as you stay on your turf with your customers, no one bothers you" (Weisburd, Wyckoff et al, 2004, p. 129). Offenders must consider this risk of entering other offenders' territories

when deciding if they should move their offending from the targeted area to a new market place.

Evidence of spatial displacement. Although relatively rare, qualitative research has presented evidence of spatial displacement. Offenders faced with the choice of moving their crime to another location consider the availability of targets in other areas as well as the guardianship over these targets in their decision to move to alternative crime locations (see Weisburd, Wyckoff et al, 2006). In a study using posts to web forums from clients of sex workers, Holt and colleagues (2008) present specific examples in which offenders posted their knowledge of police interventions in targeted prostitution markets and named which other markets provided the opportunity to move their activity. Work from the JCDDS suggested few prostitutes and drug dealers moved their criminal activity; in these cases, the offenders moved to areas in which they were familiar, a relatively short distance from their regular crime place. Interviews of drug offenders from the Jersey City Displacement Study also reveal that although movement was generally hampered due to understood territories, offender movement still existed as part of a natural competition in the market.

It is the nature of this competition that reduces the amount of movement of groups. However, this does not mean that groups do not attempt to encroach on each other's territory. One dealer states that there are fights a few times a month "if one block is booming and the other isn't" (Weisburd, Wyckoff et al, 2004, p. 137).

In other words, offenders may still choose to move to other markets, optimizing that the benefits of moving will outweigh the efforts to move, the risks brought from the unfamiliarity with the territory, as well as other offenders protecting their "turf."

Other displacement techniques. Overall, most likely due to the barriers to spatial displacement, qualitative studies have found little spatial displacement as compared to other types of displacement adaptation techniques (i.e., temporal, method, target) (see Weisburd, Wyckoff et al, 2004, 2006; Ready 2009). Offenders are more apt to change their method of crime, remaining in their geographic place of comfort, rather than change their crime location. Ready (2009) stated that as compared to other types of displacement adaptation processes, spatial displacement was the last possible type of adaptation choice among offenders "because of the difficulty of finding a suitable alternate location and the offenders' intimate knowledge of the physical layout and social organization of the existing habitat" (p. 165). Weisburd and colleagues (2006) note that even in the cases in which offenders displace using other crime adaption techniques, the frequency of their offending is still reduced by the intervention.

Understanding spatial diffusion of crime. Qualitative work has not been as clear in explaining the process of spatial diffusion of crime control benefits, the reduction of crime in areas outside the target area due to the intervention, as it has spatial displacement of crime. A primary reason for the lack in the understanding for this process is that spatial diffusion of benefits is more difficult to study at the offender level. However, three possible causal processes have been traditionally presented as explanations for spatial diffusion of benefits, including deterrence, discouragement, and incapacitation (Clarke and Weisburd, 1994; Weisburd et al, 2006). Recently, Weisburd and Telep (forthcoming) suggest another causal process: a diffusion of social control. Similar to the processes underlying spatial displacement, these explanations for spatial diffusion also fit in an integrated rational choice-opportunities framework.

An incapacitation effect has been cited as the least likely reason for spatial diffusion. Applying routine activities theory in this context, if offenders are incapacitated there are fewer offenders present, resulting in fewer crimes overall (in the targeted and surrounding areas) (Weisburd et al, 2006; also see Ratcliffe and Makkai, 2004). This possible effect was noted in the Jersey City Displacement and Diffusion Study, but was discounted since the majority of offenders arrested were imprisoned for relatively short periods (Weisburd et al, 2006). In addition, an incapacitation effect would be unlikely for crime reduction strategies that rely primarily on changing opportunities in the area, rather than arresting offenders (see Clarke and Weisburd, 1994).

Deterrence and discouragement are cited as more salient explanations for the spatial diffusion effect (see Clarke and Weisburd, 1994). In the case of deterrence, Weisburd and colleagues (2006) suggest that offenders' rationality may be bounded by their limited information of police interventions, giving them an unclear understanding of the geographic scope of the interventions (for an explanation of bonded rationality see Johnson and Payne, 1986). As such, offenders perceive an increase in risk of apprehension in areas outside the targeted site, deterring them from committing crimes both in the targeted area and in the surrounding areas. As reported in an earlier example, the JCDDS ethnographic work revealed that 9 of 49 prostitutes desisted from crime altogether, which would create a deterrent effect from these specific offenders who might have committed crimes inside and outside of the intervention areas (see Brisgone, 2004; Weisburd et al, 2006).

Diffusion may also be due to a discouragement effect; offenders do not commit criminal acts in areas outside of the targeted intervention areas because they perceive an Unfortunately, direct measures of discouragement are not available. However, Clarke and Weisburd (1994) point to an example of this in Pease's (1991) evaluation of a crime prevention strategy at a public housing development. In this case, coin fed electrical meters, a common offender target, were replaced only in homes that had been victimized; yet, all of the homes in the estate had a crime reduction benefit (Pease, 1991). Clarke and Weisburd (1994) explain that potential burglars were discouraged because "[T]they could no longer be sure of finding a meter containing cash without expending a great deal of additional effort" (p. 173). In sum, spatial diffusion due to discouragement specifies that a targeted intervention may result in a reduction of criminal events even if the perceived risks of arrest in the locations outside the target area remain constant, because the perceived efforts to commit the crime may increase and the perceived benefits for committing the crime may decrease.

In a recent article summarizing the theoretical foundation of displacement and diffusion, Weisburd and Telep (*forthcoming*) present an additional spatial diffusion mechanism nested in social control theory. Weisburd and Telep (*forthcoming*) draw upon work in the context of drug crime and disorder by Kleiman and Smith (1990) to suggest that a police intervention may result in a "sense of community empowerment [which] could spread beyond areas directly targeted by the police" (p. 16). They continue to explain that the increase in social control in the target area may result in a more general decrease in crime across a larger area, viewed as a diffusion of benefits. Pointing to work conducted by Mears and Bhati (2006), Weisburd and Telep (*forthcoming*) explain that an initiative focused on reducing disadvantage may result in benefits

diffusing to areas outside the initiatives through peoples' social ties. Finally, Weisburd and Telep (forthcoming) point to two other studies which focused on improving the economic framework in the targeted areas. First, they cite research by Zielenbach and Voith (2010), which focused on redeveloping the public housing projects in the targeted area. Then, they detail a study by Thomas (2008), which examined the "public investment to improve a small number of homes or buildings in an area" (Weisburd and Telep, forthcoming, p.18). In both of these cases the authors point to economic improvements outside the target areas as evidence of spatial diffusion of benefits (Weisburd and Telep, forthcoming). They explain that "when residents see some public investment in their community they are motivated to invest their own resources...as a result of this positive externality for the neighborhood" (p. 18). These new explanations for spatial diffusion suggested by Weisburd and Telep (forthcoming) can also be integrated into the rational choice and routine activities theory framework, since the increase of social cohesion in the area may positively influence guardianship and subsequently decrease the perceived opportunity for crime in the areas proximate to the intervention areas.

In sum, the causal process by which a targeted intervention may result in spatial displacement of crime and diffusion of crime control benefits has been explained through primarily qualitative work consisting of offender interviews and ethnographic work.

Similar to macro level displacement studies, this work has found spatial displacement to be a rare occurrence and other types of offender adaptation techniques to be more commonly used. Although spatial diffusion of crime control benefits is more difficult to study from the offender level, causal mechanisms for spatial diffusion have been

presented. The causal mechanisms for both spatial displacement and spatial diffusion fall under the same broad theoretical integration, an integration of rational choice theory with opportunities theory. In a review of the literature, there were virtually no systematic tests of place-based opportunities in the context of spatial displacement and diffusion, with the exception of two studies which touch upon opportunity constructs at place, which will be reviewed later in this chapter. A legitimate reason for this gap in the displacement and diffusion research is the complexity of accurately measuring these phenomena, which will be reviewed in the following section.

ACCURATELY MEASURING DISPLACEMENT AND DIFFUSION

A barrier to examining the relationship between opportunities and spatial displacement and diffusion is the complexity in measuring spatial displacement and diffusion effects. Although the discussion of appropriate measurement techniques has focused on measuring these parallel spatial intervention effects with the idea of determining a *net* intervention effect considering large geographic areas proximate to the targeted intervention area, much of this discussion may also be applied to measuring these effects at a smaller unit of analysis, such as the street segment. This being said, it can be argued that the ongoing discussion of the improvement of measuring *net* intervention effects has provided a defined path for scientific inquiry in the realm of these parallel intervention effects, a train moving on a pre-defined track, which has prevented researchers from switching tracks to truly understand these effects considering place. The following section reviews the primary measurement topics in relation to displacement of crime and diffusion.

Weisburd and Green (1995b) ignited an active discussion of the accurate means to measure parallel intervention effects. They suggest, although not always optimal, measuring displacement and diffusion effects should begin with a focus "specifically on these phenomena" (Weisburd and Green, 1995b, p. 358). In a seminal article Weisburd and Green (1995b) explain that many studies of the parallel spatial intervention effect were designed to fail because they measured these intervention side effects as a research afterthought, with measurement considerations and limited research resources focusing on the intervention target areas rather than on directly measuring intervention side effects (Weisburd and Green, 1995b). Weisburd and Green (1995b) used the completed "Minneapolis Hot Spots Experiment" as a working example of the pitfalls of a retrospective study of parallel intervention effects. For this examination Weisburd and Green (1995b) drew two block boundary areas around the study hot spots to serve as spatial displacement and diffusion catchment areas, but they found that the catchment areas overlapped with other catchment areas and in some cases target areas, resulting in competing areas of measurement and confounding effects (for additional information on the original "Minneapolis Hot Spots" experiment see Sherman and Weisburd, 1995). Weisburd and Green (1995b) also examined the level of crime in the retrospectively drawn catchment areas and found these crime levels to be either too high or too low, making it statistically difficult to detect significant crime changes. These findings illustrate in order to proactively measure parallel spatial intervention effects, Sherman and Weisburd (1995) would have had to sacrifice some of the internal validity of their study's primary measurement subject – direct intervention effects due to hot spots policing (Weisburd and Green, 1995b).

Weisburd and Green's (1995b) seminal piece suggested that studies of spatial displacement and diffusion should be planned and executed with focusing on these effects as the primary research topic. They (1995b) also suggested a methodology for choosing catchment areas for measuring these effects. To prevent confounding the intervention measures with the parallel spatial effects measures, these areas should not overlap with other intervention target areas (Weisburd and Green, 1995b). In addition, catchment areas should be chosen considering "problems and places that provide sufficient numbers of cases in target and catchment area for statistically powerful analysis" (p. 358). Building on this work, Bowers and Johnson (2003) point out that "if a buffer zone is too small then the levels of crime in that area are likely to fluctuate in an erratic and statistically unreliable way, which would mean that the data generated would not be suitable for analysis" (p. 280). Bowers and Johnson (2003) also point out that the choice of the catchment areas should be made considering the presence of physical boundaries which may serve as barriers to crime opportunities, since these barriers may unreasonably affect offenders' perceptions of risk and impede displacement (Bowers and Johnson, 2003). Interestingly, this requirement of catchment area choice, raised by Bowers and Johnson (2003), is a salient one, which receives little attention in discussion of catchment areas. In this case Bowers and Johnson (2003) are referring to physical boundaries around a target area, akin to a moat with alligators around a castle, but considering the context of the phenomena being measured it is surprising that other opportunity measures are not considered in this discussion. This detail once again points to the dearth of attention placed on more fully understanding these processes as compared to focusing on measuring the *net* intervention benefits.

Another consideration when measuring parallel spatial effects is controlling for secular trends, which is important in that the majority of spatial displacement and diffusion studies have focused on net intervention effects. These effects would be biased if secular trends are not considered (see Guerette and Bowers, 2009; Bowers and Johnson, 2003). To control for these secular trends, recent studies have incorporated comparison areas (Guerette and Bowers, 2009; Bowers and Johnson, 2003; Weisburd et al, 2006). In their review, Guerette and Bowers (2009) suggested that comparison areas should be "smaller, more tightly defined" since larger areas may "'dilute[d]' the displacement effect" (p. 1353). They (2009) also suggest that in addition to choosing comparison target areas researchers should choose comparison catchment areas, paralleling the focused target and catchment areas of the study. Guerette and Bowers (2009) believe this methodology may provide more accurate control measures for secular trends.

Carefully considering how to most accurately measure the *net* benefits of an intervention while considering spatial displacement and diffusion, Bowers and Johnson (2003) present a "weighted displacement quotient" (WDQ), a formula that considers the changes in the proportion of crime in a target area compared to catchment areas and control areas. This equation provides a single number representing the presence of either displacement, diffusion, or no parallel spatial effects. The equation compares the proportion of crime change in the target area to the catchment areas while attempting to control for secular trends from comparison areas. The utility of the WDQ was presented by Bowers and Johnson (2003) using burglary incidents and by Guerette and Bowers (2009) in a systematic review of studies examining parallel effects of situational crime

prevention, quantifying 19 studies. Although this equation is a uniquely attractive way to determine net intervention effects, Weisburd and Telep (*forthcoming*) explain that displacement and diffusion may occur in the catchment areas despite the intervention effects in the targeted area, and in these cases the WDQ may not be the most appropriate means to quantify net intervention effects. Finally, Bowers and Johnson (2003) point out, that the WDQ was "developed to answer the question of whether or not geographical displacement or diffusion of benefits may have occurred rather than to quantify in absolute terms the extent to which either was the case" (Bowers and Johnson, 2003, p. 286). As such, the WDQ does not provide the best means for understanding the differential distribution and variability of spatial displacement and diffusion effects across places proximate to the intervention area.

Even with all of these measurement considerations presented, it still remains difficult to assure that any crime changes in the catchment areas are directly credited to an intervention in a target area. A limited number of studies have drawn on a time series design, using the time order causation assumption to strengthen their argument of the validity of displacement or diffusion effects in catchment areas (Lawton, Taylor, and Luongo, 2005; Ratcliffe and Makkai, 2004; Weisburd, Wyckoff et al, 2004, 2006). Using this design, if the catchment area increases in crime at the same time the target area decreases, this is a sign of spatial displacement due directly to the intervention (see Eck and Spelman, 1987; Weisburd et al, 2006; Bowers and Johnson, 2003). Bowers and Johnson (2003) are critical of this approach, stating that offenders may have a lag in their adaptation to an intervention, delaying spatial displacement effects. This being said, the JCDDS (Weisburd, Wyckoff et al, 2004, 2006) showed little evidence of a lag in

displacement and diffusion effects to large geographic areas; this study overwhelmingly found that diffusion effects paralleled the timing of intervention effects.

The literature on the measurement of these phenomena has given little attention to the consideration of the outcome measure used to examine displacement of crime and diffusion of benefits. Weisburd, Wyckoff, and colleagues (2004) explain that "the amount of displacement depends, in part, on the crime or disorder being prevented" (p. 13). If this is the case, the outcome measures should be dependent on the focus of the intervention. How the outcome measure is captured is also important for accurate findings, especially considering the perils and pitfalls of measuring crime through official data sources (see Boba, 2009). Therefore, as compared to drug crime, crimes with higher reporting rates, such as residential burglary, become attractive for studying parallel spatial intervention effects (see Guerette and Bowers, 2009). As well, recent research has employed social observations of places proximate to target areas to capture street level social disorder activity and crime, especially in the context of market crimes, such as drugs or prostitution, which are more difficult to capture through official data sources (see Braga and Bond, 2008; Weisburd et al, 2006).

Perhaps because past research on spatial displacement and diffusion is overwhelmingly focused on the *net* benefits of these interventions, there has been little discussion about the variability of these effects over the span of the intervention in general or more specifically at place. This is surprising considering hot-spots research has illustrated variability in objective deterrence in the targeted areas over the course of interventions, suggesting variability in offending across the span of the intervention (see Nagin, 1998; Sherman and Rogan, 1995a; Smith, Clarke, and Pease, 2002). In addition,

Smith, Clarke, and Pease (2002) found a pre-intervention crime decline in targeted areas, termed anticipatory benefits, and credited this decline to offenders' perceptions of the presence of an intervention in the area prior to the official start of the intervention. These findings of variability of intervention effects suggest variability across the span of the intervention should be considered in measuring parallel spatial intervention effects.

Another reason to examine these processes across the span of the intervention is due to the theoretical processes used to explain offender adaptation (integrating rational choice and routine activities theory). These theoretical processes suggest that as an intervention unfolds offenders become more familiar with the scope of an intervention or even a new crime location, which influences where they choose to commit crime (in the target area or alternate location). As such, places may have different spatial displacement or diffusion outcomes dependent on the period of the intervention (e.g., beginning, middle, end of intervention).

The measurement considerations reviewed above are the ones most salient in the literature examining parallel spatial effects. Guerette and Bowers (2009) note that "many challenges remain for future research in this area, primarily because of the inherent complexity of fully measuring the movement of crime, which requires more appropriate methodological designs" (p. 1358). Although these effects are difficult to measure, many studies have taken on this challenge. However, these studies have predominately measured these phenomena to large geographic units of analysis, focused on determining the *net* benefits of the intervention in consideration of spatial displacement and diffusion effects (2009). Additionally, studies have paid relatively little attention to the differential distribution of parallel spatial intervention effects across study areas. Guerette and

Bowers (2009) point out that even within carefully chosen proximate areas "displacement and diffusion may coexist," stating "that an extra layer of complexity might be necessary in examining spin-offs or side effects of a scheme" (p. 1353). It seems that if these outcomes co-exist, there may be something more to understand about why these outcomes co-exist. Yet, studies still primarily focus on measuring the *net* displacement or diffusion effects within large geographic areas. In fact, reliance on these large areas could water down differential displacement and diffusion outcomes. Over a decade ago, Weisburd and Green (1995b) explained that if we have "a diffusion-of-benefits effect and a displacement effect of equal measure, then we would observe no change in the displacement catchment area" (Weisburd and Green, 1995b, p. 357). If this is the case, as suggested by the discussion of appropriately choosing and drawing catchment areas, net findings may vary quite a bit by the inclusion or exclusion of specific places, such as street segments, within these catchment areas. Therefore, learning more about this distribution of spatial displacement and diffusion across smaller, practically and theoretically salient units of analysis, within the larger catchment areas may provide guidance for measuring these effects, while also providing a means to investigate the causes of these effects. For instance, as compared to a catchment area, the street segment is theoretically a stronger level of measure for many types of crime and social disorder, including those found in street-level drug and prostitution markets. In this case, the street segment may be linked to an offenders' awareness space and perception of opportunities at place, has a bounded start and end, provides a means to more fully examine offender travel patterns, and may be comparable to other segments. In addition, the street segment provides a focus for police practice.

There is a dearth of research simultaneously measuring spatial displacement and diffusion effects as well as opportunity measures at a level appropriate for examining this relationship, such as a street segment. There is one exception to this myopia to *net* benefits in the literature, research conducted as a result of the Jersey City Displacement and Diffusion Study. This study overcomes many of the noted challenges of measuring spatial displacement and diffusion at place, while also incorporating measures of opportunities, crime, and social disorder at the street segment level. The JCDDS data provides the opportunity to study the distributions of these parallel spatial effects and more fully understand these effects. The following section briefly describes the JCDDS and the research from this work that has touched on the relationship between place-based opportunity measures and spatial displacement of crime and diffusion of crime control benefits.

The JCDDS: A Unique Study of Displacement and Diffusion

The JCDDS is the first study conducted with a specific plan to overcome the barriers of measuring spatial displacement and diffusion, while also capturing place-based opportunity measures. This study is the only study of spatial displacement and diffusion which was planned and executed to directly measure these spatial side effects and, as such, is considered to have a greater level of methodological rigor as compared to other studies of these effects. Each method of the study was considered with the direct purpose of measuring displacement and diffusion, including finding target areas with crime that would be likely to displace, market crime of drugs and prostitution; planning high-level, opportunity-focused intervention strategies based on best practices; choosing target areas with proximate catchment areas (approximately two blocks in radius) with

appropriate crime levels to provide ample statistical power to accurately measure parallel spatial effects; and employing various crime and opportunity measures to overcome measurement bias presented from any one measure, as well as to capture offender adaptation and parallel intervention effects from various perspectives.

Using social observation data, Weisburd and colleagues (2006) performed an analysis of the observed prostitution events and illustrated a dramatic reduction in streetlevel prostitution activities in the first month of the intervention in the prostitution target area and the surrounding catchment areas, which was sustained in the target area and catchment areas across the span of the intervention (p.569). A similar trend pattern is illustrated in the drug target area for observed incidents of disorder (Weisburd et al, 2006, p. 575). To assure that these declines were not due to secular trends experienced across Jersey City, each of these observed estimates were adjusted using the trends from the appropriate police calls for service for the rest of the city. With the exception of one intervention time period from the second catchment area of the prostitution site (approximately two blocks from the target area), this analysis found significant declines in the crime and social disorder measures considering the secular trends, supporting diffusion of benefits from the target area to the catchment areas for prostitution events in the prostitution site and for disorder events in the drug site (Weisburd et al, 2006, p. 569) -572 and p. 574 - 576).

The observed drug activity in the drug site illustrates a slightly different trend over the course of the intervention. Similar to disorder events in the drug site, there was an immediate, steep decline in drug events at the beginning of the intervention in the target area; however, controlling for secular trends with citizen calls for service, the drug

⁴ Also see Weisburd, Wyckoff, Ready, Eck, Hinkle, and Gajewski (2004).

incident declines in the catchment areas were not statistically significant (Weisburd et al, 2006, p. 572-574). As such, there is little evidence of displacement or diffusion effects for drug activity in the drug site catchment areas.

Weisburd, Wyckoff and colleagues (2004, 2006) reinforced the findings from this analysis with information gained through interviews and ethnographic work with offenders (also see Brisgone, 2004; Ready, 2009). This qualitative work was referenced throughout the earlier portion of this literature review, providing a theoretical understanding of offender adaptation and spatial displacement and diffusion. The qualitative work suggests that offenders are highly attached to their normal place of crime and unlikely to spatially displace to other places. This being said, offenders did give examples of displacement. The qualitative work does sensitize readers to the idea that spatial displacement may occur, but the analysis of the aggregate social observation data illustrate overwhelming diffusion effects. Unfortunately, to this point this work does not illustrate to what extent some places may experience spatial displacement while others simultaneously experience diffusion effects, nor does it provide a full understanding of these effects in the context of place-based opportunities.

Testing the Relationship between Opportunities and Spatial Displacement and Diffusion

There are two methodologically limited studies which touch on opportunities at place in the context of spatial displacement and diffusion, both of which used the Jersey City Displacement Study (JCDDS) physical observation data to construct physical disorder measures as indicators of guardianship (e.g., damage to buildings; vacant lots; litter and debris; and broken glass). Although these examples suggest a relationship between the level of opportunities at a place and the variability of parallel intervention

effects, this relationship is not directly tested in these examples. This being said, the two examples do provide a foundation for additional research on this topic using the JCDDS data.

Weisburd, Wyckoff and colleagues (2004) conducted a bivariate descriptive examination of the change in these physical disorder indicators through the course of the intervention in the JCDDS. They (2004) did see a reduction in physical disorder measures, which signify guardianship in the target areas; this was expected since the intervention was focused on changing perceived opportunities for crime. An examination of the same indicators in the catchment areas outside the two intervention areas illustrates an unsystematic pattern of change across the different indicators, which was difficult to interpret from a simple bivariate examination. Although this finding sensitizes us to the idea that opportunities at place may be related to spatial displacement and diffusion effects, the physical observation measures were not directly examined in relation to the crime changes at specific places, so it is difficult to tell how they relate to spatial displacement or diffusion of crime at place.

As a means to measure offender adaption, Ready (2009) used these same physical disorder indicators to conduct a multi-level analysis using an outcome measure of residents' perceptions of crime at place. Ready (2009) found that street-level disorder interacts with the intervention period and explains that

While offenders appear to be attracted to streets with high levels of physical disorder, the findings suggest that the presence of a known police intervention mediates the relationship between physical disorder and crime observed by residents on their street. In short, street-level physical disorder attracts crime, but it also facilitates crime displacement [crime] during police crackdowns (p.188-189).

He explains (2009), "While preliminary, these findings support the rational choice framework in that offenders may be changing how they evaluate or assess the suitability of the crime targets based on newfound knowledge of a police intervention...The findings also support a routine activities focus on the importance of guardianship..." (p. 190).

Ready's findings from this analysis should be considered conservatively, as

Ready notes these findings are "preliminary" (p. 190). These findings should also be

considered conservatively because the wave of resident interviews he identifies as

occurring "after the initiation of the police intervention" were actually collected after the

close of the interventions. Therefore, although they may measure a change in crime, they

would likely do so when offenders have already adopted new routine target areas, so

these post measures are a better measure of adoption rather than adaptation. In addition,

the outcome measure is gained from residential interviews, which have been noted to be a

better indicator of resident's perceptions of crime than actual crime (Weisburd, Wyckoff

et al, 2004). Finally, Ready's interpretation of the findings would be strengthened

through a discussion of the hierarchical nature of his outcome measure, which is of

multiple residents, many of whom are located on the same street segments (within

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⁵ Ready's (2009) intent was to conduct his analysis for pre and during the interventions, as a means to examine offender adaptation, but his discussion of the exact waves he elected to use from the Jersey City Displacement Study was not transparent. As such, it appeared that Ready used the second wave of physical observations (during intervention) for his analysis, in which case changes in physical disorder indicators may have been due to secular trends across the city due to the on-set of winter, which he did not consider in his analysis or discussion. Since Ready's intent was to conduct his study for pre to during the intervention, he indicates using a wave of resident interviews performed "after the initiation of the police intervention" (Ready, 2009, p. 186). However, the Jersey City Displacement and Diffusion Study's final report indicates that resident interviews were conducted in the pre-interventions and one month after the close of the interventions (Weisburd, Wyckoff et al, 2004). It is likely that Ready actually used the post intervention wave for his analysis resident perception outcome measure (which technically is after the initiation of the police intervention). If this is the case, the resident interviews measure would actually be a measure of observations of crime after the intervention had been completed and the offenders had adapted to the intervention, rather than a measure capturing their adaptation during the intervention. In either case, his analyses are unique and touch on some interesting topics, but should be considered conservatively.

groups), in relation to his independent variables, which are drawn from one observation of each of the street segments. These considerations do not deflate that Ready's (2009) work is creative in the way he examined offender adaptation and that this work serves as one of the few systematic, quantitative stepping stones for the current study.

These two research examples do touch on the salience of opportunities at the street segment within the displacement and diffusion process, but due to their specific research questions they can only be used as touch points for research focusing on the relationship between opportunities at place and spatial displacement and diffusion. Work by Weisburd, Wyckoff and colleagues (2004) examines the physical disorder indicators of guardianship at a street segment level, but does so as an outcome variable rather than specifying and testing their relationship to displacement or diffusion at the street segment. Ready's (2009) work, although intriguing, was conducted to meet his research question at hand to test residents perceptions as a measure of offender adaptation, so it does not, per se, test place indicators of crime directly or examine the change in crime (displacement or diffusion).

In sum, to this point, studies of parallel spatial intervention effects have been preoccupied with examining the presence of spatial displacement and diffusion across large units of analysis, with relatively little attention to systematically testing the relationship between these effects and place-based opportunities, the prevailing theoretical explanation for these effects, across smaller, theoretically salient units of analysis, such as street segments. The past literature on spatial displacement and diffusion is vibrant and rich, providing a secure base for additional work testing these ideas more systematically. Considering the findings presented in the literature review,

the following chapters present the study hypotheses and research methods. The final chapters provide the research analyses, findings, and conclusions.

Chapter 4: Study Hypotheses and Analytic Strategy

The past two chapters have provided the theoretical foundation for the study at hand, by providing a brief overview of the integration of rational choice theory with routine activities theory and including examples of how these theories apply to an offender's decision to commit a crime at a place. These chapters highlighted that qualitative research employing an inductive analysis process has been the primary method for determining the causal mechanisms underlying the displacement and diffusion processes (Brisgone, 2004; Holt et al, 2008; Ready, 2009; Weisburd, Wyckoff et al, 2004, 2006). These few studies have investigated offenders' adaptation processes, which may have the end result of spatial displacement (Brisgone, 2004; Holt et al, 2008; Ready, 2009; Weisburd, Wyckoff et al, 2004, 2006). Using this qualitative research as a base, it appears that place-based opportunities are important for understanding spatial displacement and diffusion to specific places neighboring targeted intervention areas.

Pairing the findings about spatial displacement and diffusion with the prevailing understanding that crime clusters and varies across the street segment level, this research study delves into examining the differential distribution of parallel spatial effects at a smaller place-level, the street segment, and examines how these effects are related to place-based opportunities. The environmental indicators of place-based opportunities, reviewed in chapter two, are used to build a number of independent variables for the current study. As reviewed, place-based opportunity measures have had little systematic testing in the context of spatial displacement and diffusion at the street segment level. In fact, there is relatively little known about how place-based opportunities affect an

⁶ As mentioned previously Weisburd, Wyckoff et al (2004) and Ready (2009) provide some limited foundation for such research, but do not examine opportunity constructs in relation to displacement and diffusion directly.

offender's choice of a targeted place for crime when an intervention is underway. If the intervention is focused on hot spots containing places "optimal" for crime and the intervention has changed the opportunities in these hot spots, individuals who offend regularly in these hot spots may adapt (consciously or unconsciously) by moving to places proximate to the intervention that have opportunities most similar to the opportunities in the hot spots. On the other hand, offenders may choose to stay away from proximate places with similar opportunities to those in the hot spots, because offenders may perceive the intervention is also focused on these similar places. In either case, these individual offender choices may result in differential spatial displacement and diffusion effects across places neighboring hot spot areas, which may have a relationship with place-based opportunities. It is clear the relationship between these place-based opportunities and parallel intervention effects warrants greater attention.

Another topic which deserves further consideration is the relationship between the variation in spatial displacement and diffusion at place and the location of place relative to the target area. Considering research on offender travel patterns, offenders would be expected to commit crime in their activity space relatively close to their routine place for crime, which would be expected to be close to the target area. As such, it would be expected that places closer to the target area would be more likely to experience displacement effects. However, qualitative work investigating diffusion suggests offenders, over estimating the scope of the targeted intervention, may be weary of committing crimes at places proximate to the targeted area. Considering these two explanations would predict different outcomes, the relative location of places

experiencing differential spatial intervention effects deserves greater attention, especially when examining the relationship between these effects and place-based opportunities.

Finally, the integration of rational choice and routine activities theory provides an explanation for crime at place within a specific situation or in the aggregate of situations. As stated in the literature review, an offender may decide on a regular crime place depending on place-based opportunity factors, but these factors may also influence an offender's choice to commit a crime within a specific situation at a place. As such, it is advantageous to examine place-based opportunity factors and parallel spatial intervention effects from a more general aggregate perspective, but also to understand the link between these opportunity factors and the occurrence of social disorder at the situational level at place. This explanation of the occurrence of crime is quite dynamic in that offenders are in constant adaptation to the intervention, effecting their offending within the situation and more generally at place over time. As such, parallel spatial intervention effects at place likely vary over the course of the intervention, as offenders adapt to their perception of the intervention and change in opportunities for crime across the different places. As such, a more complete test of the application of place-based opportunities as an explanation of parallel spatial intervention effects considers this relationship as the intervention unfolds.

The current study seeks to build upon the spatial displacement and diffusion research reviewed in the last three chapters with a focus on examining various place-based opportunities from both the situational and aggregate perspective, through the span of an intervention, and dependent on the relative location of the place to the targeted

intervention areas. The hypotheses tested for the current research build upon one another, and as such are examined in the analysis in the following order.

Hypotheses and Analysis Set 1

The first set of hypotheses analyzes if, through the course of the intervention, there is evidence of intervention effects in the target areas, as well as parallel spatial intervention effects in the catchment areas. This analysis builds on the prior research using the JCDDS data, examining if there is a *net reduction* of social disorder or a *net increase* of social disorder across the study's catchment areas, revealing the presence of either spatial displacement of social disorder or spatial diffusion of benefits. The primary difference between this analysis and other research conducted using JCDDS data is that the level of measure will be the street segment and the outcome variable will be social disorder, as defined for the current study.

The analysis is conducted using a dependent samples t-test.⁷ This analysis is conducted at the street segment level, separately for each study area – target area, catchment area 1, and catchment area 2 – so the relative location of the area in which the segments are located may be considered in the findings.⁸ Including the segment location

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⁷ A dependent samples t-test is appropriate for a repeated measure design in which the same sample of street segments is measured multiple times. Compared to an independent samples t-test, the dependent samples t-test is more powerful; by comparing each street segment to itself, the individual level differences of each place is not a concern, so the error term is smaller and the t-value is higher. As compared to the independent sample t-test, the greater power of the dependent samples t-test means smaller effect sizes can be detected with the same number of subjects or fewer subjects are needed to detect the same level of effect

⁸ Disaggregating the study area into distance categories assures variability in a specific study area is not washed away by performing the t-test on the larger sample of street segments. In addition, distance from the target area is important for understanding the location of the places that experience spatial displacement and diffusion due to the intervention. The target areas are included in this analysis, since it is important to determine if there is an overall significant effect in the target areas, the focus of the intervention. The street segments in the target areas may have increases or decreases of crime as a result of the intervention. In the target areas, increases in crime at a street segment would likely be termed spatial displacement or intervention backfire effects, while decreases would be termed a direct intervention effect rather than a

provides a means to examine how intervention effects in the targeted area compare to the catchment areas, but it also allows consideration of a displacement gradient in the catchment areas. This analysis is important for establishing if there is evidence of parallel intervention effects, so subsequent analyses may be conducted to examine these effects more closely. The first set of hypotheses are:

- <u>Hypothesis 1A:</u> The social disorder measures significantly differ for each of the study intervention phases (phases tested separately).
 - <u>Hypothesis 1B:</u> The findings from hypotheses 1A differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 1C:</u> The findings from hypotheses 1A and 1B differ through the course of the intervention.

Hypotheses and Analysis Set 2

Recent research has suggested that a large proportion of an area's crime drop can be due to the change in crime in a minority of street segments (Weisburd, Bushway et al, 2004). Building on this past crime-at-place research, the second set of hypotheses are built upon the possibility that relatively few segments may experience higher levels of parallel spatial intervention effects, with a large amount of the change occurring at a minority of street segments. Although diffusion may be the overwhelming effect present, a small proportion of places may be responsible for the bulk of diffusion effects. As such, the second set of analyses examine the variability and heterogeneity of spatial displacement of crime and diffusion of crime control benefits across the street segments proximate to targeted intervention areas. This step of the analyses examines the

diffusion effect, but no matter the terminology these effects in the target areas parallel the effects experienced in the other study areas.

⁹ This analysis is not a true statistical test in the traditional sense, but it provides a unique illustration and understanding of the proportion of places that are responsible for the greatest proportion of change (both increase and decrease) in crime for the study time periods.

proportional distribution of the change in social disorder across the street segments and study areas. As previously mentioned, offender adaption and travel patterns likely vary by the location of the street segment and the phase of the intervention, so the relative location of these places and timing of the intervention are also considered in this second set of hypotheses. The analyses from testing these hypotheses provide a base for the subsequent analyses, examining place-based opportunities as an explanation for the variability of parallel intervention effects at the street segment level. The specific hypotheses tested to understand the variability of parallel intervention effects at the street segment level are as follows:

- <u>Hypothesis 2A:</u> For an intervention period, the amount of change in the social disorder measure at the street segment level varies across street segments (study phases tested separately).
 - <u>Hypothesis 2B:</u> The findings from hypotheses 2A differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 2C:</u> The findings from hypotheses 2A and 2B differ for periods tested through the course on the intervention.
- <u>Hypothesis 2D:</u> The decreases and increases in the average amount of observed social disorder cluster at specific street segments (study phases tested separately).
 - <u>Hypothesis 2E:</u> The findings from hypotheses 2D differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 2F:</u> The findings from hypotheses 2D and 2E differ for the intervention time periods tested.

Hypotheses and Analysis Set 3

The third set of hypotheses test the relationship between opportunities at place – targets, offenders, and guardians - and spatial displacement and diffusion, defined as the change in social disorder. This relationship is tested through two different tracks.

The first track recognizes that there is something unique about the opportunities for crime and social disorder at the street segments within the target areas which make these places most optimal for crime. As such, places proximate to the target areas which are most similar to these *optimal* places may experience differential parallel spatial intervention effects as compared to dissimilar places. Considering past research on opportunities at place, it may be expected that offenders would attempt to relocate to these similarly situated opportunity places; however, considering research on offender adaptation during an intervention, offenders may avoid these unfamiliar places, unsure of the scope of the intervention and if these similar opportunity places are also a focus of the intervention. To examine these competing ideas, street segments in the catchment areas are matched with the street segments in the target area, based on specific opportunity measures for the street segments. 10 For each period of the intervention, the difference in the change in the average number of social disorder incidents per street segment from the matched places (places in the catchment areas considered to have optimal opportunities similar to the target area segments) to the unmatched places (places in the catchment areas that do not have these optimal opportunities) is tested using a dependent samples ttest.

The second track of analyses does not make an assumption about types of places similar to the target area places. This second set of analyses examine how the opportunities at the street segment level predict street segments that fall into specific groups of parallel spatial effects (e.g., high levels of diffusion, moderate levels of

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¹⁰ This matching process is conducted through a systematic comparison of each street segment in the target area to the catchment area street segments, considering specific opportunity factors. The process is described in the analysis section.

diffusion, or displacement). 11 Dividing the change variable into distinct groups provides a more accurate picture of the change at place. As described previously, some places are likely responsible for a large proportion of change. All of the study area street segments are considered in these groups, including the target areas. Target areas are included because offenders may choose to displace within the target areas, causing specific hot spot street segments to increase in crime (direct intervention backfire effects). Additionally, the theoretical mechanisms for the changes in crime in the target areas – increases and decreases – are hypothesized to be similar to those explaining crime changes in the target area. Although the theoretical framework explaining parallel intervention effects for places in any group will be the same, it may be that different opportunity factors at place will predict the different street segment groups. As will be described in the analysis section, this analysis is conducted only for the change in social disorder for the immediate intervention period (pre-intervention phase to the immediate intervention phase). For the immediate intervention period a multinomial logistic regression analysis is conducted using the grouped change score as the dependent variable and the opportunity factors to predict membership into the specific change groups, while also considering the relative location of the place. The analysis is run separately for the target area from the catchment areas, so the area effects can be considered and compared. This analysis provides a more general understanding of the relationship between the opportunities of street segments and the level of parallel intervention effects with consideration of the street segments relative location. The third set of hypotheses include:

¹¹ The operationalization of the group change variable is explained in the section which operationalizes the variables.

- <u>Hypothesis 3A:</u> Catchment area street segments with opportunity factors similar to the target area segments experience different intervention effects as compared to catchment area segments with opportunity factors dissimilar to the target area street segments (tested separately by intervention time period).
 - o <u>Hypothesis 3B:</u> The findings from hypotheses 3A differ when controlling for street segments' location relative to the intervention target area
 - <u>Hypothesis 3C:</u> The findings from hypotheses 3A and 3B differ by the time period of the intervention.
- <u>Hypothesis 3D:</u> The opportunities at the street segment level (type of targets and offenders present; the level and type of guardianship) predict the specific parallel intervention effects group (i.e., displacement, no change, low/moderate decrease, severe decrease) in which a street segment falls (tested only for the immediate intervention period).
 - <u>Hypothesis 3E:</u> The findings from hypotheses 3C differ by the street segments' location relative to the intervention target area.

Hypotheses and Analysis Set 4

The fourth set of hypotheses change the perspective to considering the opportunities at the place as a predictor of the incident of social disorder within the situation. This is done as a means to better understand the influence of place-based opportunities on an incident of social disorder within a situation at place during an intervention. Clarke and Weisburd (1994) point out that in order to maximize the benefits of focused interventions, displacement and diffusion must be understood through "an active program of research into the ways that offenders perceive and react to the ever changing criminal opportunity structure" (p.179). According to the integration of rational choice with routine activities theory, offenders make the choice of a crime place based on their perceptions of the opportunities for crime at the place, but commit a crime at the place based on the opportunities present in the situation. As such, in order to better understand the relationship between the occurrence of social disorder and place-based

opportunities, this analysis examines this relationship within the situation. Taking into account the intervention likely differentially affects the occurrence of social disorder across situations at place which have different opportunities; the analysis is conducted and compared considering the time periods capturing the intervention. Again, segments' location relative to the intervention area, signifying offender travel distance from the target area, is included in this examination.

The analysis is conducted using logistic regression to predict the occurrence of social disorder dependent on a number of opportunity measures, including crime opportunities present within the situation, crime opportunities that remain relatively constant (e.g., built environment), the temperature of the situation, and if the situation took place on a weekend. Models are run separately by the study area (target area, first catchment area, second catchment area), so area may be considered. To examine the way in which the relationship between these situated opportunity measures change over the course of the intervention, a variable for the wave of the measures is included and the model is run twice, once including all of the waves of the study and another time including all waves except the pre-intervention wave. This methodology allows for a comparison of the models with consideration of the effects of the pre-intervention wave.

This situational analysis bridges the understanding of the types of segments which experience social disorder specifically, within a defined situation and context, with the findings from the third set of analyses, examining segments which experience displacement and diffusion generally (within large time periods). The hypotheses for these analyses are as follows:

- <u>Hypothesis 4A:</u> Considering the presence of the intervention, the opportunities present in the situation and those generally at the street segment (i.e., general guardianship and types of targets that may be discerned from the built environment, and the relative location) will affect the occurrence of social disorder in that situation at the segment.
 - <u>Hypothesis 4B:</u> The findings from hypothesis 4A will differ by street segments' locations relative to the intervention area.

In all, the analyses proposed will provide an understanding of how opportunities at place explain spatial displacement and diffusion of social disorder, from the context of the situation and more generally at the place for longer time periods. Chapters five and six provide a description of the JCDDS data and how it is used for this study and chapter six provides the operationalization of the variables used for the current study.

Chapter 5: Study Sites and Data Structure

This chapter begins with a section describing the Jersey City Displacement and Diffusion Study (JCDDS) sites and unit of analysis, a synopsis of the targeted interventions that took place as part of the JCDDS, an explanation of how the data was collected for the JCDDS study, and finally a description of how this data is structured for the current study. An understanding of the data provides a nice transition to Chapter 6, which specifies the variables used to test the study hypotheses.

STUDY SITES AND UNIT OF ANALYSIS

The research hypotheses discussed above will be tested using data from the JCDDS, collected by the Police Foundation specifically to examine displacement of crime and diffusion of crime control benefits. These data were collected as part of a study funded by the National Institute of Justice. Previous research using these data has provided in-depth details about the methodology for choosing these sites and the unit of analyses located within these sites (see Weisburd, Wyckoff et al, 2004, 2006; Ready, 2009). Using this previous research as a foundation, this section summarizes the methodology for choosing the JCDDS study sites, the unit of analysis for the JCDDS study, and the study sites and unit of analysis that will be used in the current study. *Choosing JCDDS Study Sites*

The JCDDS's primary focus was to directly measure displacement and diffusion, in contrast to other studies in which displacement and diffusion were measured as an afterthought to evaluating the effectiveness of police interventions. An important

component of the project's methodology was to choose study sites that would provide the

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 $^{^{12}}$ The research study was conducted by the Police Foundation through grant No. 98-IJ-CX-0070 awarded by the National Institute of Justice.

most accurate measure of displacement and diffusion. Twenty hot-spots were chosen as possible sites for the study. For each of the potential sites, a number of quantitative and qualitative indicators were collected for the hot-spots and their surrounding areas, including their levels and density of calls for service and crime incidents by crime types, the use of the areas (residential, business, recreational, etc.), and the physical condition of the areas (litter, broken glass, graffiti). Drawing from the lessons learned from prior research, a panel of policing and research methodology experts reviewed the information collected for each site and used the following criteria to determine the final study sites, balancing the need for the most optimal measurement of displacement and diffusion with the operational requirements needed for the police department:

- the sites incorporate hot-spots with different types of crime problems, allowing for consideration of displacement and diffusion of different crimes in different settings;
- the sites have income-generating crime, with the assumption offenders would likely continue these types of crimes to meet their financial need;
- the hot-spots (target areas) within the sites have a high enough level of crime and disorder to measure displacement and diffusion;
- the areas (catchment areas) surrounding the hot-spots (target areas) have potential targets, which would provide an adequate environment for displacement and diffusion:
- the surrounding areas (catchment areas) have high enough crime and disorder to provide adequate power to detect displacement and diffusion;
- the surrounding areas (catchment areas) do not have such a large amount of crime that displacement could not be detected;
- the hot-spots (target areas) are far enough away from other police activities to assure there would be no confounding treatment programs;
- the hot-spots (target areas) are small enough to assure that the police could maintain a focused initiative (large dosage) in the area.

Using the information for each site and the established criteria, the panel chose the final study sites: a drug site and a prostitution site. ¹³ The thoughtful selection process of the study sites provided a relatively sound starting point for the interventions and the research study, guarding against the methodological weaknesses of other research on displacement of crime and diffusion of crime control benefits.

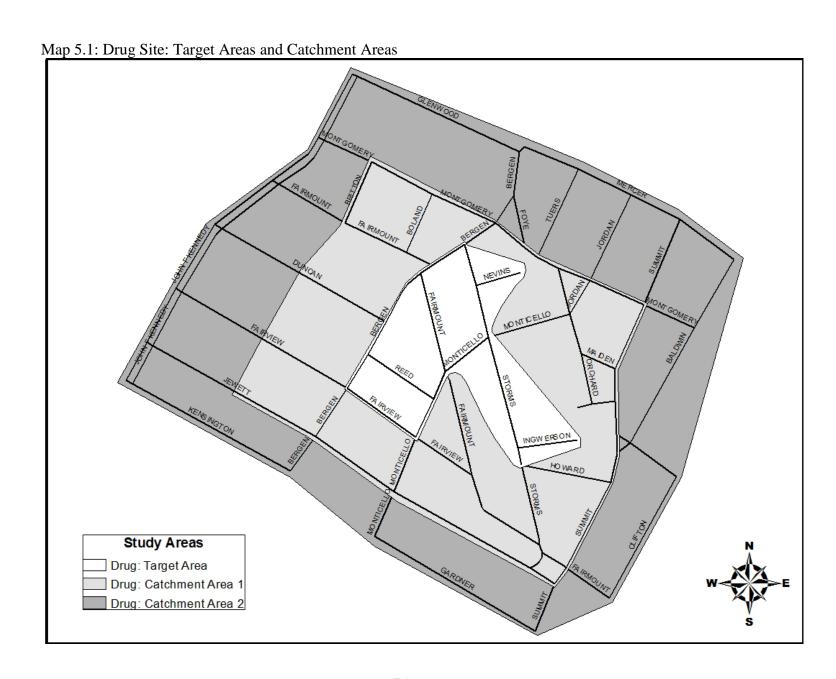
JCDDS Target Sites and Catchment Areas

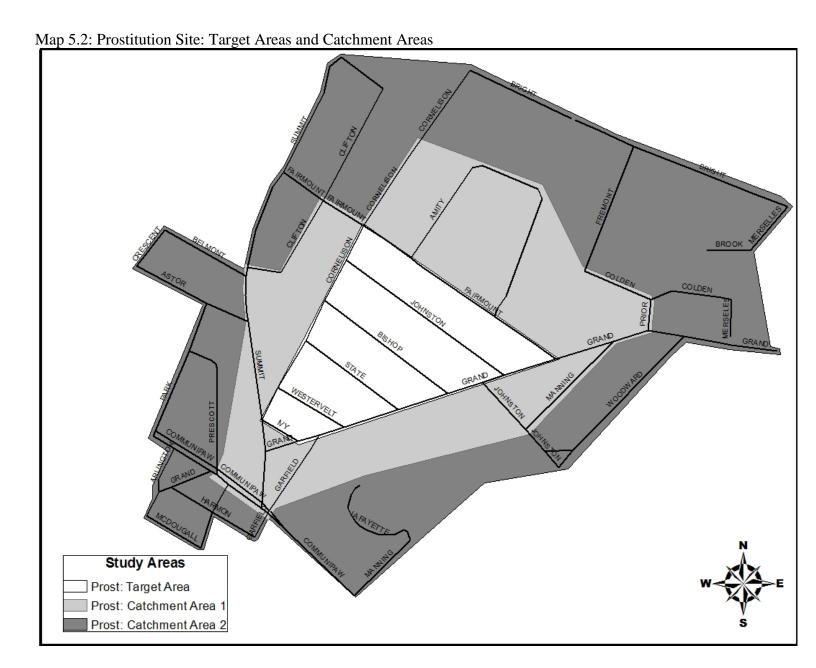
The study sites were divided into target and catchment areas. Boundary areas were drawn around the two study hot-spots, establishing bounded target areas for the police focused interventions. Two catchment areas, each approximately one city block in length, were established around both target areas. "The assumption here was that displacement and diffusion would most likely be evidenced in these locations which were both close to the target sites and offered new potential opportunities for continued criminal involvement" (Weisburd, Wyckoff et al, 2004, p.22). The target areas and the two catchment areas of both sites are illustrated in Map 5.1 and Map 5.2. ¹⁴

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¹³ Additional information on the site selection is found in the JCDDS final report (Weisburd, Wyckoff et al, 2004). One site was selected and included as a burglary study site, for which data was collected in the Jersey City Displacement and Diffusion Study. Unfortunately, the intervention area for this study site was large and the intervention was judged to be weak and inconsistent, so this site was not examined for displacement and diffusion and will not be used in the present research.

¹⁴ A description of each of these sites including their history and physical layout is available in the JCDDS final report (Weisburd, Wyckoff et al, 2004).





Each of the study sites' areas contained smaller levels of geographic units, termed street-segments. The street segment served as the level of measurement for the data collected in the JCDDS. "A street segment was defined as a block face, including both sides of a street, from one intersection to the next" (Weisburd, Wyckoff et al, 2004, 2006). The segment included any addresses (residential, commercial, and municipal) located on either side of the street. The street segments for the study were each approximately .10 miles long. ¹⁵ This standardization of the size of the street segment provides a unit of measure that is comparable, but also small enough so that an observer could easily see everything on the street, whether the observer was an offender choosing to offend, a researcher capturing information about activity on the street, or a resident answering questions about the street.

The target areas in both sites were small geographic areas, with 12 street segments in the drug target area and 21 street segments in the prostitution target area. As mentioned previously, it was important to have small target areas to assure the police department could maintain treatment in the areas. The catchment areas were comparatively much larger, with 69 street segments in the drug site and 67 street segments in the prostitution site (see Table 5.1). The large number of streets in the catchment areas provided a greater possibility of detecting displacement and diffusion to these areas.

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¹⁵ A total of 58 street segments in the study sites were longer than .10 miles and these segments were cut into two segment. Another three street segments were combined with bordering segments because they were shorter than .02 miles. Assuring the street segments were less than .10 miles long provides more accurate measures for the study.

Table 5.1: Number of Street Segments/Street segments by Site

Site	Area	Number of Street
		Segments
Drug Sites	Target Area	12
	Catchment Area 1	34
	Catchment Area 2	35
	Total Drug Segments	81
Prostitution Site	Target Area	21
	Catchment Area 1	21
	Catchment Area 2	46
	Total Prost Segments	88

Sample for the Current Study

The street-segment is the unit of analysis for the present study. For the purpose of this study, the street segments from the two sites will be considered in the same analysis. Using all of the street segments from both sites, rather than analyzing the sites independently, provides a larger sample size for the study, 163 street segments in total (see Table 5.2). ¹⁶ The current research questions examine the parallel spatial effects across all of the study areas of these 163 street segments, including the 33 street segments in the target areas and the 130 street segments in the catchment areas. ¹⁷

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¹⁶ The two sites had their own defined street segments for the study. Seven of the segments from the drug site were the same as 6 defined segments from the prostitution site. The 7 segments from the drug site will be used as the actual segments identifiers for the present study and the 6 prostitution site identifiers will be dropped for the present study. The way in which the data are handled for these segments is addressed in footnotes for each of the specific data sources.

¹⁷ Two power analyses were run using the sample size of 163 and the medium effect size established by a meta-analysis of hot-spots studies (Braga, 2007). For a dependent samples t-test the statistical power was a respectable level of .70, when indicating a two-tailed test of significance (p<.05), and a small effect size of .2 (as defined by Cohen's D) (Cohen, 1992). If Cohen's D effect size was relaxed slightly to .22 (a medium effect size is .5), the statistical power level of this analysis was .80, an understood bench mark for statistical power (see Field, 2009). For linear regression a .80 statistical power level may be reached using 8 predictors, a sample of 163, an alpha level of .05, and a standardize effect size of .10. Cohen's rule of thumb for this type of analysis places a .10 effect size somewhere between a small effect size of .02 and a medium effect size of .15. Considering Braga's (2007) findings for hot-spots studies, an effect size of .10 is quite probable, which gives some confidence in the statistical power level of .80 for this analysis. The statistical power level for a linear regression remains above .70, even if the number of predictors in this analysis is increased to 14 or the effect size is decreased to .08.

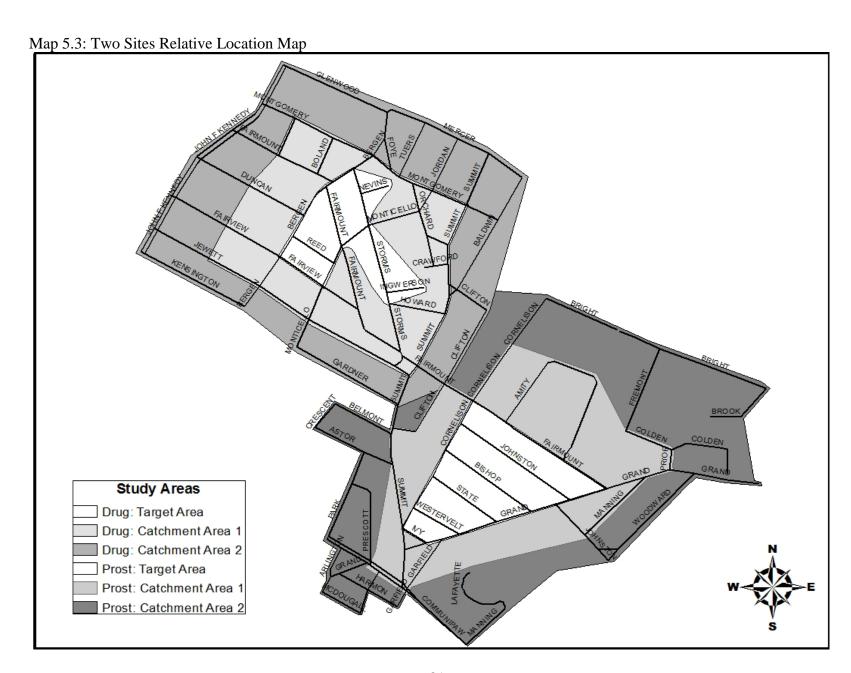
Table 5.2: Number of Street Segments/Street Segments by Site

Area	Total	Total
Drug Target Area	12	
Prostitution Target Area	21	
Total Target Areas		33
First Catchment Areas	52	
Second Catchment Areas	78	
Total Catchment Areas		130
Total Street Segments	163	163

These study sites may be examined and analyzed together for two reasons. First, the timing of the interventions and data collection for the two sites were approximately the same, so the effects of secular trends will be similar in these two sites. Second, although the interventions were focused on specific crimes in the target areas (drug and prostitution) the crimes targeted in both sites are considered market crimes. As well, the intervention strategies were quite similar (effecting criminal opportunities in the area across the board) and in both cases the target areas were flooded with intervention strategies, which would have changed the opportunity for all offending in the target areas (see intervention section below). As such, the processes being investigated and the variables used to investigate these processes are the same across all of the street segments for both of these sites, so using both sites provides for a more powerful test of the same processes.

In fact it is appropriate to examine the street segments of these sites together, since the two sites' catchment areas boarder one another (see Map 5.3). In this joint analysis, each street segment will have its own specific criminal opportunity factors, including the relative location of the street segment to the intervention areas. It is important to point out that it is unlikely offenders would travel the large distance across the catchment areas of one site into the other site, since offender research indicates that

offenders generally stay in their familiar routine activities areas with relatively small travel distances (Eck, 1993). However, considering both sites' street segments in the analysis will allow for a complete test of the intervention's parallel spatial effects at the street segment and provide the best means to understand the presence of differential displacement and diffusion effects at the street segment level.



INTERVENTIONS

In order to be assured that the parallel spatial effects of displacement of crime and diffusion of crime control benefits were caused by the intervention, it is important to establish the validity of the JCDDS target area interventions, otherwise termed as the treatment effects. Drawing on past research using data from JCDDS, it is evident the interventions in the target areas were well planned and executed, incorporating a flood of strategies which changed the opportunities for crime at the street segments in the targeted areas. The remainder of this section provides a brief discussion of the intervention strategies and dosage, summarized from other studies using the JCDDS data (see Weisburd, Wyckoff et al, 2004, 2006; Ready, 2009).

An advisory committee comprised of police experts, practitioners and academics, assisted in planning the JCDDS interventions. They determined that the intervention strategies must: be based on empirically tested best practices, be likely to result in measurable displacement and diffusion outcomes, and be practical for the police department to implement and maintain. A number of strategies were implemented at each site. Briefly, the crime reduction strategies in the sites included:

- Additional officers were assigned to both sites to assist in a substantive increase in the
 amount of police presence in the areas, as a means to increase arrests and also
 improve the perception of police presence (general deterrence).
- Both sites had specialized offender removal operations, as a means to increase specific deterrence of offenders. Incapacitation was a greater priority in the drug site, where a special focus was made on successful prosecution and removal of violent offenders.
 - The prostitution site had seven stings focusing on arresting prostitutes and "johns" in the target area.

- o In the drug site, in addition to increasing the Narcotics Task Force from two officers to twelve officers, the department implemented a Violent Offender Removal Program (VORP). VORP was a police-prosecutorial partnership focused on identifying and removing the most violent offenders from the target area, with a goal to fast-track prosecution and incapacitate these offenders.
- The strategies also focused on changing the opportunities present for offending in the target areas.
 - o In the prostitution target area, a wooded lot (a sanctuary for prostitution activity) was cleaned up and fenced in. As well, cement barriers were installed on the street of a primary prostitution stroll as a means to control access.
 - o In the drug target area, officers used code enforcement to pressure local businesses, bars and small grocery stores, into reducing their involvement with the local drug trade and into decreasing offender opportunities. In addition, a vacant lot was turned into a basketball court.
- Finally, community services and community groups were involved in the interventions.
 - o In the prostitution target area, a local substance abuse center assisted prostitutes in overcoming their drug problems, a major drive for their choice to practice prostitution. A citizens' group in the area was also involved in prevention activities.
 - In the drug target area an after school program was initiated. In addition, the new basketball court (replacing the vacant lot) was built as part of a neighborhood beautification program.

Periodic meetings between project staff and officers assured project staff remained up-to-date about the intervention strategies and officers were reminded of the target area boundaries as well as the project's intent. Officers were given maps of the target areas and instructed to remain in the areas; the only exception for leaving the areas

was in pursuit of a suspect. This coordination prevented intervention spillover effects into the catchment areas, which could result in a threat to the internal validity of the study. Interventions were conducted in the drug target area from September 14, 1998 to April 1, 1999 and in the prostitution target area from September 23, 1998 to May 8, 1999.

In addition to the list of specific activities summarized in the bullets above, Weisburd, Wyckoff, and colleagues (2004) used interviews with offenders and police initiated calls for service data to illustrate that there was evidence of an increase in police presence in the target areas relative to the catchment areas. In both target areas, offenders spoke in detail of witnessing an increase in police presence (see Weisburd, Wyckoff et al, 2004; Brisgone, 2004). In the prostitution target area, officer initiated calls for service, including administrative calls (i.e., directed patrol, meal break, other administrative duties), had a sharp increase during the intervention but decreased in both catchments areas. These trends were the opposite for the same time period in the year prior, with decreases in administrative calls in the target areas and increases in the two catchment areas. In the drug site, police administrative call trends paralleled the prostitution site, except for one instance; in one drug site catchment area there was a slight increase in police administrative calls during this intervention time period. However, this increase in administrative calls during the intervention period was similar the year prior, so there is a lack of evidence that there was a true change in the dosage in the catchment areas during the intervention year.

These findings provide confidence that the interventions took place and were restricted to the target areas. It is also evident that the intervention strategies sought to focus on changing the opportunities for crime in the intervention areas, but not in the

catchment areas. Finally, the types of strategies employed for the interventions would be expected to curb the specialized types of crime in the target areas (drugs and prostitution), but they also changed opportunities in the area so drastically, including an increase in the formal police presence in these small areas, that one would expect all types of crime and social disorder in these areas to be effected. For this reason, it would be appropriate to examine the street segments from the two study sites in one analysis and also appropriate to examine a broad spectrum of street level crime and social disorder.

DATA OVERVIEW: FROM THE JCDDS TO THE CURRENT STUDY

The current study will use original data collected solely for the JCDDS. The JCDDS study data were collected with varying methods and measures. The multiple methods and measures were planned to provide a systematic illustration of the activity in the sites and catchment areas through the span of the study period, and to allow for the triangulation of results across varied measures. Data collected included citizen and officer calls for service from the police department; highly-structured physical and social observations; semi-structured interviews with residents, place managers, and arrestees; and observations and interviews conducted by an ethnographic researcher.

The instruments and methods for the original data sources were constructed considering prior research within criminology and appropriately related fields (see JCDDS final report Weisburd, Wyckoff et al 2004 for additional details). To assure data were captured systematically and consistently across data collectors, each research team member was trained on the data collection methodology and the appropriate means to

collect the data. ¹⁸ Fortunately for the study at hand, which seeks to use the street segment as the unit of analysis, the primary level of measurement for the JCDDS data sources was the street segment. JCDDS staff was trained on the importance of the level of measurement and how to uphold the integrity of the data collection at this level through each data collection process. This section provides a description of each data source, including the methodology used for the original data collection and how the data are restructured to fit the needs of the study at hand.

Social Observations

Both sites were victim to a large amount of street level social disorder as well as crime, so they were prime locations for the study of crimes that occurred on the street (drugs and prostitution). As such, social observation data were an important original data source for understanding the frequency of social disorder and crime in the target and catchment areas. The social observations provide a direct measure of crime and social disorder activity at the street segment level. For each 20-minute social observation period, data were collected on both sides of the street segment from one corner of the segment to the opposite corner of the segment. Research staff was trained to identify these corners to assure that the events present at intersections were captured on only one segment. The social observation data source provides a snap shot of activity on the study street segments which is not present in the other data sources. Besides providing counts of crimes and social disorder that may not be reported to police (which is often the case with prostitution and drug crimes), social observations also provide information about the

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¹⁸ For a complete review of the JCDDS data collection methodology, including how the study researchers were trained please see the JCDDS final report (Weisburd, Wyckoff et al, 2004).

context of these events, including the number of bystanders, the amount of automobile traffic, the weather conditions, and quality of lighting at the time of the observation.

Social observations occurred for a period of seven consecutive days every month, beginning pre-intervention and continuing until after the intervention. ¹⁹ These observations were conducted in twenty-minute periods on randomly assigned streets during the peak activity times of the study areas. ²⁰ The street segments were randomly selected for an observation independently by study area (target area, catchment area one, catchment area two). ²¹ A target area street segment was randomly selected for a 20-minute observation every hour between the hours of 10am and 2am (the following day). Independently for each of the two catchment areas for each site, one street segment was randomly selected for observation every hour between 12pm to 12am and a second segment was randomly selected for a second 20-minute observation every hour between the hours of 4pm and 10pm. The catchment areas, which had a larger number of street segments relative to the target areas, have twice the number of observations from 4pm to 10pm because calls for service were higher during these times. ²²

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¹⁹ The only exceptions to the scheduled observations process was when observations were not conducted due to specialized police activities or severe weather that may put the observers at risk. In order to keep observers safe and assure as little reactivity by those being observed on the street as possible, the Police Chief alerted the study director of the dates and times of any specialized police operations in the target areas and observations were subsequently delayed by one week. In these cases, an effort was made to conduct a make-up observation at the same time, day of the week, and place before the next wave of social observations. Three percent of social observations (n=199) were considered make-up observations.

²⁰ An observation schedule was planned to assure a systematic and consistent collection of these observations. After consulting calls for service of the study areas, observations were scheduled during specific time spans as a means to increase the chances of observing crime and disorder in the specific study areas, while also considering the efficacy of having observers at the scheduled times.

²¹ This random selection process was conducted separately for each of the target areas and catchment areas in both sites to assure the observations were distributed geographically, since observing the spatial distribution of activity was an important consideration of the study. This way no one study area would overpower the observational findings.

²² The random selection process by area and time was performed to assure that within each area and time every segment had an equal chance for being selected for observation. The observations in the target areas and catchment areas were conducted at times that activity would be expected, as a means to be realistic about project resources when allocating the observers to these areas. It was taken into consideration that

Nine waves of seven-day social observations were collected in both sites (including target areas and catchment areas). Both sites had one wave of observations collected pre-intervention. The drug site had six waves of social observations conducted during the intervention and two waves after the intervention ended, while the prostitution site had seven waves of observations during the intervention and one wave after the intervention ended. Considering the timing of the interventions, the waves of the social observations are comparable, with two exceptions. The first exception is one wave of social observations that was conducted in the drug site after the drug intervention had ended, but before the prostitution intervention had ended. The second exception is a wave of social observation data collected in the prostitution site prior to the close of the prostitution intervention, but after the drug intervention had ended. To assure that the data from both sites may be used collectively, these two waves of data, one wave from each site, will not be used in the current study (additional detail for the waves and dates of the social observations is provided in Table 5.3). For the purpose of this study, the observations used from both sites total of 5,268; 2,681 of these observations were conducted on street segments in the drug study areas and 2,587 of these observations were conducted on street segments in the prostitution study areas.²⁴

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the target areas had fewer street segments than each of the catchment areas (with only one exception the prostitution first catchment area has 21 street segments, the same as the prostitution target area). For this reason additional street segment observations were conducted at peak activity hours in the catchment areas as a means to increase the chances of capturing and understanding the activity across the larger areas, so the activity captured at the catchment area street segments would be more comparable to the activity captured at street segments in the target areas.

 $^{^{23}}$ A wave of social observation was conducted in the drug site from 4/1/98 - 4/7/99 (n=366), which was after the drug intervention ended but before the prostitution intervention ended. Another wave of social observation was conducted in the prostitution site from 4/12/98 - 4/18/99 (n=344), which was before the position intervention ended but after the drug intervention ended. To assure the data from the two sites is comparable, considering the timing of the two interventions, these two waves of data will not be used in the current study.

²⁴ In total 151 social observations or .02% of the 6,129 social observations were removed from the social observations database. Of the 151 social observations, 135 were observations that occurred on the 6 street

Table 5.3: Social Observation Data by Dates of Waves

Intervention	Pre	During Waves			Post				
Period	Waves		start – end			Waves			
	start –		Total N			start –			
	end					end			
	Total N								Total N
Waves (7 days)	1	2	3	4	5	6	7	8	9
Drug Intervention	Prior to	Starts						Ends	4/1 & on
	9/14	9/10						3/31	
Prost Intervention	0/22	0/22						4/20	5/1 & on
	9/23	9/23						4/30	
Drug Site								Not used	
Date of Waves	8/28-	9/29 –	11/03-	12/01-	1/01-	2/02-	3/01-	4/01-	5/01-
Date of Waves	9/04	10/14	11/23	12/26	1/07	2/08	3/09	4/07	5/17
N	267	370	314	354	351	364	350	366	311
Prost Site								Not used	
Date of Waves	9/12-	10/14-	11/12-	12/12-	1/12-	2/12-	3/12-	4/12-	5/8-
	9/18	10/20	12/02	12/23	1/18	2/18	3/18	4/18	5/18
	215	246	222	22.4	222	225	220	244	2.00
N	317	346	333	324	333	337	328	344	269
Current Study		2	2	,	_		7		
Waves	1	2	3	4	5	6	7		8
Date of Wave	8/28-	9/29 –	11/03-	12/01-	1/01-	2/02-	3/01-		5/01-
Date of Wave	9/18	10/14	12/2	12/26	1/18	2/18	3/18		5/18
Na a ·	504	71 6	< 45	(50)	604	5 01			500
N (both sites)	584	716	647	678	684	701	678		580

Physical Observations

Physical observations were also collected for each street segment in both study areas. Paralleling the social observations methodology, these observations were collected on both sides of a street segment, up to the defined corners of each segment. Observers walked each street segment recording a number of physical attributes of each street. The measures collected include the designated use of the buildings in the area (i.e., including residential, commercial, public service), built environment measures that are mainly

segments in the prostitution site which were shared by 7 street segments in the drug site. It was decided to keep only the observations from the drug street segments, since including both sites observations on these shared street segments would have increased the level of observations on these segments without regard for the original methodological collection process. Another 16 observations were removed from the social observations, since they appeared to be repeat cases. These 16 cases did not appear to have any specific pattern and may have been cases that were accidently entered into the database twice. In addition, 366 observations from the drug site and 344 observations from the prostitution site are removed from the data because these waves are not included in the analysis.

static (i.e., vacant lot, bus stop, subway station, bar, bars on windows, signs with rules), measures of the quality of the buildings (i.e., boarded up or abandoned, broken windows), physical characteristics that may be a result of criminal activity (i.e., presence of condoms, drug paraphernalia, graffiti), and other measures of physical disorder that may be easily improved (i.e., broken glass, litter).

These observations were collected once prior to the start of the intervention, once during the intervention, and once after the intervention was complete. ²⁵ Completing a physical observation instrument for a street segment was quite time consuming, taking about thirty minutes. Because the physical observations collected relatively stable descriptive attributes of the built environment (i.e., street layout, built environment, quality of the buildings), one physical observation of each street segment for each study period (pre, during, and post) was judged a sufficient indicators of the physical attributes of the street segments. A total of 487 observations are used for the current study; an observation was collected for each of the 163 street segments in the study, except for two missing cases from the pre-intervention wave. ²⁶ The physical observations are used to determine measures for the built environment (e.g., type of buildings) and also to

²⁵ As stated in the final report "Due to a time crunch in collecting the baseline data for the physical observations it was unrealistic to collect all of the physical observations before the start date in the two sites as originally planned. It was decided that collecting the data after the start of the intervention was acceptable under the assumption that physical conditions would have a slight lag in improvement compared to other outcome measures. Approximately 37% of the observations of the pre-intervention wave of the two sites were collected within one to three weeks after the start date of the intervention (39.5% for the violent crime/drug site and 35% for the prostitution site). To assure that the difficulty with collecting data did not corrupt the findings an analysis was performed with and without the data collected after the start of the intervention and conclusions from the findings were similar. For this reason it was judged that it was acceptable to include the physical observations collected after the start dates in the final analysis" (Weisburd, Wyckoff et al, 2004, p. 40). These observations will be included in the current analysis as well.

²⁶ A total of 18 physical observations were removed for the 6 street segments in the prostitution site that overlapped with the 7 street segments in the drug site. Three street segments were missing one physical observation during the course of the study.

construct aggregate physical disorder scales for each of the street segments. These scales are explained in the variable section.

Table 5.4: Physical Observation Data by Dates of Waves

Intervention	Pre Waves	During Waves	Post Waves
Period	start – end	start – end	start – end
	Total N	Total N	Total N
Intervention Dates			
Drug Intervention	Prior to 9/10	9/10 - 3/31	4/1 and on
Prost Intervention	Prior to 9/23	9/23 - 4/30	5/1 and on
Drug Site			
Date of Waves	8/13-9/25	1/13-2/11	6/12-6/27
N	81	81	81
Prost Site			
Date of Waves	8/6-9/29	1/11 - 1/22	6/5-6/27
N	80	82	81
Current Study			
Both Sites			
Date of Waves	8/6-9/29	1/11-2/11	6/5–6/27
N	161	163	162

Place Manager Interviews

Place managers include residents, business owners, business managers, and patrons of businesses and are individuals who are thought to have some level of control over the behavior occurring at the places they manage (see Eck, 1994). As discussed in the literature review, a number of researchers have posited that a place manager's supervision of a specific place varies by their level of responsibility over a place (Felson, 1995). For example, a resident who owns a home would take on more responsibility for monitoring and supervising that place or block than a person who serves as a cashier in a business or merely passes through the area on their way to work (Felson, 1995).

Two interview data collection methodologies were used to gain a deeper insight into the types of place managers present on each street segment and the crime and social disorder these place managers observe. The first type of place manager data are interviews with residents. In order to interview residents, a random sampling and calling process was used to contact individuals who own or rent a home or apartment located on

the street segments in the study areas, with the goal of interviewing ten residents per street segment. The final sample of the resident place manager interviews varied by place type with more interviews being captured from places with more residents. ²⁷ Since some street segments had mixed uses (i.e., businesses, no buildings), a second type of interview was added to capture non-residential place manager perspectives of the place. The second type of data collection included in-person interviews of a convenience sample of any individuals present on the street segment and willing to participate in the interview, most frequently individuals who worked in the businesses. For the convenience interview sample, the goal was to conduct at least one personal interview per street segment, but a greater number of interviews were conducted in places where residential interviews were not possible (see Weisburd, Wyckoff et al, 2004).

The final samples of the two types of interviews were differentially distributed across the study street segments. The number of residential telephone interviews were negatively and weakly correlated with the number of place manager interviews at the street segment level (r=-.16, p=.04). The sampling methodology of these two types of interviews resulted in the number of telephone interviews of residents being higher on street segments with a higher percentage of residential buildings and the number of convenience in-person interviews being higher on street segments with a higher percentage of commercial buildings. As such, the two methodologies complement one another, filling each other's methodological shortcomings.

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²⁷ Using a reverse telephone directory, a random sample of households from each street segment was phoned and a household resident over the age of 18 was asked if they would consent to participate in the study. Upon consent, the resident was asked a number of questions about crime, disorder, and their feeling of safety on their block.

At the street segment level, the number of residential interviews was positively correlated at the .54 level with the percentage of residential buildings (p=.01). Also at the street segment level, the number of place

For the purpose of this study, the telephone interviews (resident place managers) and convenience sample interviews (in person interview of different types of place managers) are used together in order to more accurately represent place manager specific measures across the study street segments. ²⁹ Using both interview samples together provides a total of 1,552 interviews. This total includes 1,298 residential interviews, 958 in the drug site and 340 in the prostitution site. ³⁰ Of the 163 segments in the present study 121 segments, across both waves, have residential interviews. ³¹ The study will also use 254 place manager interviews, 117 in the drug site and 137 in the prostitution site, which were conducted on 108 of the 163 street segments. ³² Using these 1,552 interviews for the present study, 152 of the 163 street segments (93.3%) have one or more interview. ³³ In a review of the place manager data, of the eleven street segments that did

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manager interviews was positively correlated at the .41 level with the percentage of commercial building (p=.01).

²⁹ The place manager interviews were not analyzed in the JCDDS final report. However, Brian Barth (2004) did conduct an independent analysis of the place manager interviews and their role in crime prevention, which can be found in the appendix of the JCCDS final report (see Weisburd, Wyckoff et al, 2004).

³⁰ A total of 1409 surveys of residents were conducted in the drug and prostitution sites for the original JCDDS. The overall response rate for the residential interviews was 72%. For the purpose of this study 111 cases are removed from this total, since they were collected on the 6 prostitution street segments, which overlap with the 7 drug segments. Including these cases in the database to increase the number of interviews on these segments was considered; however, the numbers only would have increased for segments that already had a significant number of cases (segment 175, 176, and 178). For this reason, it was judged better to maintain the original methodology used for the study and just remove the cases performed on the 6 overlapping prostitution site segments. After the 111 cases were removed from the present study data, because they were collected from the segments which overlap, 31 resident interviews remained which were completed after the intervention start dates. For the present study these 31 resident interviews are included, since the resident interview measures are not dependent on the date they were collected.

³¹ For these 121 segments, the mean number of residential interviews per street segment is 11, but the standard deviation is 8 and there are 32 segments with three or fewer interviews.

³² The place manager interviews conducted on the 6 street segments in the prostitution site (total of 13) that were shared with the 7 street segments in the drug site are not included in this study. In addition, the 60 interviews in the drug site that were conducted in a mid-intervention are not included in this study, since there was not a comparable sample in the prostitution site or in either of the sites using the residential interviews methodology. For the 254 place manager interviews included in this study, the mean of the place manager interview per street segment is 2 with a standard deviation of 1.

³³ The mean number of interviews on the 151 street segments is 10 interviews and the standard deviation is 8.5 interviews.

not have any interviews six have few or no buildings or are mostly industrial areas, which would make place manager interviews over the phone and in-person on these street segments more difficult.

These interviews were collected in two waves, one wave took place before the start of the intervention and the other took place after the intervention ended. 34 The pre and post waves of both of these interview collections are consolidated and used together, drawing on measures that are similar across the two types of data collection and that would be unlikely to have a significant change from the pre-intervention to the post-intervention. Although the two types of interviews have some of the same measures, it is important to point out that the resident interviews were performed with a highly structured interview instrument, while the place manager interviews were loosely-structured with a greater number of open-ended questions. The three measures used for this study are not likely to be affected by the difference in the interview techniques, since they are structured, simple questions. The exact measures are included in the variable section.

Because the primary unit of analysis for the study at hand is the street segment, interviews were collected from multiple people located in households or places nested within each street segments. Fortunately, the questions asked in the interviews were bounded by the definition of the street segment (block), so the information solicited from the respondents pertains solely to the street segment. The interview measures are aggregated and constructed into mean scales at the street segment level, so the street

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³⁴ One wave of place manager interviews was collected during in the intervention in the drug site. Including this additional data would inflate the number of interviews for street segments in the drug site and for street segments that already have a high number of interviews. In addition there is not a comparable wave for the prostitution site. As such, this data will not be included in the current study.

segment is the primary unit of analysis for the interview results. These mean scales are discussed in the variables section.

Table 5.5: Interview Data by Dates of Waves

Intervention	Pre Waves	During Waves	Post Waves
Period	start – end	start – end	start – end
	Total N	Total N	Total N
Intervention Dates			
Drug Intervention	Prior to 9/10	9/10 - 3/31	4/1 and on
Prost Intervention	Prior to 9/23	9/23 - 4/30	5/1 and on
Drug Site		Not Used	
Date of Wave	8/16-10/23	1/12 - 2/20	5/1 - 7/7
N	501	60	574
Prost Site		None	
Date of Wave	8/21-10/23		5/5-6/28
N	207		270
Both Sites		None Used	
Date of Wave	8/16-10/23		5/1-7/7
N	708		844
	Used for Curr	ent Study Across Intervention Waves 1.552	

Arrestee Interviews and Ethnographic Observations

In addition to the quantitative data sources discussed, researchers conducted interviews with offenders who were arrested in the target areas during the intervention periods. These interviews asked a number of open-ended questions with regard to offenders' perceptions of police presence, the places arrestees conduct their crimes, and how they adapt to police interventions. Brisgone (2004) also conducted ethnographic field work in the prostitution site, where she performed in-depth interviews and observations of prostitutes who worked in the prostitution target area (also see Weisburd, Wyckoff et al, 2004). The findings from these interviews were written up in the JCDDS final report (Weisburd, Wyckoff et al, 2004; Brisgone, 2004) and also used extensively by Weisburd and colleagues (2006) and Ready (2009) in other research using JCDDS data. This previously published, inductive, qualitative work is used as a resource for the

theoretical foundation, reviewed above, and discussion of the findings for the work at hand.

Chapter 6: Operationalization of Study Variables and Methodological Considerations

The Jersey City Displacement and Diffusion Study (JCDDS) provides a rich source of data, which are used to form variables to test the relationship between place-based opportunities and parallel spatial intervention effects, which are discussed in-depth in this chapter. For reference, this chapter begins with a list of the study hypotheses followed by a table (see Table 6.1) listing each of the broad hypotheses sets and the variables used in the analyses. Next, is a discussion of how the study's time perspectives are operationalized for the current study. This is followed by a discussion of each of the study measure definitions. The table listing the models proposed and the variables for these models provides a good reference during the discussion of the specific variables. Finally, the chapter ends with a brief discussion of methodological considerations, including possible weaknesses of the study design.

STUDY HYPOTHESES

- <u>Hypothesis 1A:</u> The social disorder measures significantly differ for each of the study intervention phases (phases tested separately).
 - <u>Hypothesis 1B:</u> The findings from hypotheses 1A differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 1C:</u> The findings from hypotheses 1A and 1B differ through the course of the intervention.
- <u>Hypothesis 2A:</u> For an intervention period, the amount of change in the social disorder measure at the street segment level varies across street segments (study phases tested separately).
 - <u>Hypothesis 2B:</u> The findings from hypotheses 2A differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 2C:</u> The findings from hypotheses 2A and 2B differ for periods tested through the course on the intervention.

- <u>Hypothesis 2D:</u> The decreases and increases in the average amount of observed social disorder cluster at specific street segments (study phases tested separately).
 - <u>Hypothesis 2E:</u> The findings from hypotheses 2D differ by segments' locations relative to the intervention area.
 - <u>Hypothesis 2F:</u> The findings from hypotheses 2D and 2E differ for the intervention time periods tested.
- <u>Hypothesis 3A:</u> Catchment area street segments with opportunity factors similar to the target area segments experience different intervention effects as compared to catchment area segments with opportunity factors dissimilar to the target area street segments (tested separately by intervention time period).
 - <u>Hypothesis 3B:</u> The findings from hypotheses 3A differ when controlling for street segments' location relative to the intervention target area
 - <u>Hypothesis 3C:</u> The findings from hypotheses 3A and 3B differ by the time period of the intervention.
- <u>Hypothesis 3D:</u> The opportunities at the street segment level (type of targets and offenders present; the level and type of guardianship) predict the specific parallel intervention effects group (i.e., displacement, no change, low/moderate decrease, severe decrease) in which a street segment falls (tested only for the immediate intervention period).
 - <u>Hypothesis 3E:</u> The findings from hypotheses 3C differ by the street segments' location relative to the intervention target area.
- <u>Hypothesis 4A:</u> Considering the presence of the intervention, the opportunities present in the situation and those generally at the street segment (i.e., general guardianship and types of targets that may be discerned from the built environment, and the relative location) will affect the occurrence of social disorder in that situation at the segment.
 - <u>Hypothesis 4B:</u> The findings from hypothesis 4A will differ by street segments' locations relative to the intervention area.

Table 6.1: General Analytic Models and Variables Examined

Table 6.1: General Analytic Models and Variables E	Models					
Variables	Test of Net Parallel Spatial Effects by Area	Variability of Parallel Spatial Effects by the Segment	Matched Segment Analysis of Parallel Spatial Effects	Grouped Segment Change and Opportunities Analysis	Situated Segment Opportunities and Occurrence of Social Disorder	
Social Disorder Outcome Measures						
Average Soc. Dis. Incidents	X					
Change of Average Soc. Dis. Incidents		X	X			
Groups of Street segments by Soc. Dis. Change				X		
Occurrence of an Incident of Social Disorder in the Situation					X	
Distance/Location/Intervention Focus						
Relative Location (Static)	X	X	X	X	X	
Targets/Offenders						
Types of Buildings Items (Static)			X	X	X	
Social Class (Static)			3.7		X	
Social Class (State)			X	X	Λ	
General Public Flow Scale and Items (Static & Dynamic)			X	X	X	
General Public Flow Scale and Items (Static & Dynamic)				X	X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static)				X X	X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians				X X X	X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic)				X X X	X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians			X	X X X X	X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static)			X	X X X X	X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static) Level of Responsibility Scale (Static)			X	X X X X X X X	X X X X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static) Level of Responsibility Scale (Static) Rating of Place Scale (Static)			X	X X X X X	X X X X X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static) Level of Responsibility Scale (Static) Rating of Place Scale (Static) Mean Number of Police Patrols (Dynamic)			X	X X X X X X X	X X X X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static) Level of Responsibility Scale (Static) Rating of Place Scale (Static) Mean Number of Police Patrols (Dynamic) Physical Disorder Scale (Dynamic) Lighting (Dynamic) Situation Only Control			X	X X X X X X X	X X X X X X X X	
General Public Flow Scale and Items (Static & Dynamic) Number of Connecting Streets (Static) Number of "Possible" Offenders (Dynamic) Number of "Possible" Victims (Dynamic) Guardians Number of "Possible" Place Managers (Static) Level of Responsibility Scale (Static) Rating of Place Scale (Static) Mean Number of Police Patrols (Dynamic) Physical Disorder Scale (Dynamic) Lighting (Dynamic)			X	X X X X X X X	X X X X X X X X	

OPERATIONALIZING STUDY TIME PERIODS

To examine each of the hypotheses, a number of different time perspectives are used for this study; based on the timing of the collection of each data type as well as how the measures are constructed. This section explains the time perspectives used for the current study, including the way in which the timing of the original collection of each

data type is included within the study time perspectives. The time perspectives include phases, periods, and situations within waves. These time perspectives are defined as follows:

Study Phases

Each specific data source was collected in waves, which varied by the timing of the intervention and the timing of the data source. The original data collection waves for each data source are redefined into phases and collapsed to fit the purpose of the first three hypotheses and the study measures for testing these hypotheses. There are four study phases: (1) the pre-intervention phase, (2) the immediate intervention phase, (3) the mid-intervention phase, and (4) the post intervention phase. These phases capture measures for important points in the intervention. The pre-intervention phase serves as a baseline for the study measures, collected before any intervention started and before offenders would be expected to adapt. The immediate intervention phase is taken directly after the intervention begins; one would expect a steep intervention impact at this point, as offenders are unsure how to react to the intervention. The mid-intervention phase is in the middle of the intervention, when offenders are likely more adapt to the intervention. Finally, the post intervention phase is after the close of the intervention, when offenders have likely grown accustomed to the intervention and may have adopted new crime locations (or even returned to their former locations).

Table 6.2 specifies how the pre-existing waves from the JCDDS data are categorized into these new phases for the current study. The pre-intervention phase includes the first wave of the social observations and the physical observations. The immediate intervention phase is constructed from the first two waves of the social

observations that were collected at the beginning of the intervention. The midintervention phase is constructed from two social observation waves that fall in the
middle of the intervention, which parallel the data collection timing of the middle wave
of physical observation data. One wave of the physical observation data is used to
construct measures for both the immediate intervention wave and the mid-intervention
wave. Finally, the post-intervention phase is constructed from data using the final wave
of the social observations and physical observations, after the interventions ended. The
place manager data are used to construct measures that are static through all of the study
waves.

Table 6.2: Study Analysis: Study Intervention Phases

New Intervention	Pre-		ediate			Post	
Phases	Intervention	Interv	ention	Mid-Inte	rvention	Intervention	
	1	,	2	3	3	4	
Original Social	1	2	3	5	6	8	
Observation Waves							
(7 day waves per site)							
Dates	8/28-9/18	9/29 –	11/03-	1/01-	2/02-	5/01-5/18	
		10/14	12/2	1/18	2/18		
	584	716	647	684	701	580	
Physical Observation	1		2	2		3	
Waves							
(1 per segment per wave)	8/6/98 -		1/11/99 -	- 2/11/99		6/5/99 –	
Dates	9/29/98					6/27/99	
N	163		16	53			
						163	
Place Manager Interview			18	£2			
Waves****							
Dates			8/16/98 -	10/23/98			
			8	ζ.			
	5/1/99 – 7/7/99						
N			1,5	52			
Police Intervention Dates	Prior to	_	9/14/98 -	- 4/30/99		5/1/99 and on	
	9/14/98						

Study Periods

A primary outcome measure for the study, the change in social disorder measure, is constructed using the change in average observed social disorder from one intervention

phase to another, which is termed as an intervention period. There are four phases, so there are three intervention periods including (1) the pre-intervention phase to the immediate intervention phase, termed the beginning intervention period; (2) the immediate intervention phase to the mid-intervention phase, termed the first half of the intervention; (3) the mid-intervention phase to the post-intervention phase, termed the second half of the intervention.³⁵

Study Situations within Waves

The fourth and final set of hypotheses will examine data collected in twenty minute socially observed situations; these were collected at randomly assigned times and street segments for one week at the beginning of each month and over the course of the study. These weeks of data collection were described as waves in the discussion above, with one wave of social observations for the pre-intervention, six waves during the intervention, and one wave post intervention. For the situation measures, the time periods of the data collection are referred to as situations within waves, with the intervention waves listed in numerical order (pre-intervention wave, during intervention wave numbered 1 through 6, and post intervention wave). For the situational analysis, the final analysis, the measures collected in the social observations vary from situation to situation, as well as across the span of the intervention. However, a number of the place-based opportunity measures remain constant (i.e., building type), since these are more general measures of the place, rather than the situation. The physical observation data

³⁵ Another set of periods was only used for the analysis of the first set of hypotheses. These three periods are (1) the immediate adaptation period, the change from the pre-intervention wave to the immediate intervention wave; (2) the mid-adaptation period, the change from the pre-intervention wave to the mid-intervention wave; and (3) the stabilized period, the change from the pre-intervention wave to the post intervention wave. The examination of these periods and a discussion of why these periods were not used in the analyses of the second and third hypotheses is included in the analysis sections.

have observations that parallel the pre-intervention and post-intervention waves, but the mid-intervention is used as a measure for each of the 6 during intervention social observation waves. As was the case in the other analyses, the measures gained from the place manager interviews remain constant through all of the waves of the analysis. Table 6.3 illustrates the timing of each measure used for the analysis that examines situations nested within waves.

Table 6.3: Study Data: Situations within Waves

Study Data	Pre Waves			During `	Waves			Post	
Intervention	start – end			start –	- end			Waves	
Timing									
J								end	
Police	Prior to			9/14/98 –	4/30/99			5/1/99 and	
Intervention	9/14/98							on	
Dates									
Social	Pre-	1	2	3	4	5	6	Post	
Observation	Interv							Interv	
Waves									
(7 day waves									
per site)									
Dates	8/28-9/18	9/29 –	11/03-	12/01-	1/01-	2/02-	3/01-	5/01-5/18	
		10/14	12/2	12/26	1/18	2/18	3/18		
N = 5,268	584	716	647	678	684	701	678	580	
Physical									
Observations									
(1 per segment	8/6 –			1/11				6/5 –	
per wave)	9/29			2/1	1			6/27	
Dates									
N = 486	163			163	3			163	
Place Manager									
Interviews									
Dates			8,	/16/98 – 1	0/23/98				
				&					
				5/1/99 – 7	7/1/99				
N = 1,552		1,552							
Police	Prior to			9/14/98 –	4/30/99			5/1/99	
Intervention	9/14/98							and on	
Dates									

The time perspectives of phases, periods, and situations within waves are also referred to below, in the discussion of study measures and their construction.

OPERATIONALIZING STUDY VARIABLES³⁶

This section presents each study variable and a description of the variable, beginning by explaining each of the dependent variables, in the order they are used to test the study hypotheses (sets 1-4). Next, each of the independent variables is described. Many of the same variable measures are used in both the aggregate level analysis (hypotheses set 3) and the situation level analyses (hypotheses set 4). This is normally the case when the variable is static (i.e., a measure of the built environment, a measure from the place manager data) or when the variable is dynamic but not captured often (e.g., a measure from the physical observation data which were only collected three times during the study). However, a number of measures captured from the social observations are dynamic across the study time periods. To represent the study time periods used for the first, second, and third set of hypotheses and analyses sets, these dynamic social observation variables are aggregated to represent measures for the study phases and periods. In contrast, rather than aggregating for a longer period of time, the situational analyses (hypotheses and analyses set 4) examine the dynamic social observation variables as they were captured, to represent the twenty minute situation. For these social observation independent variables, both the aggregate and the situation level variables are described. There are two instances in which independent variables are described that are only used in the situation analyses (hypotheses set 4). Table 6.3 (above) provides a good

³⁶ The variables are constructed using observational and interview instruments from the JCDDS, which may be obtained upon request from the author or by referring to the published final report located at http://www.ncjrs.gov/pdffiles1/nij/grants/211679.pdf

reference for understanding how each of the variables is used to test the study hypotheses. In addition, the following notes are placed next to each measure, to make it clear which set of hypotheses are tested using the measure:

Note Type of analysis

- H1 Test of *Net* Parallel Spatial Effects by Area
- H2 Variability of Parallel Spatial Effect by the Street Segment
- H3a Matched Street Segment Analysis of Parallel Spatial Effects
- H3b Grouped Street Segment Change and Opportunity Analysis
- H4 Situated Street Segment Opportunities and Occurrence of Social Disorder
- H all All of the Analyses

Dependent Variables

Using systematic social observations of the study street segments, four different dependent variables are constructed for each street segment: (1) the average observed social disorder by phase (H1), (2) the change score of the average social disorder by period (H2 & H3a)), (3) the social disorder change group by period (H3b), (3) and the presence of an incident of social disorder by the situation (H4). Each of these measures are constructed using a focused construct of social disorder, which includes minor street level crime, that is observed on the street segment during the twenty minute social observation. The social disorder measures captures observed street-level social activity that are expected to change due to an intervention, including verbal disorder, loud disputes, physical assault, loitering or wandering for the purpose of prostitution, soliciting for the purpose of prostitution, picking up a prostitute in an automobile, soliciting for

drug sale, drug transaction, drug use, drunk or high on drugs, public drinking, and gambling.³⁷

Average observed social disorder by phase (H1). This measure is constructed using the total number of social disorder incidents observed on a street segment per phase and dividing the total by the number of social observations conducted on that street segment during that phase, resulting in an average number of observed social disorder incidents per phase. As illustrated in Table 6.4, the number of observations per street segment varied by phase, so an average number of social disorder incidents by phase corrects for the variation in observations, so the level of social disorder may be compared across street segments and phases. The average amount of social disorder per phase does vary by street segment, with fewer average incidents and less variability during the intervention phase. The measure is only constructed for street segments with observations; twelve street segments in the first phase had no observations and ten street segments in the final phase had no observations, but the other two phases had observations for each street segment (see Table 6.5).

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³⁷ A number of activities recorded in the social observations were not included in the social disorder measures, although these activities may be considered social disorder. To assure that the measure was capturing social disorder more reflective of crime and not overwhelmed by merely poverty and homelessness, the items of panhandling, person down, and homelessness were not included. The panhandling and person down measures comprised a small percentage of the social disorder measures, with panhandling representing .6% of situations and person down representing .1% of situations. The measures of vandalism (.1%), unattended dogs (1.7%), car break-ins (0%), and buildings break-ins (0%) were excluded because there were so few incidents in the situation data. Loud noise and music represented 20% of the social disorder incidents and was excluded to prevent this item from overwhelming the data. Loud noise and music was also not included so the social disorder measure would be more accurate, since the loud noise and music measure may capture noise and music from places outside of the street segment, easily heard in densely populated areas.

Table 6.4: Descriptives of the Number of Observations per Street Segment by Phase

	N	Range	Min	Max	Mean	Std. Deviation	Variance
Pre-Intervention Phase	151	12.00	1.00	13.00	3.86	2.39	5.72
Immediate Intervention Phase	163	27.00	1.00	28.00	8.36	5.01	25.19
Mid-Intervention Phase	163	28.00	1.00	29.00	8.49	5.06	25.62
Post Intervention Phase	153	13.00	1.00	14.00	3.79	2.48	6.16
Valid N (listwise)	143						

Table 6.5: Descriptives of the Average Observed Social Disorder per Street Segment by Phase

	N	Range	Min	Max	Mean	Std. Deviation	Variance
Pre-Intervention Phase	151	11.00	.00	11.00	2.11	2.18	4.79
Immediate Intervention Phase	163	5.43	.00	5.43	.77	.79	.63
Mid-Intervention Phase	163	3.14	.00	3.14	.59	.62	.39
Post Intervention Phase	153	7.00	.00	7.00	.65	1.21	1.46
Valid N (listwise)	143						

Change score of the average social disorder by period (H2 & H3a). Using a the measure of the average observed social disorder by phase, a change score is constructed for each street segment for the three intervention periods; this is done by subtracting each intervention phase from its pre-intervention phase. Therefore, there are three different change score measures, including (1) pre-intervention minus immediate intervention, (2) pre-intervention minus mid-intervention, and (3) pre-intervention minus post-intervention. The change score signifies the level of social disorder change a street segment experienced, so a positive change signifies an increase in social disorder (displacement), a negative change signifies a decrease in social disorder (diffusion), and no change signifies a lack of parallel spatial effects for that street segment.

A number of other change score techniques were considered before settling on a straightforward subtraction method to construct this score. For instance, percentage change from one phase to another phase was considered. The difficulty with percentage

change is the score would over-inflate the scores for places with fewer crimes. Places with one incident in the first phase and no incidents in the second phase would have a 100% reduction in incidents, but places with 10 incidents in the first phase and 9 incidents in the second phase (also a one crime decrease) would have a 10% reduction in incidents. Calculating a residual change score was also considered, which would be constructed by regressing the average social disorder from the one intervention phase on the average social disorder from the later intervention phase. As compared to a simple difference score for change (time 1 minus time 2), residual change scores "do not give an advantage to persons [street segments] with certain values of the pretest scores" (Bergh and Fairbank, 2002; p. 361-362). However, Cronbach and Furby (1970) point out that the residual change score should not be viewed as "a 'corrected' measure of gain...", but rather as a "way of singling out individuals who gained more (or less) than expected" (p.74). Considering these other measures, it was determined that in the case of this study, it is important to know the actual change, not just the perception that places gained more or less due to the intervention. Since, the residual change score does not allow for an examination of the way in which specific places are responsible for the general change of the area. In the case at hand, the range of incidents is 11 to 0, so the greatest change possible is 11, which is not a large enough range to experience extreme data swings. Therefore, although the effects may be greater in street segments with started with higher levels of crime, this is important to capture, as it is also important to capture the places that started with low levels of crime and increased dramatically. Thus, the final decision was to return to the most transparent method for constructing the change measure: the simple difference of time one minus time two. As shown in Table 6.6, generally street

segments illustrate diffusion (mean -1.3 to -1.5) and the majority cluster within two standard deviations from the mean. However, there appears to be variability of the different scores across the street segments, since the standard deviations are larger than the mean scores and because there is a large range in the data by period (between 14 and 17.

Table 6.6: Descriptives of the Change Score of the Average Social Disorder by Period

	N	Range	Min	Max	Mean	Std. Deviation	Variance
Immediate Adaptation Period	151	14.17	-9.17	5.00	-1.33	2.02	4.10
Mid-Adaptation Period	151	14.14	-11.00	3.14	-1.50	2.11	4.45
Stabilized Period	143	17.80	-10.80	7.00	-1.47	2.46	6.07
Valid N (listwise)	143						

Social disorder change group by period (H3b). As will be described in the analysis section, the social disorder change group is only constructed for the first period of the study, change in social disorder from the pre-intervention phase to immediate intervention phase. Using the knowledge gained from examining the variability of the change in social disorder at the street segment level, segments were separated into social disorder change groups for this period. All of the study area street segments were considered in constructing these groups and in the analysis, including the target areas, since offenders may choose to displace within the target areas, causing specific hot spot street segments to increase in crime (direct intervention backfire effects). Additionally, the theoretical mechanisms for the changes in crime in the target areas – increases and decreases – are hypothesized to be similar to those explaining crime changes in the target area.

Although the analysis is only conducted examining the first intervention period's change score, in order to determine a methodology for assigning segments to change

groups, the distributions of the data for all of the periods were examined. Since segments have some natural variability in their level of social disorder, the first consideration was to create a no change group of a greater scope than just zero change, including segments that had relatively little increases or decreases in social disorder levels compared to the rest of the segments. However, examining the distributions of the periods, this methodology appeared to greatly limit the segments in the displacement change group. This was a concern, since a number of periods (pre-intervention to immediate and immediate intervention to mid-intervention) took place when there was a decrease in the temperature, therefore, overall decreases in social disorder and crime across Jersey City more generally (see Weisburd et al, 2006); thus these social disorder change levels would likely be biased toward findings of diffusion of benefits. To provide a more transparent analysis, without further bias against the displacement group, it was decided that the no change group would only include the segments with absolute zero change. Although this methodology may result in a few segments being included in the diffusion group because of the natural variation of the change in the level of social disorder at the segments, it was determined this weakness was more palatable than further biasing the analysis toward diffusion and away from displacement.

Once this decision was made, the groups of no change and increasing in social disorder (displacement or backfire effects) were easy to establish. This was because there were only 39 segments (25.8% of the segments) that had an increase in social disorder levels (suggesting displacement or backfire effects) with levels ranging from .07 to 5 and there were only six segments with no change in social disorder levels during this period. After these groups were established, the segments which decreased in levels of social

disorder (diffusion of social disorder or deterrence) were examined. There are 106 segments (70% of the segments) with declines in levels of social disorder during this period, with a large range of -9.10 to -.07. Examining the distribution of the first period change scores, 25% (38 of the 151 segments measured in this period) of the segments are responsible for 68.70% of the total decline in level of social disorder. As such, these 38 greatest declining segments were made into the high diffusion/deterrence group (see Table 6.7).

Table 6.7: Distribution of Segments by Study Area across Change Groups

Study	High Diffusion or	Low/Moderate	No change	Displacement or	Total
Areas	Deterrence Group	Diffusion or	Group	Increase Group	N
	N	Deterrence Group	N	N	% within
	% within	N	% within	% within	
		% within			
Target	16	14	0	2	32
Area	50.0%	43.8%	.0%	6.3%	100.0%
Catchment	11	26	0	13	50
Area 1	22.0%	52.0%	.0%	26.0%	100.0%
Catchment	11	28	6	24	69
Area 2	15.9%	40.6%	8.7%	34.8%	100.0%
Total	38	68	6	39	151
	25.2%	45.0%	4.0%	25.8%	100.0%

The presence of an incident of social disorder by the situation (H4). The

situational level social disorder measure is a dummy variable indicating the occurrence or the lack of occurrence of any incident of social disorder during the situation (twenty minute social observation). Similar to the other dependent measures, an incident of social disorder in a situation includes one or more of verbal disorder, loud disputes, physical assault, loitering or wandering for the purpose of prostitution, soliciting for the purpose of prostitution, picking up a prostitute in an automobile, soliciting for drug sale, drug transaction, drug use, drunk or high on drugs, public drinking, or gambling. This measure is constructed for each situation within each wave of the study, including the one

wave pre-intervention, the seven waves during the intervention, and the one wave after the intervention. Table 6.8 illustrates that the occurrence of social disorder incidents within situations varied through the waves of the intervention, with social disorder occurring in 60% of the situations in the pre-intervention wave but in only 26% of situations in the post-intervention wave.

Table 6.8: Number and Percent of Situations with Incidents of Social Disorder by Waves

Social			Waves							
Disorder Present in		Pre-			Interve	ention			Post-	
Situation		Interv	1	2	3	4	5	6	Interv	Total
Yes	Count	352	256	203	199	177	219	234	149	1789
103	Percent	60.3%	35.8%	31.4%	29.4%	25.9%	31.2%	34.5%	25.7%	34.0%
No	Count	232	460	444	479	507	482	444	431	3479
110	Percent	39.7%	64.2%	68.6%	70.6%	74.1%	68.8%	65.5%	74.3%	66.0%
Total	Count	584	716	647	678	684	701	678	580	5268
Situations	Percent	100%	100%	100%	100%	100%	100%	100%	100%	100%

Street Segment Level: Relative Location

Relative location of the street segment (H all). As discussed, the distance or relative location of a street segment from the intervention target area may influence the presence of intervention effects at the study area street segments. In order to gain an understanding of the proximity of place to the intervention area and its relation to displacement of crime and diffusion of benefits, a measure of street segment location is included in the analysis.

Prior research examining offender distance often uses distance measures constructed through GIS software. In this study, a relative location measure has already been planned into the study design through the larger geographic categories of target area, catchment area 1, and catchment area 2. Since the street segments are quite small, exact distance measures are not likely to provide additional information above and

beyond the geographic categories. Contrary to an exact distance measure, these geographic areas provide control over the relative location of street segments which are of similar distance from the target areas, while also providing a location measure that is easy to translate into police practice. The distance measure also provides a means to control for the direct intervention effects, since the target area includes the intervention areas. The specific distance and relative location of these geographic areas are as follows (also see Map 5.3 in the previous chapter):

- Target areas: no distance, since these areas include the street segments where the interventions took place;
- Catchment area 1 for both sites: approximately one block or tenth of a mile long beginning from the edge of the target area and running away from the target area; includes street segments bordering either of the target area and running for approximately 1 block or tenth of a mile away from the target area and side streets running parallel to the target area,
- Catchment area 2 for both sites: includes street segments approximately 1 block or tenth of running away from the catchment area 1 street segments and the side streets running parallel to the street segments in catchment area 1

As illustrated in Tables 6.9, the majority of street segments fall in the second catchment area (47.9%). Not surprisingly, the target areas with 33 street segments comprise the fewest street segments (20.2% of the sample) of all of the geographic areas.

Table 6.9: Relative Location Categorical Measure Collapsed by Areas

			-	Cumulative
	Frequency	Percent	Valid Percent	Percent
Target Areas (Prost and Drug)	33	20.2	20.2	20.2
Catchment Areas 1	52	31.9	31.9	52.1
Catchment Areas 2	78	47.9	47.9	100.0
Total	163	100.0	100.0	

Targets/Offenders Available

Presence of specific types of buildings (H3a, H3b, H4). The way in which the public uses the street segments serves as a proxy measure for the targets available at each of the street segments. As discussed in the literature review, a number of studies have provided evidence of a variation in crime across place use settings (see Perkins et al, 1993; Taylor et al, 1995). Sampson and Raudenbush (1999) explain, "...illegal activities feed on the spatial and temporal structure of routine legal activities (e.g., transportation, work, and shopping), the differential land use of cities is a key to comprehending neighborhood crime, and, by implication, disorder patterns" (p.610). Using data from the physical observations, the current analysis employs a number of land use measures as proxy measures for the targets available at the street segments in the study area.

The land use measures are constructed from the physical observation data. The measures are six dummy coded variables, each specifying if a type of building/institution is present at the street segment, including: (1) any residential building, (2) commercial buildings mostly industrial, (3) commercial buildings mostly retail, (4) any commercial building, (5) any public service institution, and (6) any bars/liquor store.³⁸ These measures are employed as separate indicators, when appropriate, in the analysis section.³⁹

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³⁸ The land use measures were constructed using specific variables from the physical observations data which reveal if the street segments had any residential buildings (questions 26 and 28), any commercial buildings (questions 26 and 28), commercial buildings that are mostly retail or industrial (question 27), any public service buildings (question 33), and any bars or liquor stores (question 18). Public service buildings in this case include "buildings for religious worship, hospitals or clinics, social services (i.e., YMCA, counseling services), and government services such as police and fire stations."

³⁹ Each of these variables were collected three different times in the study, once prior to the start of the intervention, once during the intervention, and once after the intervention was complete. There is no reason to expect a change in the type of land use at the street segment level over the course of the study. For this reason the answer for each street segment was compared for each variable for each of the three waves of the physical observations to assure the variables were clean. If two or more waves agreed on a category, this was the category used for the street segment. This resulted in a change in the residential or commercial land use variable for 8% of the street segments. For the public service buildings this resulted in recoding less than 2% of data for this variable. After this point the variable was clean, so the measure is considered

Using a selection of these measures, a categorical land use measure is also constructed in which each segment is categorized as a segment which has retail commercial buildings, industrial warehouse buildings, all residential buildings, or no residential or commercial buildings. Street segments are most likely to have residential buildings (77.3% of street segments), but the percentage of the remaining land-use measures suggest that street segments are diverse in the types of buildings present (see Table 6.10).

Table 6.10: Presence of Specific Land Use Measures (total N = 163)

	Frequency Of Land Use Type Total N = 163	Percent of Places Have Land Use Type
Any Residential Buildings	126	77.3
Industrial Commercial Buildings	31	19.0
Retail Commercial Businesses	84	51.5
Any Commercial Buildings	115	70.6
Any Public Service Institutions	64	39.3
Any bar or liquor store	17	10.4

Table 6.11: Categorization of Land Use Measures (total N = 163)

	Frequency Categorized Land Use Total N = 163	Percent of Places Categorized Land Use
All Residential Buildings	39	23.9
Industrial Commercial Buildings	31	19.0
Retail Commercial Businesses	84	51.5
No Commercial or Residential Buildings	9	5.5
Total	163	100.0

a constant measure for the span of the intervention year and the same measure is used to test each period of the study.

⁴⁰ For the categorical types of buildings measure some of the segments were mixed land-use with commercial and residential buildings, dividing the measures further by industrial-residential and commercial-residential resulted in groups with too few segments for a stable model, so for segments with residential and commercial establishments the segments are categorized based on the commercial buildings present. As such, only street segments with all residential buildings were categorized into the residential buildings category, while street segments with any retail commercial buildings are categorized into the retail commercial category and segments with any industrial warehouse buildings are categorized into the industrial warehouse category.

Street segment social class (H3a, H3b, H4). The socioeconomic conditions of a street segment serve as an indicator of the types of targets available on that street segment. For instance, Felson and Boba (2010) explain that poor people make good targets, since they are more likely to carry a greater amount of cash and to have "light weight electronics as their best luxuries" of cash compared to people from the middle class (p. 85). The social class variable for this study is obtained from the physical observation data, in which researchers coded each street segment into a social class. This categorization was made through the researcher's perception of the size of the houses and apartments, the physical condition of the properties, and the value of the properties. The variable is collapsed into three categories (1) ghetto poverty area; (2) lower to working class area; and (3) middle class area. 41 As illustrated in Table 6.12, the majority of street segments are considered lower to working class (81.6%) and a minority of street segments are considered poverty (6.1%) or middle class (12.3%). 42 Although the variation in this variable is low, this variable may still be salient in the analysis when considered in conjunction with the other variables examined. Since this measure is not expected to change over the three study waves, this measure will remain constant and the same measure is used for each analysis of the study.

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⁴¹ The original variable had five categories: ghetto poverty area; mixed, mostly poor; lower to working class area; middle class area; and mixed, mostly wealthy. All of the street segments except one were categorized into the three categories of ghetto poverty area; lower to working class area; and middle class area. For this reason, these three categories are used for the social class measure. The one street segment that was not in one of these three types was in the mixed, mostly wealthy category. This one street segment was re-coded into the middle class area category.

⁴² The class measure was captured in the physical observation data collection three times during the study: once pre-intervention, once during the intervention, and once post intervention. There was a small discrepancy of the categorization of street segments by social class when comparing the three waves. It is highly unlikely that the street segments would have a change in class over a 10 month period, so if a street segment was categorized in the same class category for two or more of the waves, this category was used for the street segment for all of the waves (9% of the data was corrected in this manner). As such, each street segment is the same class category across all three waves of the study.

Table 6.12: Frequency of the Social Class Variable across Street Segments

	Frequency	Percent	Valid Percent	Cumulative Percent
Ghetto Poverty Area	10	6.1	6.1	6.1
Lower to Working Class Area	133	81.6	81.6	87.7
Middle Class Area	20	12.3	12.3	100.0
Total	163	100.0	100.0	

General public flow scale and items (H3a, H3b, H4). As indicated in the literature review, research has illustrated that the street network design, including a street segment's location within the street network and the layout of the street segment, can influence the public flow (targets and offenders) and the opportunity for crime on a street segment (see Beavon et al, 1994; Bevis and Nutter, 1978; Perkins et al, 1993). Public flow can also be measured by the number of people traveling into the street segment and can signify the amount of potential targets and offenders in an area.

For the group-based analysis only (H3b) a public flow measure is constructed for the immediate intervention phase. This measure is an additive scale of four items. The four items used for this scale are the number of lanes, the presence of a bus stop, the volume of automobile traffic, and the volume of pedestrian traffic for each street segment. Two of the measures are static measures and are obtained from the physical observation data, including the number of lanes measure (question number 21), which categorized each street segment as one lane, two lanes, or four lanes, and the presence of a bus stop measure (question 22). ⁴³ The volume of automobile traffic (question number 37) and the volume of pedestrian traffic (question number 38), were obtained from the

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⁴³ The bus stop and the number of lanes measure were collected three different times during the course of the study. It is likely these measures would be stable over the three waves, so in order to clean the data if two or more waves indicated the same answer this was made the answer for all of the waves. This resulted in recoding of two street segments as having a bus stop in one wave of the bus stop variable and the change of one street segment from one lane to two lanes in the number of lanes variable. As a result, these measures are each consistent across the three waves. Although there is a subway in the Jersey City area, only one street segment had a subway stop, so this was not included in the analysis.

social observation data, so they are dynamic measures changing dependent on the situation observed within the street segment. These two measures were both four-point scales ranging from 1 for none to 4 for heavy and they were collected numerous times for each street segment within each week of the social observations data collection.

The general public flow measure is constructed for the immediate intervention phase only, since this is the only phase needed for the group-based analysis (H3b). ⁴⁴ For this phase, an average of the four-point scale across all of the situations is constructed for both the volume of automobile traffic and volume of pedestrian traffic measures. These measures and the two static measures, number of lanes and presence of a bus stop, are added together to construct a summated scale for each of the four study waves. ⁴⁵ A reliability analysis reveals a Cronbach's Alpha for the first phase into the intervention of .79.

Table 6.13: Public Flow Scale Descriptives (static and dynamic H3b)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Immediate Intervention Phase	163	5.83	4.33	10.17	6.54	1.49	2.23

For the situation specific analyses (H4), the two static measures (bus stops and number of lanes) are included as separate measures, and the volume of pedestrian traffic and volume of auto traffic are measured as an additive scale at the situational level. The Tables below provide the descriptive details for the street segment level measures (bus stop and number of lanes) and situation measure for the volume of pedestrian and auto traffic scale (Table 6.14 - 6.16).

the post intervention wave (t = -2.615, p = .010). For this reason, the measures will remain dynamic for the study waves.

45 Standardizing the different items before summing them was considered, but it made little difference in

 $^{^{44}}$ A dependent t-test illustrated a significant change in the average volume of automobile traffic at the street segment level from the pre-intervention wave to the immediate intervention wave (t = -2.301 p = .023) and a significant change in the average volume of pedestrian traffic from the pre-intervention wave to the post intervention wave (t = -2.615, p = .010). For this reason, the measures will remain dynamic for the

⁴⁵ Standardizing the different items before summing them was considered, but it made little difference in the final Cronbach's Alpha score, so for ease of interpretation the items were left in their original form.

Table 6.14: Presence of Any Bus Stop by Street Segment (static, H4)

				Cumulative
	Frequency	Percent	Valid Percent	Percent
No	122	74.8	74.8	74.8
Yes	41	25.2	25.2	100.0
Total	163	100.0	100.0	

Table 6.15: Number of Lanes by Street Segment (static, H4)

		j	Valid	Cumulative
	Frequency	Percent	Percent	Percent
One lane	64	39.3	39.3	39.3
Two lanes	80	49.1	49.1	88.3
Four lanes	19	11.7	11.7	100.0
Total	163	100.0	100.0	

Table 6.16: Volume of Pedestrian and Auto Traffic Scale

						Std.	
	N	Range	Minimum	Maximum	Mean	Deviation	Variance
Volume of Pedestrian	5268	6.00	2.00	8.00	4.50	1.03	1.05
and Auto Together							

Number of connecting streets (H3b, H4). The number of street segments which connect to a specific street segment (or possible crime site) provide a measure of connectivity to that street segment. As discussed, street segments with a greater level of connectivity are expected to have greater ease of access, ease of escape, and level of familiarity by both offenders and targets. These places are also expected to have greater numbers of targets and offenders. Surprisingly, this measure did not align well with the other public flow measures, discussed above, in an exploratory factor analysis or a reliability analysis. However, the measure seemed to be salient in its own right and so it is still included in the analyses.

For the present study, the connectivity measure is the number of street segments connected to a specific street segment. The same measurement technique was used by Johnson and Bowers (2010) for their first order connectivity measure in their research

examining permeability and burglary risk. This technique was also used by Beavon and colleagues (1994) in their study examining the relationship between street segment accessibility and crime (see page 127), in which they describe the connecting street segments as the number of turns a person can take to enter (or exit) a street segment. For each street segment in the study area, a measure was constructed by counting the number of street segments (including those falling outside the study area) that are connected to each study street segment. The connectivity measure is a continuous measure for each of the 163 street segments, ranging from 2 connections to 9 connections with a mean of 4.4 and a standard deviation of 1.6 (see Table 6.17).

Table 6.17: Number of Connecting Streets (static measure across all waves)

	N	Range	Min	Max	Mean	Std. Dev	Variance
Number of Connecting Streets	163	7.00	2.00	9.00	4.37	1.63	2.64

Possible offenders and victims/targets (H3b, H4). For the research at hand, the proxy measures for population and number of offenders is a bit more complex than the examples presented from past research. A direct measure of population by street segment is not available. Although the variability in the population size is to some extent limited because the size of the street segments were relatively the same (each approximately .10 miles), street segment size does not provide a true control of the population across the street segments. The most optimal measurement strategy would also include a separate proxy measures for victims/targets and offenders. As such, using

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⁴⁶ Unfortunately the observation data did not capture the total number of people observed on the street segment at the time of each observation, nor was there available from any of the data sources a measure of the total number of buildings or housing units at the street segment level. The short form for the 2000 Census provides population data at the block level; however, block level data cuts across multiple street segments, so this data source is not feasible for the current analysis. Using the total number of households and businesses with a phone which would have been the original populations used to create the sample for the resident survey data collection was considered for this measure; however, this data was not found when reviewing the data available for this study.

the social observations, a proxy measure is constructed for the number of "possible offenders" for each street segment and the number of "possible victims/targets" for each street segment.

For each social observation, the observer recorded the number of male youth, female youth, male adults, and female adults observed standing or sitting in public for no observable reason (question 34), talking on an outdoor payphone (question 35), and participating in recreational activity. ⁴⁷ The number of people sitting or standing in public and talking on a public telephone measures parallel what other studies have termed highrisk subpopulations (Mazerolle, Kadleck, and Roehl, 1998). It is likely a large proportion of these measures would include potential drug sellers, drug buyers, drug users, prostitutes, johns, and other individuals at a higher likelihood of committing a crime. This is especially the case in less populated areas, such as warehouse and factory areas, which were noted in the prostitution target area (Weisburd, Wyckoff et al, 2004). Arrestee interviews and ethnographic work in the study sites indicate that the overwhelming majority of prostitutes were female and drug dealers were male (see Weisburd, Wyckoff et al, 2004, Brisgone, 2004). For this reason there will be two separate "possible offender" measures, first the total number of females (youth or adults) and second, the total number of males (youth or adults) standing for no observable reason and talking on an outdoor telephone. The third population measure signifies the "possible victims/targets" available on the street segment, which is constructed from the

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⁴⁷ Two other sub-population count measures were captured similar to this one. Question number 35 recorded the number of people talking in public on an outdoor phone. This measure had a low frequency in the data and was clustered at specific places and is most likely a better measure of places that have phones than a measure of a "possible" offending population. Question number 36 captured the number of people involved in recreational activity, which had high frequencies at specific street segments and is more likely a measure of a park or regular recreation location, a different subset of the population measure.

total number of people involved in recreational activities (questions 36) on a street segment. These measures are patterned after work by Mazerolle and Roehl (1998) work, which used social observations of street segments in an experiment evaluating civil remedies to control drugs and disorder. In their study, people loitering were considered as being involved in illicit activity – also categorizing this activity by gender – and people riding bicycles were considered as being involved in licit activity (also see Mazerolle, Kadleck, and Roehl, 1998).

These sub-population measures are far from perfect, with the weakest measure being the "possible victims/targets" measure. This measure is likely to be highly correlated with street segments that have parks and will not give a truly accurate snap shot of the non-offending population. Although this measure has flaws, findings from the other opportunity measures, which provide relative population of the street segment, public flow and land-use, also assist in interpreting any findings made using this measure. It is also the case that a high proportion of the social disorder items employed as outcome measures in this study include activities where there is no direct victim/target and all of those involved are willing participants. The people involved in the outcome measure activities of drug activities, prostitution activities, drug or alcohol use in public, drunk or high in public, gambling in public, and public argument would likely be captured under the "possible offender" category. In these cases, all of the individuals involved in these activities would be considered offenders. The only time a social disorder item may be viewed as having a specific victim or target may be the occurrence of physical assault on the street, but even for this item there may be cases in which those individuals involved in the activity are both considered offenders. For this reason, in the context of the study

at hand, the indicator of "possible offenders" becomes more important, especially since the land-use and public flow measures provide some means to understand the level of population for each street segment.

These measures are used for the immediate intervention phase in the group-based analysis (H3b) and for each situation within wave in the situational analysis. The final measure used for the group-based analysis (H3b) are the average number of female "possible offenders", male "possible offenders", and "possible victims/targets" per observation for each street segment for the immediate intervention phase of the study (see Tables 6.18 - 6.20). ⁴⁸ For the situation level analysis (H4) those present and recorded in the situation are used, see Table 6.21 - 6.23.

Table 6.18: Descriptives of Avg "Possible Male Offenders" per Ob per Phase (dynamic, H3b)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Immediate Intervention Phase	163	5.40	.00	5.40	1.13	1.20	1.45

Table 6.19: Descriptives of Avg "Possible Female Offenders" per Ob per Phase (dynamic, H3b)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Immediate Intervention Phase	163	4.00	.00	4.00	.49	.75	.56

Table 6.20: Descriptives of Avg "Possible Victims" per Observation per Phase (dynamic, H3b)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Immediate Intervention Phase	163	6.40	.00	6.40	1.46	1.29	1.69

observations parallel the

middle wave of the physical observations, so these two social observation waves were used to construct the one wave measure. The ninth wave of the social observations was used for the post intervention wave, since it paralleled the final wave of the physical observations.

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⁴⁸ The waves used from the social observations are the same that were used in the public flow measure. As stated previously, the first wave of the social observations was used as the pre-intervention wave, since it paralleled the pre-intervention wave of the physical observations. The fifth and sixth wave of the social

Table 6.21: Descriptives of "Possible Male Offenders" per Observation per Wave (dynamic, H4)

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Pre-Intervention	582	17.00	.00	17.00	1.58	2.89	8.40
Wave 1 – During	716	15.00	.00	15.00	1.30	2.26	5.11
Wave 2 – During	647	11.00	.00	11.00	.92	1.83	3.38
Wave 3 – During	678	21.00	.00	21.00	1.03	2.06	4.26
Wave 4 – During	684	8.00	.00	8.00	.34	1.03	1.07
Wave 5– During	701	9.00	.00	9.00	.28	.98	.97
Wave 6 – During	678	11.00	.00	11.00	.28	.99	.98
Post Intervention	580	9.00	.00	9.00	.35	1.17	1.38
Total	5266	21.00	.00	21.00	.75	1.83	3.36

Table 6.22: Descriptives of "Possible Female Offend." per Obs per Wave (dynamic, H4)

Table 0.22. Desci	table 0.22. Descriptives of Tossible Temale Official per obspect wave (dynamic, 114)										
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance				
Pre-Intervention	582	19.00	.00	19.00	.76	2.15	4.65				
Wave 1 – During	716	11.00	.00	11.00	.61	1.52	2.33				
Wave 2 – During	647	9.00	.00	9.00	.35	1.07	1.16				
Wave 3 – During	678	13.00	.00	13.00	.35	1.05	1.11				
Wave 4 – During	684	5.00	.00	5.00	.07	.36	.13				
Wave 5– During	701	5.00	.00	5.00	.10	.49	.24				
Wave 6 – During	678	4.00	.00	4.00	.09	.42	.18				
Post Intervention	580	4.00	.00	4.00	.10	.50	.25				
Total	5266	19.00	.00	19.00	.30	1.13	1.27				

Table 6.23: Mean "Possible Victims" per Observation per Wave (dynamic, H4)

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Pre-Intervention	584	35.00	.00	35.00	2.81	4.26	18.15
Wave 1 – During	716	17.00	.00	17.00	2.02	3.18	10.16
Wave 2 – During	647	30.00	.00	30.00	.87	1.99	3.97
Wave 3 – During	678	9.00	.00	9.00	.70	1.34	1.79
Wave 4 – During	684	12.00	.00	12.00	.39	.91	.84
Wave 5– During	701	9.00	.00	9.00	.64	1.25	1.58
Wave 6 – During	678	10.00	.00	10.00	.77	1.22	1.50
Post Intervention	580	14.00	.00	14.00	1.19	2.04	4.18
Total	5268	35.00	.00	35.00	1.15	2.37	5.65

Street Segment: Guardianship/Place Management

Number of possible place managers (H3a, H3b, H4). The number of place managers interviewed, serves as the number of "possible" place managers on a street segment. As described in the data collection section, place manager interviews were conducted in two different fashions, through in-person interviews of those available on the street segment and through telephone interviews. These two methodologies complement each other, providing a more-representative place-manager perspective across different types of places. However, as illustrated in Table 6.24, the number of place manager interviews vary across the 163 street segment, with a range of 0 to 38, a mean of 9.5, and a standard deviation of 8.6. Drawing upon research on survey responses, this variation likely provides a unique indicator of the number of "possible" place managers for each place.

Research exploring survey response bias suggests the variability of survey responses across places is likely associated with the number of people available across these places, as well as the cooperation level or willingness of these people to participate in the survey, often based on individuals' interest in the topic (Groves, Pressner, Disko, 2004; Peress, 2010). Applying these findings to the present research provides support for using the number of total interviews by place as a number of "possible" place managers measure. The place managers that completed the survey (in person or over the phone) are more likely invested in the topic, so places with a greater number of interviews likely have a greater number of place managers invested in the topic of crime prevention in their area. It is also likely that a higher number of interviews were completed in places

with more people, which is found to be the case when examining the number of place managers interviewed relative to other place-based measures. For instance, 62.5% (20) of the 32 street segments with one or fewer interviews either had no commercial or residential buildings at all or had mostly industrial buildings. For these street segments, it would have been difficult to contact residential place managers over the phone or any type of place managers in person. The place manager interviews are also positively correlated (p<.01 r=.341) with the "possible offender" measure aggregated for males and females (total number of people standing on the street segment for no observable reason and talking on a pay phone on the street segment), which may indicate the number of place managers is higher where there are more people. Finally, including this measure allows for the number of place managers interviewed to be considered in relation to the remaining place manager measures constructed from the interviews, which are listed after this measure. Table 6.24 provides the descriptive details of the static "possible" place manager measure.

Table 6.24: Descriptives of "Possible" Place Managers by Street Segment (static, H3a, H3b, H4)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Total number "Possible"	163	38.00	.00	38.00	9.52	8.66	75.0
Place Managers							

Level of place manager responsibility by street segment (H3a, H3b, H4). Using the place manager interview data, an average level of place manager responsibility is constructed for each street segment. The responsibility level of each place manager was coded using their answer to a question regarding the level of responsibility a place-

manager has at the place in which they were interviewed. ⁴⁹ Drawing upon the responsibility categories Clarke (1992) developed, each place manager is categorized into one of five responsibility categories: (1) general (i.e., customers, people hanging out), (2) diffuse (i.e., cashier, server), (3) assigned (i.e., manager, security guard), (4) personal for those who rent (i.e., home renter), (5) personal for those who own (i.e., home owner, business owner). Clarke's (1992) personal category has been divided into two, renters and owners, since owners are thought to have a greater level of responsibly than renters at place. In addition, 86% of the interviewees were residents who owned or rented their home, so dividing the personal category in to two allowed for greater specificity and variation in the measure. Of the 1,552 interviews 107 (7%) did not have enough information to categorize their answers into a responsibility level; because 105 of these cases were from the residential interviews, which were already overly represented in the sample, and proportionately evenly distributed across places, there was not a concern of the missing cases affecting the mean responsibility level by street segment. Of those that answered the questions used to determine the level of responsibility, 24.8% of the sample fell into the personal own category, 61.7% fell into the personal who rent category (or have an intimate relation to the owner, such as a close relative), while the remaining 13.5% fell into one of the three other categories (see Table 6.25).

Table 6.25: Place Manager Sample Responsibility Level (static, H3b, H4)

			_		Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	General	50	3.2	3.5	3.5
	Diffuse	64	4.1	4.4	7.9
	Assigned	81	5.2	5.6	13.5
	Personal: Rent	892	57.5	61.7	75.2

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⁴⁹ Those interviewed as part of the telephone interviews were asked if they own or rent their home (resident survey question 59), while those interviewed as part of the in-person interviews were asked if they own the location as well as their designated position in the place, such as manage, clean, provide security, or simply hang-out in the location (place manager survey question 10).

	Personal: Own	358	23.1	24.8	100.0
	Total	1445	93.1	100.0	
Missing	No answer	107	6.9		
Total		1552	100.0		

For each street segment, an average level of responsibility was derived by totaling the scores for each of the place manager responses on the street segment and dividing it by the total number of place manager responses on that street segment. The final street segment manager responsibility level measure is constructed for 151 of the 163 street segments. The mean of the responsibility level scale for the 151 street segments is 3.6, so the average level of responsibility for the street segments falls between assigned and the rent category of personal (see Table 6.26).

Table 6.26: Average level of Place Manager Responsibility by Street Segment (static)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Responsibility Level Scale	151	4.00	1.00	5.00	3.63	.88	.77

Average length of place managers at place (H3b, H4). As described in the literature review, the length of time an individual has lived at a specific place is a common indicator of place attachment. Using the number of months respondents indicated they have lived, worked, or hung-out at a place, an average length of place manager attachment is calculated for each street segment. The average length of place manager at place measure is constructed for 151 of the 163 street segments. The mean of the average length of place manager at place measure for the 151 street segments is 10 years, with a range of one month (.08 years) to 40 years (see Table 6.27).

Table 6.27: Average Number of Years Interv Lived, Worked, or Freq Location (static, H3b, H4)

N	Range	Min	Max	Mean	Std. Dev.	Variance
1.4	Range	171111	IVIAA	Wican	Sid. Dev.	v ai iaiicc

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⁵⁰ For the twelve street segments without a measure, eleven of the street segments had no interviews completed and one street segment only had one interview in which the respondent did not answer the question related to renting or owning their home.

Average Years at Location	151	39.92	.08	40.00	9.95	6.52	42.51

Average rating of place (H3b, H4). Brown and colleagues (2004) stress that attachment to a place is more than length of stay or ownership, but requires "positive psychological bonds" to that place (Brown, Perkins, and Brown, 2004, p. 361). Each place manager, across both interview types, was asked to rate the place in which they live, work, or hang-out as either (1) poor, (2) fair, (3) good, or (4) excellent. It is assumed that those who give the place in which they live, work, or frequent a higher rating are more likely to have a greater attachment to that place. For this reason, the responses to this question will serve as another indicator of "capable" guardianship. As illustrated in Table 6.28, 42.2% of the sample answered that they would rate the place as good or excellent.

Table 6.28: Frequency Distribution of Place Manager Rating of Street Segment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) Poor	248	16.0	16.1	16.1
	(2) Fair	644	41.5	41.7	57.8
	(3) Good	535	34.5	34.7	92.5
	(4) Excellent	116	7.5	7.5	100.0
	Total	1543	99.4	100.0	
Missing	No answer	9	.6		
Total		1552	100.0		

Using each place manager's place rating, an average place rating is calculated for 152 of the 163 street segments.⁵² The range of the averages is one to four, with the mean of 2.26 for all of the street segment average ratings falling closer to fair (2) in the rating scale (see Table 6.29).

⁵¹ Question number 43 in the in-person (Place Manager Survey) and question number 2 in the telephone interview (Resident Survey).

⁵² The eleven street segments that do not have a rating did not have any interviews conducted in the pre and post waves of the study.

Table 6.29: Average of Place Manager Rating by Street Segment (static, H3b, H4)

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Average Place Rating	152	3.00	1.00	4.00	2.26	.51	.26

Level of police presence (H3b, H4). For the purpose of the study, there are not specific measures of police responsibility; however, a level of police presence may be constructed using observations of police presence from the social observation data. The social observation data provides a measure of the number of police patrols observed during each observation period. Police patrols used for this measure included any type of patrol, such as foot patrol, bike or scooter patrol, motorized patrol, or more than one type of patrol. For the first phase into the intervention (used in H3b); the police presence measure is constructed for each street segment by calculating the mean number of police patrols per number of observations (see Table 6.30). Using the same police presence variables used for the aggregate analysis, a police presence measure of any police presence (yes/no) is constructed for the situational analysis (H4). Table 6.31 provides the descriptive details of the situated police presence variable.

Table 6.30: Mean number of police patrol by obs by Street Segment (dynamic, H3b)

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Immediate Intervention Wave	163	1.80	.00	1.80	.43	.39	.15

Table 6.31: Police patrol per obs within wave (dynamic, H4)

			· •	,
				Cumulative
	Frequency	Percent	Valid Percent	Percent
No police patrol	3458	65.6	65.6	65.6
Police Patrol (any)	1810	34.4	34.4	100.0
Total	5268	100.0	100.0	

It is important to point out that the police measure presented is not likely to capture all of the intervention activities that took place in the target areas. As discussed in the intervention description section, a great number of the intervention techniques

involved activities that would not be captured in these observations, such as undercover operations and prosecutorial strategies. However, the relative location measure (discussed earlier) included in the analysis will provide another control for the focused interventions and target sites, as compared to the remainder of the study areas.

Physical disorder scale (H3b, H4). The level of physical disorder present at a street segment serves as another indicator of street segment guardianship. As reviewed in the literature, street segments with a greater amount of physical disorder may be perceived by offenders as having less capable guardianship and greater opportunity for crime. Using the physical observation data, a 7-point disorder scale is constructed by summing the number of physical disorder items present for each wave of the study. The 6 measures used for the scale include: burned, boarded up or abandoned buildings; buildings with structural damage; buildings marked with graffiti; vacant lots not in use; streets and sidewalks covered with broken glass; and yards and streets with litter.⁵³ Using each item's measurement scale, ⁵⁴ the items were dummy coded to indicate if there was a substantial presence of the physical disorder item at the street segment. 55 The vacant lots measure is a continuous measure, so if there were one or more vacant lot present on the street segment the item was given a one in the dummy coding. ⁵⁶ It would be reasonable to expect that an offender would notice and possibly adapt their offending if there is even one vacant lot on a street segment. Once dummy coded, the six physical

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⁵³ The items included from the physical disorder instrument included number 12, 32, 37, 38, 39, and 40.

⁵⁴ The scales differed, so depending on the item's measurement scale moderate or heavy, 26% or more, or 30% or more indicated that the physical disorder item had a major presence on the street segment

⁵⁵ When originally collected for the research, each measure was collected in a likert scale which captured the approximate amount of the presence of each physical disorder item, except for the vacant lots item, which was a count of the presence of vacant lots.

⁵⁶ As indicated in the data description section there were two street segments in the first wave of the study, which did not have a physical observation conducted. For these two street segments for each of the disorder items the average for the two waves that were completed was calculated and this was used for the pre-wave measure and to calculate the full scale measure.

disorder items were summed for each street segment within each study wave. This scale is based upon a scale previously used with the same data by Hinkle and Weisburd (2008) and Hinkle (2005) to examine the relationship between disorder, focused police crackdowns, and fear of crime. As illustrated in Table 6.32 the seven point scale ranges from 0 to 6, with a mean varying from 2.4 to 2.2. The Cronbach's alpha for this 6 item physical disorder scale is .703 for the pre-intervention wave, .658 for the during intervention wave, and .514 for the post intervention wave.⁵⁷

Table 6.32: Physical Dis Scale Descriptives (Dynamic but Static within Intervention, H3b, H4)

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	N	Range	Min	Max	Mean	Std. Dev.	Variance
Phys Dis Scale Pre-Int	163	6.00	.00	6.00	2.36	1.76	3.11
Phys Dis Scale During Int*	163	6.00	.00	6.00	2.22	1.68	2.81
Phys Dis Scale Post Int	163	6.00	.00	6.00	2.39	1.45	2.10
Valid N (listwise)	163						

^{*}The during intervention scale is used as an indicator for all during intervention analyses (periods or waves).

Situated level of lighting and day time observation (H4). A number of studies have revealed that the level of lighting is negatively associated with crime and social disorder (Farrington and Welsh, 2002a, 2002b; Welsh and Farrington, 2008). Literature points to two possible mechanisms involved in lower crime because of better lighting. First, sufficient lighting in an area, similar to physical disorder, may indicate to an offender a greater level of community pride. Secondly, good lighting in an area also provides the opportunity for place managers to view the area more easily; aware that they are more likely to be seen, offenders may be less likely to commit crime or social disorder in areas with better lighting. For this same reason, day time observations may

the indicator was not significant, so it was not included in the final models.

⁵⁷ It was unexpected that the scale did not maintain its internal consistency when including the buildings with broken windows item (item number 11 in the physical observation data), so this item was not included in the scale. However, this item was examined as a unique indicator on its own merits in the analyses but

provide better guardianship and, since not all observations were collected at night when area lighting would be a factor, it is important to capture if the observation was conducted during the day. The observations in the study produced one measure that signifies situated level of lighting, but also captures if the observation was conducted in the daytime. Using these two measures, a four-point ordinal scale measure is constructed, including the following categories: (1) whole area being lit poorly/mostly poorly, (2) area lit mostly well, (3) whole are lit well, (4) daytime observation. This measure is only used for the situation analysis (H4).

Table 6.33: Frequency of Area Lighting and Day Time Observation (Dynamic, H4)

				Valid	Cumulative
		Frequency	Percent	Percent	Percent
Valid	Area lit poorly/Mostly lit poorly	435	8.3	8.3	8.3
	Mostly lit well	1823	34.6	34.7	43.0
	Whole area lit well	404	7.7	7.7	50.6
	Day time observation	2594	49.2	49.4	100.0
	Total	5256	99.8	100.0	
Missing	No Answer	12	.2		
Total		5268	100.0		

Control Variables

Situated temperature (H4). It is well noted that offenders are less likely to commit crimes during colder weather, so there is an expected variation in offending by temperature. In fact, it is likely the case that a number of indicators are affected by the cold temperatures, such as the number of "possible offenders" and the number of "possible victims/targets." The current study began in August and was completed in May in Jersey City, New Jersey, a place that can experience freezing temperatures during the winter months. In addition, even within a single day of social observations the temperature may vary dramatically, influencing the occurrence of crime. For this reason,

a situated temperature measure is included as a control variable in the situation analyses (H4). The temperature will be kept in the situational analysis as a four-point ordinal scale, including (1) cold (under 32 degrees Fahrenheit), (2) cool (32-59), (3) warm (60-85), and (4) hot (over 85 degrees Fahrenheit). The temperature measure was captured during each observation, so each situation will have a related temperature. Table 6.34 provides the frequency distribution for the temperature measure across the weeks of the social observations.

Table 6.34: Frequency of Temperature in Situation by Wave (Dynamic, H4)

			Wave							
		Pre-			Interv	ention			Post-	
		Interv	2	3	4	5	6	7	Interv	Total
Cold	Count	1	47	113	199	313	157	75	0	905
(Under 32 F)	Percent	.2%	6.6%	17.5%	29.4%	45.8%	22.4%	11.1%	.0%	17.2%
Cool	Count	80	480	487	424	370	523	554	309	3227
(32-59 F)	Percent	13.7%	67.0%	75.3%	62.5%	54.1%	74.6%	81.7%	53.3%	61.3%
Warm	Count	403	189	47	55	1	21	49	265	1030
(60-85 F)	Percent	69.0%	26.4%	7.3%	8.1%	.1%	3.0%	7.2%	45.7%	19.6%
Hot	Count	100	0	0	0	0	0	0	6	106
(Over 85 F)	Percent	17.1%	.0%	.0%	.0%	.0%	.0%	.0%	1.0%	2.0%
Total	Count	584	716	647	678	684	701	678	580	5268
Situations	Percent	100%	100%	100%	100%	100%	100%	100%	100%	100%

<u>Weekend or weekday observation (H4).</u> Research has noted variation in both crime and disorder by the day of the week; since the original study sampling was conducted across day and time for these street segments, with the intent to generalize up to the larger area, day of the week was not a concern for generalizing to the larger area. However, for this study which employs the street segment as the unit of analysis, there may be variation by day of the week. To provide some control over this possible

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 $^{^{58}}$ The scale captured in the social observation was flipped to make it easier to interpret.

measurement bias across segments, a dummy variable is included in the situational analysis, indicating if the observation was conducted on a weekday or weekend (see Table 6.35).

Table 6.35: Frequency of Weekend or Weekday (Dynamic, H4)

	Frequency	Percent	Valid Percent	Cumulative Percent
Weekend	1752	33.3	33.3	33.3
Weekday	3516	66.7	66.7	100.0
Total	5268	100.0	100.0	

STUDY DESIGN LIMITATIONS AND CONSIDERATIONS

Challenges of Street Segment Level of Measurement

The current study uses various data sources measured at the street segment level; however, their original purpose and collection methodology was designed to generalize to a larger unit of measure, the catchment areas and target areas. Using the street segment as the unit of analysis is challenging, since the data available at this level is normally collected for other purposes and crime, especially specific types of crime, may not be plentiful enough at this level to provide for effective examination (Weisburd, Bruinsma et al, 2009). Weisburd and colleagues (2009) note, "This will often create a dilemma for researchers, who need to do the best they can with the information available. Our point is not that research should not use the data at hand, but that they should be critical of the data used and recognize the fallacies of interpretations that may head from the unit of analysis problem" (p. Weisburd, Bruinsma et al, 2009, p.21). As compared to many other studies employing street segment measures, the current study does provide original data collected with the street segment unit as the level of measurement. This being said, it is still important to consider the limitations for this data, due to the original data collection and sampling procedures. This section discusses how each data source may be

generalized to the street segment level, considering each data source's limitation and the measures the data source is being used to represent.

Social Observation Measurement Considerations

The social observations are used to construct a number of situational and aggregate variables about the type of people present at the place, the social flow of the place, and the social disorder present at the place (the outcome variable for all of the analyses). As mentioned in the data description chapter, street segments were randomly selected for an observation within their site, their geographic area, and the time of day for the seven day periods for each month. Because of the sampling technique some of the street segments had a greater number of social observations than other street segments. In addition, because street segment random selection was conducted considering time of day and day of week, these places were not necessarily observed at the same time of day and day of week for each of the observations. This is not a concern for the situational analysis for which these factors may be controlled for, but it may be a concern for the aggregate street segment analysis. For the aggregate analysis, the indicators are produced by intervention period by using averages, which provides an overall measure correcting for the differences in the number of observations by place. However, this does not correct for the variability in standard error across places, which may be present due to the original sampling method.⁵⁹

Because of the sampling methodology, the number of observations within any given wave at a street segment varied from as little as one to as many as twenty nine (see Table 6.36). The first concern of generalizing from the observations to the street segment

⁵⁹ The large standard error because of this measurement error most likely results in a lack of efficiency of the measures rather than bias.

level is whether there are enough observations to generalize to the street segment. The street segments are a small level of measurement, approximately one tenth of a mile, and other research using and studying this level of measure has suggested that a large number of observations is not necessary for generalizing to this small unit of analysis, since these places are relatively homogeneous and have less complexity as compared to larger units of geography (i.e., neighborhood, community) (Mazerolle, Kadleck et al, 1998; Mazerolle and Roehl, 1998; Oberwittler and Wikstrom, 2009). In a study examining the relationship between the applicability of civil remedies in reducing drugs and social disorder, Mazerolle and her colleagues had only two observations per street segment for pre and post intervention (Mazerolle, Kadleck et al, 1998; Mazerolle and Roehl, 1998). This gives some confidence in the generalizability of the observations to the street segment level in the present study, since the pre and post intervention periods (which each use one wave of data) have an average of approximately 4 observations each and the immediate and mid-intervention phases have an average of approximately 8.5 observations each (see Table 6.36).

Table 6.36: Descriptives of Number of Social Obs per Street Segment by Intervention Phase

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Pre-Intervention Phase	151	12.00	1.00	13.00	3.87	2.39	5.73
Immediate Intervention Phase	163	27.00	1.00	28.00	8.36	5.02	25.20
Mid-Intervention Phase	163	28.00	1.00	29.00	8.50	5.06	25.62
Post Intervention Phase	153	13.00	1.00	14.00	3.79	2.48	6.17

The second concern with using the social observations to construct measures at the street segment level is that the variability in the number of observations across street segments may affect the reliability of these indicators across the street segments. As mentioned previously, some street segments have greater numbers of observations

because of the sampling design. As well, as part of the current study the pre-intervention period and the post intervention period are constructed from one wave of data, while the two during intervention periods are each constructed of two waves of data (these waves were collapsed so more street segments would be included). Therefore, the two periods during the intervention have higher numbers of social observations per street segment. Although, as mentioned, the homogeneity of these areas reduces the concern of the sampling error; the variability in the error across places is still of some concern. The distribution of the number of observations across the study areas may give additional insight into the sampling variability. The number of observations at place was part of the sampling design. As such, the target area street segments had greater numbers of observations (mean 37.52) as compared to the catchment areas (mean for the first catchment area was 25.33 and mean for catchment area 2 was 17.40). Quite simply, the number of observations conducted at a street segment varied by the geographic area of the street segment (see Table 6.37).

Table 6.37: Descriptives of Number of Social Observation per Street Segment by Areas

	N	Range	Min	Max	Mean	Std. Dev.	Variance
Target Areas	33	55.00	12.00	67.00	37.52	18.93	358.45
First Catchment Areas	52	33.00	11.00	44.00	25.33	7.62	58.07
Second Catchment Areas	78	27.00	7.00	34.00	17.40	5.60	31.39
Total of All Areas	163	60.00	7.00	67.00	24.00	12.76	162.77

Unfortunately, this variation across areas is difficult to control for, but at least it is to some extent systematic and may be considered and noted in the interpretation of the findings. In an examination of indicators measured to generalize to the street segment level as compared to measure to larger geographic areas, Oberwittler and Wikstrom (2009) found that using the smaller unit of the street segment with fewer observations

resulted in less reliable measures as compared to if these measures were generalized to the larger geographic areas. But they (2009) noted that this was the only weakness they found when comparing the two levels of measurement. Oberwittler and Wikstrom (2009) go on to state "By and large, in our evaluation …in order to advance the role of environment in crime causation small is certainly better" (p. 58). So it is important to consider that although using the social observations to measure at the street segment level may have some flaws, the measures should not be dismissed altogether.

Since the focus of the aggregate analysis is change in the social disorder indicator (gained from the social observations), another concern is the variability of the number of observations by street segment across the intervention periods of the study. As illustrated in Table 6.38, the number of observations by street segment is highly correlated by intervention period.

Table 6.38: Correlation of the Number of Observations per Street segment by Intervention Period

		Pre-	Immediate	Mid-	Post
		Intervention	Intervention	Intervention	Intervention
Pre-Intervention	Pearson Correlation	1	.496**	.510**	.469**
	Sig. (2-tailed)		.000	.000	.000
	N	151	151	151	143
Immediate	Pearson Correlation	.496**	1	.743**	.571**
Intervention	Sig. (2-tailed)	.000		.000	.000
	N	151	163	163	153
Mid-Intervention	Pearson Correlation	.510**	.743**	1	.623**
	Sig. (2-tailed)	.000	.000		.000
	N	151	163	163	153
Post Intervention	Pearson Correlation	.469**	.571**	.623**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	143	153	153	153

^{**} Correlation is significant at the 0.01 level (2-tailed).

When using dependent samples t-tests to examine the difference in the number of observations by phase within site and geographic areas, there were no significant differences for the prostitution site areas and within the drug site areas five of the nine tests were not significant. So overall the significantly positive correlations between phases paired with the overwhelming non-significant difference between phases within sites and areas, for the number of observations per street segment, gives some relief that the standard error within a street segment across the periods of the study will be fairly constant.

Another concern in using the social observations to aggregate activity to the street segment level is that within and across street segments the observations were conducted at different times of the day and different days of the week, so if activity at place varies by time or day of week, the aggregate level of activity observed at place may vary due to the sampling strategy. In a discussion of this sampling problem for social observations, Mazerolle, Kadleck, and Roehl (1998) note that in an "extreme case, one could argue that consideration of sampling error is not a concern because one observation would be representative of the population of social activity patterns (n=1) for that street block" (p. 388). They (1998) continue and make a more conservative suggestion that the rhythm of activity at a place may be relatively homogeneous across large blocks of time during the

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⁶⁰ Using a dependent samples t-test (p<.05), the drug site had a significant difference in the number of observations at the street segment from the pre-intervention phase to the mid-intervention phase in each drug site area (target, catchment area 1, and catchment area 2) and from the pre-intervention phase to the immediate intervention phase in only catchment area 1. The prostitution site had no statistically significant difference at the p<.05 level.

re were one significant difference between the number of observations in periods in the drug target area one and catchment area 2 as well as two significant differences in periods in catchment area 1, but does have one significant difference in the second catchment area from the pre-intervention phase to the post intervention phase at the p<.10 level. In order to perform this test, the number of observations in the immediate intervention phase and the mid-intervention phase were divided by two, since these phases were constructed using two waves, as such these phases were comparable to the pre-intervention phase and post intervention phase, which were each constructed from one wave of social observations.

day, for instance there may be specific pattern in the morning versus the afternoon or the evening.

Drawing upon this more conservative approach presented by Mazerolle, Kadleck, and Roehl (1998), the social observations for the study at hand were examined for each intervention phase by a day time block (between 10am and 5pm) and evening/night block (between 5pm and 2am). The assumption is that the greater number of street segments with observations conducted during both of these blocks, the less the time of day sampling error will be a factor. Examining observations by these two blocks of time, in both the pre and post intervention phases, approximately 60% of the street segments had at least one observation for both time blocks (day and night/evening). For the two intervention phases (immediate and mid-intervention), approximately 80% of street segments had observations conducted during these two periods of the day. As illustrated in Table 6.39, the majority of the street segments which do not have observations for both time blocks are located in the second catchment areas. This table also illustrates that the majority (over 50%) of street segments within each area and intervention phase have at least one observation for both time blocks, with only one exception 46.5% of the street segments in the second catchment area during the post-intervention had observations conducted during both time blocks. These findings do provide a moderate comfort that the street segment observations may be generalized across the entire block of time from 10am to 2am, but also suggest the importance of interpreting results considering the greater level of standard error in the second catchment areas.

Table 6.39: Percent of Places with at Least One Observation in the Two Time Periods

	Intervention Phase	Percent of Observations in
	(Total N)	Both Day Time Periods
		(N)
Target Areas	Pre-Intervention	78.1
	(32)	(25)
	Immediate Intervention	100.0
	(33)	(33)
	Mid-Intervention	97.0
	(33)	(32)
	Post Intervention	78.8
	(33)	(26)
First Catchment Areas	Pre-Intervention	62.0
	(50)	(31)
	Immediate Intervention	92.3
	(52)	(48)
	Mid-Intervention	96.2
	(52)	(50)
	Post Intervention	65.3
	(49)	(32)
Second Catchment Areas	Pre-Intervention	52.2
	(69)	(36)
	Immediate Intervention	80.8
	(78)	(63)
	Mid-Intervention	80.8
	(78)	(63)
	Post Intervention	46.5
	(71)	(33)

Considering the arguments and explanations of possible sampling error noted above, social observations are still the most appropriate data source for this study when compared to citizen calls for service, the data source often used to examine displacement. Although citizen call data are widely used as a proxy measure for crime and social disorder, a commonly noted limitation for this data source is that a large proportion of crime and social disorder are not reported to the police, especially for drug and prostitution crimes. It is also the case that citizen calls are less likely on street segments with fewer citizens present to observe crime, such as street segments with factories or few building, which is the case for many of the street segments in the current study. 61

These limitations are not present for social observations, which provide measures across

⁶¹ Approximately 20% of segments were comprised of primarily industrial buildings and warehouses or did not have residential or commercial buildings.

different types of street segments and for all of the observed activities of interest. As such, although the social observation data with the current sampling biases are not the perfect measure of activity at the street segment, arguably they are better than other data sources available.

Physical Observations Measurement Considerations

The physical observation data were collected once pre-intervention, during intervention, and post-intervention. A number of the measures gained from these data are static measures, which remain consistent through the span of the study (e.g., types of buildings). The physical disorder measures are the primary measures gained from these data that are not static and which may have some measurement error when generalizing to the street segment level. On this note, I defer back to the previous discussion that these places are relatively homogenous and are unlikely to have changes in opportunity characteristics as an argument of the validity of these measurements. In addition, since the street segments were all physically observed around the same approximate time of the year, this provides some relief that the accuracy of the measures across places.

<u>Place Manager Interview Measurement Considerations</u>

The place manager interviews, consisting of the telephone interviews of residents and in-person interviews of people present on the street segments (e.g., business owners, residents) are used to capture four types of place manger measures – number of "possible" place managers, responsibility level, length at place, and rating of place. Since there were a number of street segments with few or no interviews over the two waves of interviews, the measures used for the study were constructed by collapsing the two separate waves of the place manger interviews (pre and post) into one full sample.

These collapsed measures are used as static measure of the street segment across all of the study time periods and are used for the aggregate analysis examining change in crime at the place (spatial displacement and diffusion) and for the analysis examining the commission of an incident at a place within the situation.

Collapsing the two waves of place manager into static measures increases the accuracy of the number of place managers counted and the accuracy of the measures themselves, since they represent greater numbers of interviews at each place. This is similar to running a data collection process for longer and collecting a greater sample, which has been found to decrease the bias of survey results (Peress, 2010). Using both waves increases the sample of street segments with interviews from 120 in the preintervention wave and 146 in the post intervention wave to 152 street segments for both waves. The nature of the measures and an examination of the data relieve concerns of using the two waves to construct one measure. It is unlikely there would be a large amount of turnover in the type of people by level of responsibility at these places during the study period of approximately 6 months, considering that of the 1,514 people who answered the question of how long they lived, worked, or hung out in the area, only 73 (4.8%) indicated under 6 months. Since a minority of people answered their length of time in the area was under 6 months, the responsibility level of the respondents should be relatively stable over the period of the study. Of the four measures created from the place manager interviews, collapsing the waves into one is of most concern with the place rating measure, since the intervention – impacting crime and police presence – may impact respondents' rating of the place. However, these concerns are put to rest since there is no significant difference between the mean rating of place for the preintervention wave and the mean rating of place for the post intervention wave (dependent samples t = -1.1 p = .274).

For the methodology of collapsing the two waves together into one static measure, it is important to note that although the interviews were not collected as a panel design, there is a chance that the same people were interviewed twice during the study period (once pre intervention and once post intervention). The chances of this happening, although slim, would be greater on street segments with fewer people and buildings.

Although there is no way to control for this possible measurement error, the fact that the scale of the three place manager descriptive measures are determined through an average provides some security that any instances of people answering twice (once preintervention and again post intervention) will not overly skew these measurement scores. Unfortunately, there is not a way to correct for this possibility for the number of "possible" place managers measure.

As described previously, the number of respondents that completed the survey varied by street segment, likely because of the level of interest people from a street segment had in the topic but also because of the number of possible respondents available at each street segment over the two waves of data collection. The number of place managers interviewed serves as a specific measure, since this number may influence the opportunities for crime. As indicated above, using two waves of data provides greater confidence in the accuracy in the number of place managers measure across places (Peress, 2010). In essence, the number of interviews provides a unique means to measure guardianship across places, so the bias of the measure – including no representation from

places with few place managers or with people not interested in participating – actually provides a better measure of "possible" place managers.

Chapter 7: Revealing Intervention Effects and Side-Effects at the Street Segment Level

NET INTERVENTION EFFECTS

In order to reveal the spatial displacement and diffusion across street segments, it must first be established if there was an intervention effect in the target area and what the impact of this effect was across the span of the intervention. Using the pre-intervention as a base, the first analysis illustrates if there was a significant change in observed social disorder at the street segment level from the pre-intervention phase (phase absent of the intervention) to each of the subsequent intervention phases for the target area. This analysis mimics prior analyses conducted by Weisburd, Wyckoff and colleagues (2004, 2006) and Ready (2009), but differs from these analyses in that it employs the social disorder measure and the time periods defined for the current study. After examining if there was a decrease in social disorder at the street segment level in the target and catchment areas for each intervention phase as compared to the pre-intervention phase, the next analysis will examine how and if the social disorder effects varied through the span of the intervention. This analysis will reveal if there are specific intervention periods in which there was little or no additional intervention benefit. As described in the methods section, the level of social disorder for a street segment is the mean number of social disorder events observed on a street segment for a specific intervention phase (pre, immediate, mid, and post phases). Summing the social disorder this mean for each street segment, provides a total for the level of social disorder for the each intervention phase.

<u>Description of Target Area Hot Spots</u>

First, it is important to establish that the target areas, prior to the intervention, do provide street segments in which the social disorder events cluster, relative to the two

catchment areas. The target areas' street segments in the pre-intervention phase had a significantly higher mean number of observed social disorder events (by street segment) than either catchment areas 1 (t=3.72, p<.001) or catchment areas 2 (t=5.09, p<.001) (tested using an independent samples t-test). 62 Using the mean number of social disorder events observed in the pre-intervention phase as the level of social disorder, the 32 target area street segments contain 38% of the 319.06 social disorder events, while the 50 street segments in the first catchment areas contain 30% of the events and the 69 street segments in second catchment areas contain 32% of the events. In fact, 24 percent of the street segments from the total study area (36 of the 151 segments) contain 60% of the social disorder events in the pre-intervention phase (319.06 events). Of the 36 high social disorder segments, 18 are in the target area (56% of 32 observed target area segments), while only 18 are from the two catchment areas, 9 from each catchment area (13% of catchment area 2 segments and 18% of catchment area 1 segments). These finding suggest that in the pre-intervention phase, as expected, there is a greater amount of social disorder activity clustered at the street segments in the target areas than in the study catchment areas, reinforcing that the target areas are appropriate for the focus of this study.

Intervention Effects and Parallel Effects

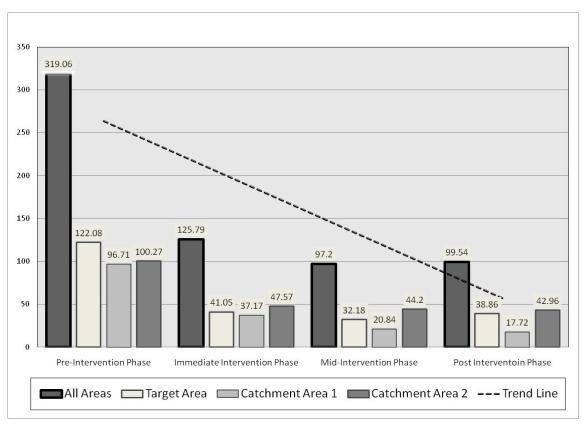
Now that it is evident that in the pre-intervention the target area street segments have a significantly greater amount of social disorder events as compared to the two catchment areas, it is appropriate to examine how the interventions affect the social

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 $^{^{62}}$ Area means for the average incidents of social disorder by street segment: target area = 3.82; catchment area 1 = 1.93; catchment area 2 = 1.45

disorder events within these areas. As illustrated in Graph 7.1 there is a steep decline in the total social disorder levels for all of the areas as the intervention progressed.

Graph 7.1: Total Social Disorder Levels by Study Area



Although the totals in Graph 7.1 suggest that there is a striking intervention effect when comparing each intervention phase to the pre-intervention phase, this may not be the case if the effect is mostly found in a few street segments. To reinforce this assumption two-tailed dependent samples t-tests are performed and there is a significant decrease in the mean number of social disorder events per street segment for each of the study areas (target areas, catchment area 1, catchment area 2) from the pre-intervention phase to each of the subsequent phases (immediate, mid, post). The relationship for each of these

⁶³ A dependent samples t-test was also run to examine the change from the pre-intervention to each of the subsequent intervention phases for the areas within the prostitution site and drug site. For these analyses, each of the dependent sample t-tests remained significantly different at the .01 level, except for the

phases remains significantly different when considering all of the street segments for the entire study area and not differentiating the segments by relative geographic location (see Table 7.1). These finding reinforce those made by Weisburd, Wyckoff and colleagues (2004, 2006) and Ready (2009) that for the street segments in the study, the target area experienced deterrence effects, while the catchment areas experienced diffusion of crime control benefits, with the diffusion effect being greater in the areas closer to the target areas.

Table 7.1: Difference in Mean Observed Social Disorder Events per Street Segment using Pre-Intervention Phase as Baseline for Events

Comparison Phases	Areas (N segments)	Mean Pre Phase	Mean 2 nd Phase	Mean Difference	t statistic
Pre: Immediate	Target Area (32)	3.81	1.26	-2.56	-7.19***
	Catchment Area 1 (50)	1.93	.70	-1.24	-4.34***
	Catchment Area 2 (69)	1.45	.61	-0.85	-3.86***
Pre: Mid	Target Area (32)	3.81	.98	-2.83	-7.16***
	Catchment Area 1 (50)	1.93	.41	-1.52	-5.21***
	Catchment Area 2 (69)	1.45	.61	-0.88	-4.07***
Pre: Post	Target Areas (32)	3.81	1.21	-2.60	-5.39***
	Catchment Area 1 (47)	1.98	.37	-1.61	-5.13***
	Catchment Area 2 (64)	1.45	.63	-0.81	-2.76***

^{*}p<.10 **p<.05 ***p<.01

(two-tailed dependent samples t-test for means)

It is evident that there were significant decreases in social disorder at the street segment level for each study area when examining the difference from the pre-intervention phase to each subsequent phase. However, as suggested by prior research

prostitution second catchment area which was significant at the .10 level from the pre-phase to the immediate intervention phases and not significant for the pre-phase to both the mid and post-intervention phases.

and by Graph 7.1, it is likely the intervention effect was greatest at the beginning of the intervention, from the pre-intervention phase to the immediate intervention phase (see Nagin, 1998; Sherman and Rogan, 1995a; Smith et al, 2002; Weisburd, Wyckoff et al, 2004). If this is the case, the intervention effects may decay over time, so there may be little change in social disorder in the catchment areas street segments. As such, in order to effectively develop and test theory and police practice focused on understanding and harnessing spatial displacement and diffusion to the street segment, it is important to understand these effects as the intervention unfolds. For this reason, the remainder of the analyses will focus on understanding parallel intervention spatial effects through the course of the intervention, as the intervention unfolds.

As expected from the prior analysis, using a dependent samples t-test there is a significant change in social disorder at the street segment level from the pre-intervention to the immediate intervention phase for each study area (see Table 7.2). However, findings for the change in social disorder at the street segment level by study area vary for the remainder of the intervention. From the immediate intervention to midintervention phase, there is a significant difference in social disorder for the target area (.10) and for the first catchment area (.05), but not for the second catchment area. For the mid-intervention phase to the post intervention phase, the change in social disorder at the street segments level is not significant for any of the study areas.

Table 7.2: Difference in Mean Observed Social Disorder Events per Street Segment through the Intervention Phases

Comparison Phases	Areas (N segments)	Mean 1st Phase	Mean 2 nd Phase	Mean Difference	t statistic
Pre: Immediate	Target Area (32)	3.81	1.26	-2.56	-7.19***
	Catchment Area 1 (50)	1.93	.70	-1.24	-4.34***
	Catchment Area 2 (69)	1.45	.61	85	-3.87***
Immediate: Mid	Target Area (33)	1.24	.97	-0.27	-1.90*
	Catchment Area 1 (52)	.72	.40	-0.31	-2.40**
	Catchment Area 2 (78)	.61	.57	-0.04	58
Mid: Post	Target Areas (33)	.97	1.18	.20	.89
	Catchment Area 1 (49)	.43	.36	-0.06	68
	Catchment Area 2 (71)	.58	.61	.02	.15

^{*}p<.10 **p<.05 ***p<.01

(two-tailed dependent samples t-test for means)

These findings suggest that the target areas and first catchment areas' street segments experienced significant declines in social disorder (deterrence and diffusion of benefits) until the mid-intervention phase, while the second catchment areas' street segments felt these significant decreases (diffusion of benefits) at the beginning of the intervention only (the immediate intervention phase). Although there is a lack of evidence of additional intervention benefits – deterrence or spatial diffusion - being felt in the second half of the intervention, the areas did not significantly increase in social disorder, suggesting benefits from the intervention were maintained during this time period. It is important to note that social disorder at the street segment level would have a natural variation and once a specific low level of social disorder level is reached, it may be unlikely to have any additional significant reduction in social disorder, which may be

a reason why there are not additional declines felt in the second catchment area after the beginning phase of the intervention.

The leveling off of intervention effects through the course of the intervention are reinforced in an examination of a variable constructed to measure the change in the mean number of social disorder events for the different study phases. As described in the methods section the change in social disorder level variable is constructed by subtracting a later intervention phase from an earlier intervention phase, so if we subtract the midintervention phase level of social disorder from the immediate intervention phase level of social disorder the final number is the change in the level of social disorder for that period (immediate intervention phase to mid-intervention phase).⁶⁴ Testing the difference in the *change* in the level of social disorder at the street segment level across the different study periods⁶⁵ by area reveals if there were significant differences in the change in the levels of social disorder at the street segment level as the intervention progressed. As illustrated in Table 7.3, there is a significant difference in the change in the mean number of observed social disorder events at the street segment level when testing the immediate intervention period change levels against the first half of the intervention period change levels, with greater declines in social disorder at the street segment level for the immediate intervention period as compared to the first half of the intervention period. However, there were no significant differences found in the change

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⁶⁴ For the change in social disorder level variable a reduction in social disorder from one phase to another phase (i.e., subtracting the mid-intervention phase from the immediate intervention phase) would provide a negative change level for a segment, an increase in the level of social disorder across these two phases would provide a positive change level for a segment, and no change in social disorder would provide a zero change level for a segment.

⁶⁵ There are three intervention periods which are constructed from the change in social disorder levels between different periods. The three periods are (1) the beginning of the intervention period which is the pre-intervention phase to the immediate intervention phase, (2) the first half of the intervention period which is the immediate intervention phase to the mid-intervention phase, and (3) the second half of the intervention period which is the mid-intervention phase to the post intervention phase.

in social disorder level for the first half of the intervention period as compared to the change in social disorder level for the second half of the intervention. This is likely because after the first half of the intervention the intervention effects remained relatively stable, over the course of the intervention.

Table 7.3: Difference in the Change of the Mean Observed Social Disorder Events per Street Segment through the Intervention Phases

Comparison	Areas	Mean 1 st	Mean 2 nd	Mean	t statistic
Periods	(N segments)	Period	Period	Difference	
		Change	Change		
Beginning	Target Area	-2.56	28	2.28	6.12***
Intervention	(32)				
Period (2-1):	Catchment Area 1	-1.24	29	.95	2.82***
First Half	(50)				
Intervention	Catchment Area 2	85	03	.82	3.26***
Period (3-2)	(69)				
First Half of	Target Area	27	.20	.47	1.68
Intervention	(33)				
Period (3-2):	Catchment Area 1	33	06	.26	1.34
Second Half of	(49)				
Intervention	Catchment Area 2	04	.02	.06	0.32
Period (4-3)	(71)				

^{*}p<.10 **p<.05 ***p<.01

(two-tailed dependent samples t-test for means)

In sum these findings reinforce other work using these data; there were significant intervention effects which resulted in overall declines in levels of social disorder in the target areas and adjoining catchment area street segments, suggesting overwhelming deterrence effects in the target areas and diffusion of benefits in the catchment areas. Although these declines appear to be maintained through the course of the intervention, the majority of the intervention effects and related spatial diffusion effects occurring at the street segment level appear to have taken place at the beginning of the intervention only (pre-intervention phase to immediate intervention phase). It appears as if there were some additional intervention reduction effects felt in the target areas and the first catchment areas into the first half of the intervention, but there do not appear to be

additional positive intervention effects felt into the second half of the intervention.

Because the bulk of the intervention effects appear to have occurred at the beginning of the intervention, this period remains a focus for subsequent analysis. As well, because of the large immediate intervention effect, yet subsequent small effects through the course of the intervention, using the pre-intervention as the base comparison for the mid and post intervention phases would overwhelm the constructed measures with the impact of the intervention already measured from the pre-intervention phase to the immediate intervention phase (the immediate intervention period). For this reason, subsequent analyses will focus on the intervention effects as the intervention unfolds, rather than on each intervention phase's change from the pre-intervention phase.

VARIABILITY OF INTERVENTION EFFECTS AT THE SEGMENT LEVEL

As reviewed previously, prior research exploring crime-at-place has found variability in social disorder and crime across smaller units of analysis, such as the street segment (Sherman, 1995a; Weisburd, Bushway et al, 2004; Weisburd et al, 2010; Weisburd, Morris et al, 2009). However, there is a lack of research examining the variability of spatial displacement and spatial diffusion at the street segment level due to a targeted intervention. It may be the case that a minority of street segments for a study area (including target area and catchment areas) are responsible for the majority of any observed net-decrease in crime, or in the case of the current study, social disorder. It may also be the case that a minority of segments have increases in social disorder while the majority of the segments are decreasing in social disorder. In other words, there may be great heterogeneity in "treatment" effects hidden across the street segments which fall within catchment area. As already noted, prior research has suggested that offenders

adapt to an intervention as it progresses, so the variability across street segments may change over the span of the intervention. This section explores if such heterogeneity in change in social disorder does exist across the study street segments through the span of an intervention.

Table 7.4 provides descriptive information for the distribution of the change in social disorder for the study street segments. As illustrated in Table 7.4 the mean of the change in the level of social disorder events at the street segment level is greatest at the beginning of the intervention (mean = -1.34); the target area and the first catchment area have the greatest mean levels and standard deviations during this period (see Table 7.4). More importantly, in the beginning intervention period (pre-intervention phase to immediate intervention phase), relative to the target area, the catchment areas both have standard deviations larger than their means, suggesting a wide amount of variability in the change in social disorder at the street segment level within these areas. For the second two periods of the intervention (first half and second half), although the standard deviations of the target areas and catchment areas are relatively large compared to their respective means, in all of these areas the mean of the social disorder change is very low. This finding indicates that although there is a large variation in the change of social disorder at the street segment level compared to the mean in these areas, the overall level of change in these areas was quite small. The likely reason for the decrease in means and standard deviations as the intervention progresses is simply that most of the change in the level of social disorder, intervention effects, at the street segment level was at the beginning of the intervention.

Table 7.4: Descriptives of the Change in Social Disorder Levels per Street Segment for Each Change Period and Area

Change Periods	Areas (N segments)	Range	Minimum	Maximum	Mean	Std.
	,					Deviation
Beginning Intervention	Target Area (32)	7.32	-6.54	.78	-2.56	2.01
	Catchment Area 1 (50)	11.35	-9.17	2.18	-1.24	2.01
	Catchment Area 2 (69)	13.47	-8.47	5.00	85	1.82
	Total Study Area (151)	14.17	-9.17	5.00	-1.34	2.02
First Half of Intervention	Target Area (33)	2.87	-1.74	1.13	27	.81
	Catchment Area 1 (52)	7.11	-5.43	1.68	31	.94
	Catchment Area 2 (78)	3.60	-2.00	1.60	04	.66
	Total Study Area (163)	7.11	-5.43	1.68	175	.797
Second Half of	Target Areas (33)	5.35	-1.35	4.00	.20	1.30
Intervention	Catchment Area 1 (49)	4.07	-2.50	1.57	06	.65
	Catchment Area 2 (71)	6.90	-2.00	4.90	.02	1.23
	Total Study Area (153)	7.40	-2.50	4.90	.03	.09

The simple descriptive information, presented above, about the distribution of the street segment level of change in social disorder does not provide a complete picture of the variability of this change. To understand parallel spatial intervention effects, the focus should be on exploring if increases and decreases in social disorder within the areas and across the street segment level co-exist. As illustrated in Table 7.5, the greatest net intervention benefit at the street segment level, as expected, occurred from the pre-intervention phase to the immediate intervention period, with a total decrease of 202.09 social disorder events. However, using the street segment as the level of measure, the actual decrease in the average amount of social disorder events was 227.63, but there was also a simultaneous increase of events of 25.54. The majority (60%) of this increase was felt in the second catchment areas.

As compared to the beginning of the intervention, as the intervention progressed social disorder at the street segment level was less likely to decline and more likely to increase. In the first half of the intervention the *net* intervention benefits across the street segments decreased (a total of 28.59 average events); however, during this *net* study area decrease there were a number of segments which increased in social disorder, with a total increase of 28.95, reducing the net intervention benefits, again these increases were primarily in the second catchment area. In the second half of the intervention (midintervention to post intervention) there was actually a small increase in the net social disorder events for all of the study segment (+5.10), with a simultaneous increase of events of 53.60 and decrease of 48.50 events. During this second half of the intervention period, of the three study areas the second catchment area was responsible for approximately half of the increase and half of the decrease in social disorder events, with a total effect in the second catchment area of an increase in 1.52 social disorder events. In contrast, the target area experienced a greater increase in social disorder events (18.33) than a decline in events (11.64), with a *net* social disorder increase of 6.70 events.

Table 7.5: Increases and Decreases in the Social Disorder Level per Street Segment by Area*

Periods Beginning Intervention Catchment Area 1 Catchment Area 2 Total Study Area First Half of Intervention Catchment Area 1 Catchment Area 1 Catchment Area 2 Total Study Area Target Area Catchment Area 2 Total Study Area Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention Catchment Area 1	-61.76 -58.44 -202.09 -8.89	-83.34 36.61% -70.58 31.01% -73.71 32.38% -227.63 100% -15.73 27.34% -21.75	(% of Total Increase) 1.44 5.64% 8.82 34.53% 15.28 59.83% 25.54 100% 6.84 23.63% 5.42
Total Study Area First Half of Intervention Catchment Area 2 Total Study Area Catchment Area 1 Catchment Area 1 Catchment Area 1 Catchment Area 2 Total Study Area Target Area Target Area	-61.76 -58.44 -202.09 -8.89	36.61% -70.58 31.01% -73.71 32.38% -227.63 100% -15.73 27.34% -21.75	5.64% 8.82 34.53% 15.28 59.83% 25.54 100% 6.84 23.63%
Catchment Area 1 Catchment Area 2 Total Study Area First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention Target Area	-58.44 -202.09 -8.89	-70.58 31.01% -73.71 32.38% -227.63 100% -15.73 27.34% -21.75	8.82 34.53% 15.28 59.83% 25.54 100% 6.84 23.63%
Catchment Area 2 Total Study Area First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention Target Area	-58.44 -202.09 -8.89	31.01% -73.71 32.38% -227.63 100% -15.73 27.34% -21.75	34.53% 15.28 59.83% 25.54 100% 6.84 23.63%
Total Study Area First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-202.09	-73.71 32.38% -227.63 100% -15.73 27.34% -21.75	15.28 59.83% 25.54 100% 6.84 23.63%
Total Study Area First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-202.09	32.38% -227.63 100% -15.73 27.34% -21.75	59.83% 25.54 100% 6.84 23.63%
First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-8.89	-227.63 100% -15.73 27.34% -21.75	25.54 100% 6.84 23.63%
First Half of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-8.89	100% -15.73 27.34% -21.75	100% 6.84 23.63%
of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention Target Area		-15.73 27.34% -21.75	6.84 23.63%
of Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention		27.34%	23.63%
Intervention Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-16.33	-21.75	
Catchment Area 1 Catchment Area 2 Total Study Area Second Half of Intervention	-16.33		5.42
Total Study Area Second Target Area Half of Intervention		27.910/	
Total Study Area Second Target Area Half of Intervention		37.81%	18.72%
Second Target Area Half of Intervention	-3.37	-20.05	16.68
Second Target Area Half of Intervention		34.85%	57.62%
Half of Intervention	-28.59	-57.53	28.95
Half of Intervention		100%	100%
Intervention	6.70	-11.64	18.33
Catchment Area 1		24.00%	34.20%
Catchinent Area 1	-3.12	-11.75	8.63
		24.23%	16.10%
Catchment Area 2	1.52	-25.11	26.63
		F .	49.68%
Total Study Area		51.77%	49.06%
	5.10	51.77%	53.60

^{*}Social disorder change level for a period is the change in the mean level of social disorder events between the two phases of a period.

These findings illustrate that the greatest declines in the level of social disorder at the street segment level occurred at the beginning of the intervention. As the intervention progressed within the study areas there were fewer declines of social disorder levels at the street segment level and simultaneously greater increases in social disorder levels at the street segment level. In each period, the second catchment area was responsible for the majority of the increases in social disorder level.

Examining the proportion of street segments in each study area which experience differential intervention effects provides reveals if these effects occur at a small number of segments within an area or if these effects are more generally felt across the study segments. Using the change in social disorder events by period, the street segments for each period are divided into three groups – increase, decrease, and no change. For this illustration, these categories are strictly defined with zero change serving as no change, anything above zero falls into the increase category, and anything below zero falls into the decrease category. By categorizing street segments into these three groups, it is possible to examine if within periods a proportion of places increase in social disorder events, while others decrease. This examination also allows a comparison of the proportion of differential change categories across the study geographic areas.

As illustrated in Table 7.6, the majority of street segments (70.2%) in the beginning of the intervention (pre to immediate intervention phase) experienced a decrease in social disorder events (227.63). Looking at within areas for this period, a minority of segments experienced increases in social disorder events (total increase 25.54), with 6.3% (2 of 32) of the target area segments, 26% (13 of 37) of the first catchment area segments, and 34.8% (24 of 69) of the second catchment area segments experiencing increases. These findings suggest that during this period, when the greatest *net* intervention effects took place (*net* effects -202.09), diffusion of benefits were spread widely across the study segments (106 segments), rather than experienced in a minority of segments. The minority of segments which felt an increase in the level of social disorder may be in part the result of offender adaptation, reflecting active offenders moving to those places.

As compared to the beginning of the intervention, in which 70.2% of segments had a decrease in levels of social disorder, the subsequent periods of the intervention resulted in fewer segments experiencing declines in levels of social disorder (approximately 50% for both of these periods). This being said, under 40% of study area segments experienced increases in levels of social disorder for the second two halves of the intervention and the increase in social disorder levels (+28.95 first half of the intervention and +53.60 second half of the intervention). Despite the increase in the first half of the intervention (+28.95) there was still a net decrease (-28.59) in social disorder level during this period because 53.4% of segments (87 segments) experienced a decrease in social disorder level (-57.53). The target area street segments had the largest proportion of street segments to experience any social disorder increase for the first half and second half of the intervention. The first catchment area segments maintained a similar proportion of increasing segments from the immediate intervention phase to the first half of the intervention (approximately 25%).

Reflecting on how small the street segment social disorder level mean (-.175 for the study area) and standard deviation (.797 for the study area) are for the first half of the intervention period (immediate intervention phase to mid-intervention phase; see Table 7.6), a portion of the increases and decreases of the segment social disorder levels may be natural variation in data due to measurement error. However, it may also be the case that the segments increasing in social disorder levels indicate an intervention rebound effect, including offender adaptation resulting in movement to these location or even returns to their original locations, occurring as those in the area come to terms with the intervention and its effects on the surrounding community. As for the segments with decreasing

levels, the small mean and standard deviation may also indicate a slight additional intervention benefit, as was suggested by the dependent samples t-tests illustrating a significant decrease in social disorder at the street segment level from the beginning of the immediate intervention phase to the mid-intervention phase (see Table 7.2 above). It is also possible that these findings are a result of the decrease in temperature at the time, from social observations collected in the cool fall (average temperature between 32 and 59 degrees Fahrenheit) to those collected in the cold winter (greater amount of temperatures under 32 degrees Fahrenheit).

During the second half of the intervention (mid-intervention phase to post intervention phase) 49% of the segments experienced a decrease in the level of social disorder (-48.50) while 36.6% experienced an increase in level of social disorder (-53.60), but overall there was only a net increase in the level of social disorder of 5.10. This small net increase is because there were segments simultaneously increasing and decreasing in levels of social disorder, which washed out each others' effects, suggesting a small, arguably negligible, increase in social disorder. In fact, at this time the mean change in social disorder level for the total study area was only .03 with a standard deviation of .09 (see Table 7.4). However, as illustrated in Table 7.6 below, the target area had the greatest proportion of segments increasing in social disorder (17 of 33 or 51.5%), followed by the first catchment area (34.7%) and the second catchment area (31%). The target area also had the greatest mean (.20) and standard deviation (1.30) of street segment social disorder levels as compared to the other areas; however, once again these numbers are quite low, especially compared to the beginning of the intervention when the mean decrease for the target area was 2.56 with a standard deviation of 2.01.

Measurement error aside, the increase in social disorder at these segments, especially in the target area may be due to the increase in temperature (going from the cold winter to the warmer spring) or with the close of the intervention due to offenders returning to their normal routine social disorder places.

Table 7.6: Proportion of Street Segment Change in Social Dis Level by Period and within Area

within Aica	<u> </u>			
Change	Area	% of Seg Decrease	% of Seg Increase	% of Seg No Change
Periods	(N of Segments)*	(N of Seg Decrease)	(N of Seg Increase)	(N of Seg No Change)
Beginning	Target Area	93.8%	6.3%	0.0%
Intervention	(32)	(30)	(2)	(0)
	Catchment Area 1	74.0%	26.0%	0.0%
	(50)	(37)	(13)	(0)
	Catchment Area 2	56.5%	34.8%	8.7%
	(69)	(39)	(24)	(6)
	Total Study Area	70.2%	25.8%	4.0%
	(151)	(106)	(39)	(6)
First Half of	Target Area	51.5%	45.5%	3.0%
Intervention	(33)	(17)	(15)	(1)
	Catchment Area 1	67.3%	25.0%	7.7%
	(52)	(35)	(13)	(4)
	Catchment Area 2	44.9%	44.9%	10.3%
	(78)	(35)	(35)	(8)
	Total Study Area	53.4%	38.6%	8.0%
	(163)	(87)	(63)	(13)
Second Half	Target Areas	48.5%	51.5%	0.0%
of	(33)	(16)	(17)	(0)
Intervention	Catchment Area 1	46.9%	34.7%	18.4%
	(49)	(23)	(17)	(9)
	Catchment Area 2	50.7%	31.0%	18.3%
	(71)	(36)	(22)	(13)
	Total Study Area	49.0%	36.6%	14.4%
	(153)	(75)	(56)	(22)

^{*}This number indicated the number of segments measured for each of the period (measures were captured for each phase, so the period change may be calculated).

In closing this section, it is evident that there is in fact variability of change in levels of social disorder across the street segments for each of the three study periods (immediate, first half, second half). It is also evident for each period that this variability resulted in a majority of street segments experiencing a decrease in level of social disorder, while a smaller proportion of street segments experienced an increase in the level of social disorder, and a minority had no change in their level of social disorder.

The actual *net* decrease in social disorder was greatest for the beginning of the intervention period (-202.09), was relatively small for the first half of the intervention period (-28.59), while there was a small net increase for the second half of the intervention (+5.10). These findings suggest that the greatest intervention effects were felt at the beginning of the intervention, when it appears there was a large deterrent effect in the target area and suggestions of notable diffusion effects in both catchment areas. Findings also suggest additional intervention effects, although slight, continued into the first half of the intervention, with deterrent effects in the target area and diffusion effects in both catchment areas. In contrast, there was no evidence of continued declines in street segment social disorder levels into the second half of the intervention, but it appeared that intervention levels were sustained as there was not a significant difference in social disorder level at the street segments level for this period compared to the period prior (first half of the intervention).

In all of these periods, there appear to be segments that increased in social disorder levels, suggesting possible displacement of social disorder in the catchment areas and rebound effects in the target areas. However, considering the small difference in change levels between the first half of the intervention period and the second half of the intervention period and that when testing the difference in change from the second half of the intervention to the period prior (see Table 7.3) there was no significant difference, it is likely that the most notable intervention effects on street segment social disorder took place in the first two periods of the intervention (pre to immediate phase; immediate to mid-intervention phase).

Chapter 8: Opportunities and Change in Level of Social Disorder at the Street Segment

The third set of hypotheses test the relationship between opportunities at place – targets, offenders, and guardians – and spatial displacement and diffusion by examining the relationship between the change in the level of social disorder for the intervention periods and the opportunities for social disorder at the segment level. This relationship is tested through two different tracks. The first track recognizes that there is something unique about the opportunities for social disorder at the street segments within the target areas which make these places *most optimal* for social disorder. Drawing upon this assumption, the difference between the change in social disorder in the target area segments, segments from the catchment areas with matching opportunities, and segments from the catchment area which do not have matching opportunities is examined. The second analysis track will examine how the opportunities at the street segment level predict street segments that fall into specific groups of parallel spatial effects (e.g., high levels of diffusion, moderate levels of diffusion, no change, displacement).

MATCHED OPPORTUNITY PLACES AND CHANGE IN SOCIAL DISORDER

Considering past research on opportunities at place, it is speculated that due to a focused intervention offenders may attempt to relocate from target area segments to similarly situated opportunity segments in the catchment areas. However, considering offender level research on adaptation during an intervention, offenders may avoid these opportunity-similar segments; unsure of the scope of the intervention they may assume these places are also a focus of the intervention. In addition, these alternative crimeplaces may be less familiar to offenders and as such be perceived to have greater offending risk. If offenders from the target areas are either attracted or detracted to these

opportunity-similar segments in the catchment areas segments, these similar segments would have significantly different changes in the level of social disorder compared to segments in the catchment areas that do not have similar opportunities for social disorder and crime.

To test this idea, catchment areas' segments with similar opportunities are matched to the target area segments. The segments were matched using eight different opportunity measures. A number of opportunity measures were available for the present research, but considering familiarity may be at play when an offender chooses an alternative place for crime, it was important to capture place-based opportunities that were easily discernable to offenders who were even unfamiliar with the area. As such, seven of the eight opportunity measures represent the possible convergence of targets/victims with offenders, which would easily observed in a segment's environment. These measures include the types of buildings located on the segment (e.g., public service, residential, retail commercial, industrial commercial, or bar) and the socioeconomic status of the segment (social class), which indicate the way the segment is used by the public and the presence of possible targets. Measures also include the presence of a bus stop on the segment, which suggest a greater level of public flow and ease of access to the segment. The final (eighth) opportunity measure used in the matching process is the number of place managers, which is an important measure to incorporate to capture guardianship. 66 Using these eight measures of segment opportunity, 31 segments in the catchment areas were found to match 28 of the 33 target

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⁶⁶ After considering the distribution of the place managers measure, the matching process was conducted for this measure by collapsing each segment's number of place managers into categories (0-5, 6-10, 11 or more).

area segments.⁶⁷ After removing the place manager measure (guardianship) as a criteria, catchment area segment were found for the final five target area segments. As illustrated in Table 8.1, the 33 street segments from the target areas are matched with 37 segments from the catchment areas, 85% of the target area segments were matched using the 8 measures and the final 15% were matched using 7 of the measures.

Table 8.1: Target and Catchment Area Matched Segments and Criteria

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Target Segment	Matched Catchment				cning (3 Varia	Criteria			
Identification				((S Valla	bies)			
Numbers	Areas Segment Identification Numbers	Social Class	Public Service Building Present	Residential Buildings	Retail Comm.	Industrial Comm.	Bar	Bus Stop	Number of Place Managers
221	122, 2250	Lower to Working Class	Yes	Yes	No	No	No	No	0 to 5
2220	116, 142, 2234, 2241, 2264, 2265, 2273	Lower to Working Class	No	Yes	Yes	No	No	No	0 to 5
223, 224, 225, 228, 229, 2211, 2213, 2214, 2215, 2216, 2217, 2221	2261, 2225, 2222	Lower to Working Class	No	No	No	Yes	No	No	0 to 5
17	128	Lower to Working Class	No	Yes	Yes	No	No	Yes	0 to 5
2218	2224	Lower to Working Class	No	No	No	Yes	No	Yes	0 to 5
112, 16, 15, 226**	2272, 165	Lower to Working Class	Yes	Yes	Yes	No	No	No	6 to 10
111, 11, 226**	180, 119, 169, 167	Lower to Working Class	Yes	Yes	Yes	No	No	No	11 or more
2219	2223	Lower to Working Class	No	No	No	Yes	No	No	6 to 10

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⁶⁷ In some instances target area segments matched one another, as well in some instanced more than one match was found for a target area segment and for these instances each match was included.

Target Segment	Matched Catchment				tching (3 Varia	Criteria bles)			
Identification Numbers	Areas Segment Identification Numbers	Social Class	Public Service Building Present	Residential Buildings	Retail Comm.	Industrial Comm.	Bar	Bus Stop	Number of Place Managers
110	2232	Lower to Working Class	No	Yes	Yes	No	No	Yes	6 to 10
18	2258	Ghetto Poverty	No	Yes	Yes	No	No	No	11 or more
227, 13, 12	130, 144, 114, 134, 137, 170, 166	Lower to Working Class	No	Yes	Yes	No	No	No	11 or more
19, 14	125	Lower to Working Class	Yes	Yes	Yes	No	Yes	Yes	11 or more
222*, 2210*	2248, 2247	Lower to Working Class	No	Yes	No	Yes	No	No	Removed as a Criteria
2212*	2242, 2229, 2243, 2246	Lower to Working Class	Yes	No	No	Yes	No	No	Removed as a Criteria

^{*}These segments did not have matches when considering all eight place criteria, but did when removing the number of place managers measure, while still including the other seven criteria.

After determining the matched segments, there are three groups available for analysis – the target area segments (33 segments), the *matched* catchment area segments (37 segments), and the *unmatched* catchment area segments (93 segments). Examining the change in social disorder levels at the street segments in these groups may reveal if there is something about the opportunity factors at places, which may explain change during an intervention. At the beginning of the intervention, the catchment area *matched* segments and *unmatched* segments both have change levels significantly different from the target area change levels. This is not surprising, since as compared to the catchment area, a greater intervention effect is expected in the target area. What is more important to explore is if there is a difference in the street segment change levels when comparing

^{**}Segment 226 had no matched catchment area segments when considering all eight place criteria; however, when considering seven of the criteria and removing the number of place managers measure as a matching criteria, segment 226 matched with two separate groups of matching segments.

the catchment area segments with similar opportunities to the target area segments (matched segments) to the catchment area segments that do not have similar opportunities (unmatched segments). As illustrated in Table 8.2, the catchment area matched segments do appear to have a less severe mean change level (-.63) as compared to the unmatched segments (-1.17); however, using an independent samples t-test, these differences were not significant (see Table 8.3). In fact, the matched segments and unmatched segments were not found to have significant differences in their change levels for any of the study periods (see Table 8.3). It appears that there is no basis, using this methodology, to conclude that segments from the catchment areas with similar opportunities to the target areas experienced differential parallel intervention spatial effects as compared to the unmatched catchment area segments.

Table 8.2: Difference in Mean Observed Social Dis Events by Opportunity Group by Period

Target, Matched, Un	matched	Beginning Intervention Period	First Half of Intervention Period	Second Half of Intervention Period
Target Segments	Mean	-2.5593	2694	.2030
	N	32	33	33
	Std. Dev.	2.01430	.81305	1.30407
Catchment Area Matched Segments	Mean	6305	3118	.1676
Watched Segments	N	35	37	35
	Std. Dev.	1.47320	1.03774	1.18342
Catchment Area	Mean	-1.1682	0878	0879
Unmatched Segments	N	84	93	85
	Std. Dev.	2.04709	.67009	.96175
Total	Mean	-1.3383	1754	.0333
	N	151	163	153
	Std. Dev.	2.02494	.79709	1.09593

Table 8.3: Difference in Change in Social Dis Level between Target Area, Matched, and Unmatched Segments

Independent Samples t-te	st Between:	Beginning Intervention	First Half of Intervention	Second Half of Intervention
Target Segments and Matched Catchment Areas Segments	Mean difference (Sig.)	-1.929*** (.000)	.042 (.851)	.035 (.907)
Target Segments and Unmatched Catchment Areas Segments	Mean difference (Sig.)	-1.391*** (.001)	182 (.255)	.291 (.250)
Catchment Areas Matched Segments and Unmatched Catchment Areas Segments	Mean difference (Sig.)	.538 (.162)	224 (.147)	.256 (.220)

***.001

This analysis fails to illustrate a difference in the change in level of social disorder between the catchment areas' street segments matched to the target area segments on place-based attributes and the unmatched catchment area segments. A possible barrier to reveling significant differences between the matched and unmatched segments may be the differential distribution of these segments across the two sites' (prostitution and drug) catchment areas. For instance, the first catchment area may be overly represented in the matched cases, but not in the unmatched cases. In an independent samples t-test examining the difference in the change in social disorder between the catchment areas for each period of the intervention, these area segments were significantly different (t= -1.924, p<.10) for the first half of the intervention period (immediate intervention phase to middle intervention phase) but not for the immediate intervention or second half of the intervention periods. Matched and unmatched cases may be even less comparable if the majority of matched segments are in one sites' catchment area (e.g., the prostitution site's first catchment area), while the majority of the unmatched segments are in another sites' catchment area (e.g., drug sites first catchment area). In this example the segments level

of social disorder would be more affected by their location to a specific site. In essence, the opportunities of the place as the focus of the analysis would be difficult to disentangle from the ease of reaching the location from the target area (places closer to the target area also may be more familiar to offenders). For this reason the location of the matched and unmatched segment groups within the study areas is examined. As illustrated in Table 8.4, compared to the proportionate distribution of the matched catchment area segments, the unmatched segments do over represent the second drug catchment area, while under representing the segments in the first drug and first prostitution catchment areas.

Table 8.4: Distribution of Segments within Site Catchment Areas

Catchment Areas within Sites	Matched	Unmatched	Total
	Segments	Segments	
	N	N	
	% within	% within	
Prostitution Catchment Area 1	9	12	21
	24.3%	12.9%	16.2%
Prostitution Catchment Area 2	11	29	40
	29.7%	31.2%	30.8%
Drug Catchment Area 1	11	20	31
	29.7%	21.5%	23.8%
Drug Catchment Area 2	6	32	38
	16.2%	34.4%	29.2%
Total	37	93	130
	100.0%	100.0%	100.0%

To examine a possible area effect, independent samples t-test were run comparing the matched sample to the unmatched sample considering the catchment areas separately (run within each catchment area) and considering the catchment areas separately within the drug and prostitution sites (e.g., first catchment area within drug site). In each of these tests, the matched cases were not significantly different from the unmatched cases, regardless of catchment area location or catchment area location within the drug or prostitution sites.

Regardless of the lack of an area affect when comparing the matched and unmatched cases by area, the methodology for this analysis would be stronger if there was a greater control over the proportionate distribution of the location of the unmatched segments across the sites and catchment areas. In order to have greater control over the proportional distribution of the unmatched segments across the sites' catchment areas, within each site area the same number of unmatched segments as matched segments were randomly sampled from all of the unmatched segments available in the area. This strategy provides a random selection of unmatched segments that are more comparable to the segments in the matched segment group. For each of the intervention periods, the random sample of unmatched segments (total of 37) was not significantly different in the level of social disorder change from the unmatched segments not included in the random sample (total of 56) (tested using independent samples t-test).

Using the random sample of unmatched segments (similarly distributed across the sites' catchment areas as the matched cases), dependent t-tests were run again and findings were similar to those presented previously, the random sample of unmatched segments had a significantly lower mean level of social disorder change from the target area for the beginning period of the intervention; however, all of the other periods were not significant. Also similar to the first analysis, there were no significant differences for any of the intervention periods when testing the difference of the change levels between the matched sample of segments and the unmatched random sample of segments (all tests conducted using independent samples t-test).

Table 8.5: Difference in Change in Social Disorder Level between Target Area, Matched, and Unmatched Random Sample Segments

Independent Samples t-te	st Between:	Beginning Intervention	First Half of Intervention	Second Half of Intervention
Target Segments and Matched Catchment Areas Segments	Mean difference (Sig.)	-1.929*** (.000)	.042 (.851)	.035 (.907)
Target Segments and Unmatched Random Sample Catchment Areas Segments	Mean difference (Sig.)	-1.579*** (.001)	077 (.665)	.420 (.107)
Catchment Areas Matched Segments and Unmatched Random Sample Catchment Areas Segments	Mean difference (Sig.)	.350 (.339)	119 (.554)	.384 (.107)

***.001

Similar to the analysis using all of the unmatched segments, it appears using this more exacting methodology there remains no basis to conclude that generally segments from the catchment areas with similar opportunities to the target areas experienced differential parallel intervention spatial effects as compared to the unmatched random sample of catchment area segments.

In close, using the present methodology there is a lack of evidence supporting that catchment area segments with opportunities similar to target area segments show a differential effect from the intervention on social disorder (change in level of social disorder) compared to unmatched opportunity segments in the catchment areas. It appears that at the beginning of the intervention the segments in the catchment areas have a decrease in the level of social disorder suggesting a diffusion of benefits, which is relatively similar across catchment area segments, regardless of the opportunity factors present on the segment. In addition, the decreases in levels of social disorder do not seem effected by these opportunities when considering segment location. Findings remain similar for the first half of the intervention period, when there were relatively few

additional intervention benefits brought to the study areas (see previous chapter), and also for the second half of the intervention, when the intervention was maintained but additional intervention benefits were not noted in the study areas (see previous chapter). Although it may be the case that there truly are no differences between these matched and unmatched segments in the catchment areas, there may be other possibilities for these findings. For instance, there may be other opportunity attributes in addition to or instead of those used in the matching process, which are more important for choosing places matched by opportunity factors.

PLACE-BASED OPPORTUNITIES AND SPATIAL DISPLACEMENT AND DIFFUSION

This section examines the relationship between opportunities – targets, offenders, guardians – and the variability of parallel spatial effects for all of the street segments, by using segment opportunity measures to predict if street segments fall into specific groups of parallel spatial effects (e.g., high levels of diffusion, moderate levels of diffusion, no change, displacement). Considering the null findings from the previous analysis, in which segments were matched on specific opportunity factors, additional opportunity factors are included in this analysis. The previous analysis merely tested if the segments in the catchment areas with similar opportunities to the segments in the target areas explained place-based differences in the change in social disorder for catchment area segments. This analysis did not consider that there may be different opportunity factors at play within catchment area segments which help explain different types of segment change in social disorder. It may be that segments which have displacement of social disorder (increases in social disorder) have different opportunity factors as compared to

segments with higher rates of diffusion of benefits (relatively large decreases in social disorder) or lower levels of diffusion of benefits.

To examine the possibility that differential place-based opportunities may predict distinct groups of parallel spatial effects, this analysis is conducted by assigning each segment to specific groups defined by level of change in their social disorder. As described in the research methods section, using the change in social disorder level for the beginning of the intervention period, four change groups are made for the period from the pre-intervention phase to the immediate intervention phase of the intervention. Dividing the change in social disorder variable into distinct groups provides a means to easily differentiate between displacement of social disorder (increases), no change, and diffusion of social disorder (decreases). These change groups provide a means to examine the opportunity factors at play at the segments within these theoretically important groups, which is not possible when examining the change in social disorder level at the street segment level as a continuous variable. Using the distinct groups of change in social disorder, a multinomial logistic regression is employed, in which segment opportunity measures are used to predict the segment's group membership, establishing which opportunity measures result in specific types of segment intervention effects.

Focusing on the First Period of the Intervention

This analysis will focus on change in social disorder levels and opportunities at the study street segments for the beginning period of the intervention (pre intervention to immediate intervention phases). As previously established, the beginning period of the intervention experienced the greatest intervention impact with the most net social disorder level declines (overall a 202.09 decrease) as compared to the second two subsequent intervention periods. In contrast to the beginning intervention period with a net decline in social disorder level of 202.09, the first half of the intervention period had a small additional intervention effect with a net social disorder decrease of 28.59 while the second half of the intervention period the intervention was maintained and there is little evidence of additional intervention impact, with a net social disorder level increase of 5.10. As such, the beginning intervention, compared to the other periods, has the greatest range and standard deviation in the change in social disorder levels of the study area segments (see Table 7.4 in the previous chapter). In comparison to the first intervention period, the second two intervention periods reflect a maintenance in the intervention effect, with relatively little change in social disorder at the street segment level. For these reasons, the analysis is expected to be most optimal by focusing on the beginning intervention period, where the greatest intervention impact was felt by the segments.

Dividing Segments into Change Groups

As explained in the research methods section, using the knowledge gained from examining the variability of the change in social disorder at the street segment level, segments are separated into social disorder change groups for this period. All of the study area street segments are considered in constructing these groups, including the target areas, since offenders may choose to displace within the target areas, causing specific hot spot street segments to increase in crime (direct intervention backfire effects). Table 8.6 provides the distribution of the change groups across the study areas, 39 segments fall within the *displacement/backfire group* and 38 segments fall into the *high diffusion/deterrence group*.

Table 8.6: Distribution of Segments by Study Area across Change Groups

Study Areas	High Diffusion	Low/Moderate	No change	Displacement	Total
,	or Deterrence	Diffusion or	Group	or Increase	N
	Group	Deterrence Group	N	Group	% within
	N	N	% within	N	
	% within	% within		% within	
Target Area	16	14	0	2	32
	50.0%	43.8%	.0%	6.3%	100.0%
Catchment Area 1	11	26	0	13	50
	22.0%	52.0%	.0%	26.0%	100.0%
Catchment Area 2	11	28	6	24	69
	15.9%	40.6%	8.7%	34.8%	100.0%
Total	38	68	6	39	151
	25.2%	45.0%	4.0%	25.8%	100.0%

<u>Predicting Change Group by Place-Based Opportunity Measures</u>

Using the groups presented above (see Table 8.6), a multi-nominal logistic regression was performed using the *low/moderate diffusion/deterrence group* as the reference category, comparing the *high diffusion/deterrence category* to the *low/moderate group* and the *displacement/backfire group* to the *low/moderate diffusion/deterrence group*. The *no change group* (6 segments) is too small to include in the analysis, reducing the number of segments included in the analysis to 145. Two models are run; the first includes all of the segments from all of the areas, while the second model includes only the segments in the two catchment areas. Using this methodology provides a means to compare the two models and determine the effects of the target area and catchment areas segments separately in the analysis. ⁶⁸

A number of independent variables are included in the two models. To represent the types of measures of possible offenders and victims available on a segment two variables include measures of types of buildings, the presence of any commercial

⁶⁸ Since the target area only had two segments in the displacement/deterrence group, incorporating this area on its own disrupted the model, so excluding the area variable and running a full model overcame this problem.

building and of any public service building. A scale of public flow through the area (additive scale of the number of lanes, presence of a bus stop, volume of pedestrian traffic, and volume of auto traffic) is also included as a measure of possible offenders and victims in the area, but also moving through the area. A number of measures are included to capture guardianship, including the number of possible place managers, the level of place manager responsibility scale, a place manager rating of the place, and finally a physical disorder scale. A number of other measures were considered, but due to high correlations and/or low variability these measures were deemed not appropriate for the final models. ⁶⁹ Finally the models are run separately excluding the target area, so the impact of the catchment areas could be considered separately from the target area, as a means to measure relative distance (displacement gradient) from the target area. This variable also provides a differentiation of the catchment areas from the change in opportunities, including police focus, of the target area.

The two final models and their findings are provided in Table 8.7. The interpretation of these results begin by comparing the two models, starting with a discussion of the high diffusion/deterrence group compared to the low/moderate group findings. Next, there is a discussion of the displacement group as compared to the

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⁶⁹ A number of other place-based measures were considered but were not included in the final models. Both the bar present on the segment and social class measures had little variability, so they were not feasible to be included once broken down by area and when considering other measures. A number of measures were not included because they were highly correlated with other measures included in the model: the average years a place manager has lived, worked, hung out in the area was moderately correlated with the average level of responsibility scale (r=.43, p=.000); the police patrol and the recreation measures were both moderately correlated with the public flow scale (both above r=.32, p=.000); and the number of place managers was moderately correlated with number of female loiters (.31, p=.000). It appeared as if public flow and number of place managers were sufficient population and flow measures, so considering the correlated measures and to keep a more parsimonious model the other population type measures were excluded (i.e., number of people recreating, male and female loiterers). The any residential building measure was not included because there was little variability, but also because it was moderately correlated with the responsibility level scale and number of interviews.

low/moderate group findings. Finally, there is a summary of the findings considering both entire models.

High diffusion/deterrence group compared to the low/moderate group. As illustrated in Model 1 including all of the study areas there is an area effect (see Table 8.7). As compared to the second catchment area segments, a segment located in the target area was significantly more likely to fall into the high diffusion/deterrence group rather than the moderate/low group (p=.04; log odds=3.72). The segments in the first catchment area were not significantly more likely to fall into the high diffusion/deterrence group compared to the low/moderate group for either of the models. This suggests that a greater number of the target area segments fell into the group of high diffusion/deterrence segments (responsible for approximately a quarter of the net declines across the area). This is not very surprising, considering the target area was the direct subject of the intervention. Also, considering the proportionate distribution of the catchment area segments across the groups, it is not surprising that the two catchment area segments were not significantly different from each other considering membership into the high diffusion group as compared to the low/moderate group. This suggests that while including other segment opportunity measures, there is little evidence to support that the travel distance to the first catchment area or the second catchment area from the target area made a significant impact on segments experiencing high levels of diffusion (decreases in the change in social disorder measure) as compared to those experiencing low/moderate levels of diffusion of benefits (decreases in the change in social disorder measure). It should be noted that the catchment areas explored here are still in a

relatively close distance to the target area, so offenders may travel further than these areas.

The two models have two other significant variables to consider as explanations for the segment which fall into the high diffusion/deterrence group as compare to the low/moderate diffusion/deterrence group, the level of public flow measure and the place manager responsibility level measure. As illustrated in the comparison of the high diffusion/deterrence portions of model one and two, the public flow measure is highly significant in both of the models; however, the odds ratio is slightly higher in the catchment areas only model (p=.025, odds ratio=1.54) as compared to the model including all of the study areas (p=.036, odds ratio=1.41). This finding suggests that across all study areas, street segments which have a greater flow of the public are significantly more likely to fall into a group of high diffusion/deterrence as compared to segments with lower levels of public flow. Comparing the two models, it appears that public flow has a slightly greater impact on the catchment area segments high diffusion/deterrence group membership than the target area segments; however, the difference in the odds ratio are very slight and may be a measurement artifact. Although considering the few segments in the target area (33) compared to the catchment areas (130), this may not be the case. If the difference in the public flow measure between the models is taken at face value, the catchment area segment high diffusion/deterrence group membership may be more influenced by public flow than the target area's group membership, which may be an artifact of the intervention in the target area, which may be more fully distributed across the target area segments. This finding suggest that public flow may be an important to the tested relationship in the target areas but more important

in the catchment areas. In any case, this finding suggests that those places with the greatest public flow likely reaped the greatest impact of the benefits of the intervention, in this case including direct intervention effects deterring social disorder in the targeted areas as well as indirect benefits of the intervention effects diffusing to catchment area segments and reducing social disorder.

The final measure to consider when comparing the high diffusion/deterrence group of segments to the low/moderate group is the place manager responsibility scale measure. In both Model 1 (including all study areas) and Model 2 (including only the catchment areas), the significance of the place manager responsibility scale suggests that place managers interviewed from the high diffusion/deterrence group segments, on average per segment, have a greater level of responsibility over the place as compared to those interviewed on segments in the low/moderate diffusion group. However, when examining the first model, including all of the areas, the confidence intervals for the place manager responsibility level cross over one, which limits the confidence in this finding that the direction of the relationship would remain if additional samples were collected from this population (p=.036, odds ratio=1.86, confidence interval range .95 - 3.63). In contrast, for the second model, including the catchment area segments only, the relationship between the place manager responsibility scale and membership into the high diffusion/deterrence group (as compared to the low/moderate group) has a confidence interval over one. As such, for the catchment area segments only, the segments with a greater level of place manager responsibility were more likely to fall into the high diffusion/deterrence group as compared to the segments in the low/moderate group (p=.033, 3.14). In considering the place manager responsibility level in the two models,

it is likely this measure is of importance to increase diffusion of benefits in the catchment areas but not important in increasing deterrence in the target area, where the intervention is being brought more fully to a small number of segments, regardless of place manager level of responsibility. The relationship between the greater level of diffusion at segments with the high level of place manager responsibility may indicate these types of places appear less opportune for crime during the intervention.

In sum, as compared to the low/moderate diffusion/deterrence group segments falling into the high diffusion deterrence group were in the target area and had a greater public flow. Segments in the catchment areas, but not in the target areas, also were more likely to have place managers with a higher level of responsibility at the places on the segment. The other variables were not significant for the comparison of segments in the high to low/moderate diffusion groups, regardless of being located in the catchment areas or in any of the study areas.

Displacement group as compared to the low/moderate group findings.

Examining the portion of the two models for the segments which fall in the displacement group as compared to those that fall into the low/moderate group there is only one significant variable, the place manager responsibility level scale. However, when examining the second model, including only the catchment areas, the confidence intervals for the place manager responsibility level cross over one, which, as described above, limits the confidence in this finding (p=.052, odds ratio=2.27, confidence interval range .995 – 5.18). In contrast, model 1 has a confidence interval which fully falls above one and indicates that as compared to segments which fall into the low/moderate diffusion group those which fall into the displacement group are likely to have a higher average

level of place manager responsibility of places on the segments (p.022, odds ratio=2.37). These findings do suggest that the average responsibility level of place managers is the only significant indicator for the displacement group segments, as compared to the low/moderate diffusion/deterrence group segments. However, we should be cautious in our trust of these findings, since we can only be confidence of the analysis including the segments from the catchment areas.

Besides the place managers level of responsibility measure there were no other variables which had a significant relationship in predicting membership into the displacement group, as compared to the low/moderate diffusion/deterrence group, for either of the two models. It is quite surprising that the area variable is not significant for this portion of the analyses, as one would have expected a greater proportion of segments from the catchment areas to be in the declining group (displacement) as compared to the target area (backfire effects). However, since a greater proportion of the target area segments fall into the high diffusion/deterrence group, rather than the low/moderate diffusion/deterrence or the displacement groups, there was not a great proportion difference for membership for these two groups for the target area as compared to the two catchment area segments.

In sum, there were few significant predictors for street segments falling into the displacement group as compared to the low/moderate diffusion group. The only exception was the significance of the place manger responsibility measure, which may indicate that as compared to the low/moderate diffusion group segments in the displacement group have place managers who have a greater level of responsibility at

place. Considering the confidence intervals for the catchment areas only model, this variable must be interpreted with caution.

All groups summary. Overall across both models, the place manager responsibility variable has the most influential effects, appearing to significantly predict that catchment area segments with a greater average place managers responsibility level fall into the high diffusion/reduction group as compared to the low/moderate diffusion group. A similar finding is illustrated for the all areas model (Model 1) for the displacement/increasing group as compared to the low/moderate diffusion group, but considering this finding was no longer significant for the catchment area only model, this may be a result of the influence of the target area segments, which are influenced by the intervention. The public flow measure is the only other measure which was found to be significant; as the public flow increases so do the odds that a segment would fall into the high diffusion group, as compared to the low/moderate group. None of the other measures were significant in the models.

Table 8.7: Testing Routine Activities Theory at Place: Multinomial Logistic Regression

		High Re	duction	(Diffusion	on) Gro	up as coi	mpared to Low Mod	derate R	eduction	Group			
		M	odel 1: A	All Area	S				Mod	el 2: Cato	hment A	Areas	
Variables				Odds	95% C.I.	for EXP(B)	Variables				Odds	95% C.I.	for EXP(B)
	В	S.E.	Sig.	Ratio	Low	Upper		В	S.E.	Low	Upper		
Areas		•					Areas						
Target Area	1.312	.664	.048**	3.72	1.01	13.64	Target Area			Not include	d in model		
Catchment Area 1	.076	.586	.897	1.08	.34	3.40	Catchment Area 1	.420	.636	.509	1.52	.44	5.29
Catchment Area 2 (suppressed)	0						Catchment Area 2 (suppressed)	0					
Types of Buildings (Offenders/Victims)							Types of Buildings (Offenders/Victims)						
Any Commercial Buildings (Suppressed)	0						Any Commercial Buildings (Suppressed)	0					
No Commercial Buildings	-1.010	.718	.159	.36	.09	1.49	No Commercial Buildings	-1.073	.750	.152	.342	.079	1.49
No Public Service Buildings (Suppressed)	0						No Public Service Buildings (Suppressed)	0					
Public Service Building Present	083	.508	.870	.92	.34	2.49	Public Service Building Present	.264	.636	.678	1.30	.37	4.53
Public Flow (Offenders/Victims)							Public Flow (Offenders/Victims)						
Public Flow Scale	.342	.163	.036**	1.41	1.02	1.94	Public Flow Scale	.431	.193	.025**	1.54	1.05	2.24
Place Manager Measures (Guardians)			1			1	Place Manager Measures (Guardians)					1193	
Number of Place Managers	032	.035	.361	.97	.90	1.04	Number of Place Managers	025	.040	.533	.98	.90	1.06
Level of Responsibility Scale	.619	.342	.070 ⁺	1.86	.95	3.63	Level of Responsibility Scale	1.15	.536	.033**	3.14	1.10	8.99
Place Manager Rating of Place	276	.500	.581	.76	.29	2.02	Place Manager Rating of Place	449	.678	.508	.64	.17	2.41
Physical Disorder Scale	.098	.156	.529	1.10	.81	1.50	Physical Disorder Scale	.211	.186	.258	1.24	.86	1.78
Intercept	-4.469	2.240	.046				Intercept	-7.34	3.068	.017			
			,	I	ı	1			, 5.555		1	1	

	Inc	rease Gr	oup (Dis	placen	nent/Bac	ckfire) as	compared to Low I	Moderate	Reduct	tion Grou	ıp		
		Model	1: Entire	Study	Area				Mod	el 2: Cato	chment A	Areas	
Variables	В	S.E.	Sig.	Odds Ratio	95% C.I.	for EXP(B) Upper	Variables	В	S.E.	Sig.	Odds Ratio	95% C.I.	for EXP(B) Upper
Areas		0.2.	o.g.	- tallo		т орро.	Areas		0.2.	o.g.	rano		г орро.
Target Area	-1.02	.895	.254	.36	.06	2.08	Target Area			Not include	ed in model		
Catchment Area 1	441	.508	.385	.64	.24	1.74	Catchment Area 1	497	.523	.343	.61	.22	1.70
Catchment Area 2 (suppressed)	0						Catchment Area 2 (suppressed)	0					
Types of Buildings (Offenders/Victims)							Types of Buildings (Offenders/Victims)						
Any Commercial Buildings (Suppressed)	0						Any Commercial Buildings (Suppressed)	0					
No Commercial Buildings	.023	.494	.963	1.02	.39	2.69	No Commercial Buildings	.047	.505	.926	1.05	.39	2.82
No Public Service Buildings (Suppressed)	0						No Public Service Buildings (Suppressed)	0					
Public Service Building Present	090	.493	.855	.91	.35	2.40	Public Service Building Present	406	.525	.440	.67	.24	1.87
Public Flow (Offenders/Victims)							Public Flow (Offenders/Victims)						
Public Flow Scale	003	.162	.985	1.0	.73	1.37	Public Flow Scale	.030	.166	.857	1.03	.74	1.43
Place Manager Measures (Guardians)						_	Place Manager Measures (Guardians)						_
Number of Place Managers	042	.030	.154	.96	.91	1.02	Number of Place Managers	032	.030	.288	.97	.91	1.03
Level of Responsibility Scale	.861	.375	.022**	2.37	1.14	4.93	Level of Responsibility Scale	.819	.421	.052 [†]	2.27	.99	5.18
Place Manager Rating of Place	264	.539	.624	.77	.27	2.21	Place Manager Rating of Place	.006	.592	.992	1.01	.32	3.21
Physical Disorder Scale	140	.150	.351	.87	.65	1.17	Physical Disorder Scale	160	.160	.318	.85	.62	1.17
Intercept	-2.06	2.087	.324				Intercept	-2.65	2.23	.234			
	n = 135; Nagelkerke Pseudo R ² = .283; p=.003					=.003		n = 1	105; Nage	elkerke Ps	eudo R ² :	= .231; p=	=.094

^{*}p<.10 **p<.05 ***p<.01 + For these significant cases the confidence intervals cross one, which limits the generalizabilty of these findings and these indicators should not be treated as significant (see Field, 2009).

Chapter 9: Opportunities and the Occurrence of Social Disorder in the Situation at the Street Segment

The fourth set of analyses change the perspective from the aggregate level examination of the relationship of opportunities and parallel intervention effects on a segment, to a *situational* level examination of the relationship between the opportunities at place and the occurrence of a social disorder event. Understanding the way in which constructs from routine activities theory explain crime within a situation at place will help specify which types of places may fall victim to crime during an intervention.

SITUATIONAL OPPORUNITY MEASURES AT PLACE AND INTERVENTION EFFECTS

This analysis is conducted using logistic regression to predict the occurrence of social disorder (occurrence yes or no) within a twenty minute social observation period, defined as a situation. The opportunity measures include: measures about the situation, targets/offenders (flow of auto and pedestrian traffic, number of possible offenders, number of people recreating) and guardianship (i.e., police present, quality of lighting); static measures about the segment's environment which represent the level of targets/offenders (i.e., types of building items, number of connecting streets, bus stop present), and guardianship (physical disorder scale); and aggregate measures about the segment's type of people, guardianship (number of place managers, level of responsibility scale, average years at segment, rating of the place scale). In addition to these measures, a measure of the temperature during the observation and a measure capturing if the observation was collected on the weekend are included as control variables.

Using these measures two sets of logistic models are run. The first set of models include each wave of the social observations (one pre-intervention wave, six during intervention waves, and one post intervention wave) and is run separately for each study area (see Table 9.1). The second set of models includes all of the same measures as the first set of models run, except the pre-intervention wave of data is excluded. This second set of models is also run separately for each study area (see Table 9.2). This methodology allows for a comparison of the effects of opportunity factors across study areas while also considering how these effects differ in the models including only the intervention waves, as a means to assess if the effects of opportunities differ during an intervention. To provide structure, the difference between the findings across the models, including difference by area, is discussed below, considering the following situational categories: intervention wave effects, types of buildings, public flow, possible offenders/victims, place manager measures, and control measures.

<u>Situational Analysis Findings</u>

Intervention wave effects. An indicator for each wave of the social observation data is included in the first set of models run for each area (Model 3, 4, and 5), including the pre-intervention wave, which is used as the comparison category, the six intervention waves in the time order of the intervention, and the post intervention wave. In the first model set (Model 3, 4, and 5), the odds of an event of social disorder occurring in the situation is significantly less likely for each of the waves during the intervention (waves 1-6) and for the wave post intervention, as compared to the pre-intervention wave.

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⁷⁰ Because observations were collected on the same street segments at different times, the observations are not independent; therefore, the standard errors should be considered with some degree of caution. This being said, the situational elements of each case do appear to provide a great amount of variability across the situations and the final models do appear quite stable, suggesting greater independence than might have been expected for segments across these places.

Examining the second model set (Model 6, 7, and 8), in which the pre-intervention wave of situational data is not included, only the fourth intervention wave in the target area model (Model 6), is found to have a significant finding, suggesting a social disorder event occurring in situations in this wave were significantly less likely than an event occurring in the first wave *into* the intervention (p=.036, odds ratio=.623). In the second Model set (Model 6, 7, and 8), all of the other waves in the target and catchment areas were either not significantly different from the first wave *into* the intervention or in two cases (one in the target area and one the first catchment area) there is a lack of confidence in the significant findings (confidence intervals cross over one). These findings suggest that for each of the study areas, the greatest impact of the intervention in reducing the odds of a social disorder event was at the beginning of the intervention, from the pre-intervention to the first wave of the intervention. Examining the odds ratio by area for the models including the pre-intervention wave (Models 3-6), there appears to be an area effect, with the greatest intervention impacts appearing to take place in the target area, the next greatest in the first catchment area, followed by the second catchment area. 71

Types of buildings. There were a number of building measures examined in the analysis, including the presence of a public service building; the presence of a bar/liquor store; and if the segments had any retail commercial store, any industrial commercial, was mostly residential, or had no commercial or residential buildings. Findings for each of these measures will be discussed. The presence of a public service building had a significant and negative impact on the odds of an event of social disorder taking place in

⁷¹ Although comparing odds ratios of the same indicators across logistic models is not normally recommended due to the differences in the amount of unobserved heterogeneity and effect sizes (see Mood, 2010), the current models use all of the same variables and only remove a portion of the sample, so these precautions are not as extreme in the case at hand. As such, the odds ratios will be compared across models, but only for relative size rather than exact differences.

a situation, but only in the target area. This relationship remains significant in the target area when removing the pre-intervention wave of data. This finding is not replicated in the catchment area segments, so it is not likely the presence of a public service building differentially influences the occurrence of an event of social disorder during an intervention compared to absent of an intervention.

In an examination of the impact of the presence of a bar/liquor store in the models, the presence of a bar/liquor store significantly increases the odds of an occurrence of an incident of social disorder for situations in the target areas and second catchment areas, but decreases the odds of an incident of social disorder occurring in the first catchment area. This directional relationship for the presence of a bar/liquor store on the segment within the situation remained regardless of the inclusion of the preintervention wave (Models 3-6) or the exclusion of the pre-intervention wave (Models 4-6). However, when the pre-intervention wave was removed from the models, if a bar/liquor store was present the odds of an event occurring in the situation were increased in the positive direction in the target area and second catchment area, but were reduced in the negative direction in the first catchment area. This finding suggests that situations with bars/liquor stores can have a differential impact on the occurrence of an incident of social disorder, which may be magnified by the intervention. However, the differential impact may also be due to the operationalization of the measure during data collection, capturing liquor stores and bars as one measure. But in either case, there is greater evidence here and from other research that bars are likely positively associated with social disorder events (Frisbie et al, 1978; Gorman et al, 2001; Peterson et al, 2000; Roncek and Maier, 1991).

For the different types of places as either all residential, any industrial commercial, or no commercial or residential, as compared to any retail commercial, the models including the pre-intervention are quite similar to those excluding the pre-intervention. Although there is one exception, in the first catchment area the situations which occurred on mostly residential segments, as compared to segments with any retail commercial, had a significant and negative relationship with the occurrence of social disorder for the model including the pre-intervention wave, but once the pre-intervention wave was removed this relationship was no longer significant (Model 4 compared to Model 7). This finding suggests that in the first catchment area, the intervention may have impacted the events occurring in residential segments or the comparison group, segments with retail commercial establishments, enough to the point where the significant findings is no longer present during the intervention.

The other place use settings with a significant impact maintained the same directional impact across the two models (models including the pre-intervention and not including the pre-intervention). For the target area, excluding the pre-intervention wave resulted in a slight increase in the odds ratio of an event occurring in mostly residential segments, as compared to segments with any commercial retail buildings. In the first catchment area, as compared to segments with any the commercial residential building, there is also a slight decrease in the odds ratio of an event occurring. However, these two finding should be examined with caution as only 3% of segments in the target area are in the all residential building category and 3.8% of the segments in the first catchment area have no commercial or residential buildings. These two differential place use findings, for the target area and first catchment area, may be overly influenced by the relatively

few observations for these place use types, which are relatively rare as compared to other place use types in each of the two study areas.

A significant place use finding which does deserve attention occurs in the second catchment area, where there is a slight decrease in the odds of an event occurring in segments with any industrial or warehouse commercial building, as compared to segments with any commercial retail buildings (segments with industrial or warehouse buildings comprised 10.3% of the segments in the second catchment area). Interestingly, 50% of the street segments in the target area have commercial buildings that are mostly industrial or warehouse buildings, which may suggest offenders from the target areas are steering clear of segments in the second catchment area with these types of buildings, reducing the odds of an event during the intervention at situations at these places. Although if this is the case, we may expect a significant negative relationship for the places with warehouse or industrial buildings in the target area, but the lack of this significant relationship in the target area may be due to the intervention effects strongly impacting the segments with commercial retail buildings as well as segments with industrial and warehouse commercial buildings, so the significant difference is not detected. If the second catchment area places with industrial and warehouse buildings are experiencing diffusion effects, it is also surprising that these similar type segments within the first catchment area did not evidence a similar pattern (11.5% of the second catchment area segments had industrial or warehouse buildings). As such, the second catchment area segments with industrial and warehouse buildings may be experiencing a benefit from the intervention, but it is difficult to assure this is the case.

<u>Public flow.</u> Regardless of the model examined, as the volume of pedestrian and auto scale increases so do the odds of an event occurring in the situation. When comparing the two sets of models (including the pre-intervention wave or not including this wave) the odds ratio are very similar, indicating the pre-intervention wave may have little impact on the overall findings. Comparing these models, although it is difficult to say there is evidence of displacement, it is evident that segments with a greater volume of auto and pedestrian traffic may be more likely to have incidents of social disorder within a situation, so it may be fruitful for police to focus efforts in the target area and in surrounding areas during an intervention.

The presence of a bus stop, the number of lanes, and the number of entry turns for a segment each have a different finding when considering the study area. Having a bus stop present only increases the odds of a social disorder event occurring in the target area, again regardless of the inclusion of the intervention in the model or not, with similar odds ratios for both models. In the first catchment area, situations on segments with two or four lanes (as compared to one lane) have an increase in the odds of an event occurring in a situation, regardless of the model but slightly greater odds ratios for the model which excludes the pre-intervention wave. In the second catchment area, the number of entry turns decreases the odds of an event occurring in the situation, but we can only be confident of this finding in the model not including the intervention wave. These findings are difficult to interpret, it could be that bus stops in the target area, number of lanes in the first catchment area, and the number of entry turns in the second catchment area all measure accessibility to a segment, but there may be some other factor – such as the way in which the streets are connected - that is causing the differential findings for

these measures across the areas. In any case, it does appear segments with more lanes in the first catchment area may indicate an increase in the odds of an event, illustrating possible displacement effects and deserving greater attention in reduction strategies.

Possible offenders/victims. For the second model set (Models 6, 7, and 8), as the number of males loitering increases so do the odds of an event of social disorder in the situation, regardless of the area. This is also the case for the models including the intervention wave (Models 3, 4, and 5), except for the second catchment area for which the significant level had a confidence interval which crossed one, suggesting the intervention may have an impact on the relationship between males loitering and the occurrence of an event in the second catchment area. For the target area and first catchment area, the odds ratios for the relationship between the number of males loitering and an event of social disorder in the situation are quite similar, regardless of including the intervention wave in the models. Only the target area has a significantly positive relationship between females loitering and an event of social disorder in the situation, which was significant for both models.

These findings suggest that the number of females and males loitering in the target area continue to impact the odds of an event occurring, regardless of the intervention. In the first catchment area this is likely the case but only with males loitering. However, in the second catchment area, it appears that there may be an intervention impact positively impacting the likelihood of an event if males are loitering in the situation on the segment.

<u>Guardianship.</u> Regardless of the model (including the pre-intervention or not), in the target area, as the number of place managers increase the odds of an event of social

disorder deceases. This finding is paralleled in the second catchment area, but only for the model including the pre-intervention wave, so there is a lack of confidence in this finding during the intervention. The only other place manager measure which has a significant impact is the average place manager rating of the segment, signifying place manager pride in the place, which for both of the catchment areas, but not the target area, the odds of an event decrease as place mangers ratings are more positive. This finding is true of the catchment areas, regardless of the inclusion of the pre-intervention wave. The average rating of the place made by place mangers is not significant for the target area segments, since it may be that the strong intervention effects impacted the target area regardless of the average place manager rating of the street segments. This finding suggests that place manager pride may deflect social disorder at segments proximate to the intervention, during an intervention. This may be due to offenders, unaware of the scope of the intervention, perceiving places with this guardianship factors as having greater risk during the intervention. Alternatively, it may be due to a diffusion of benefits of social control from the intervention to place managers in these segments, resulting in managers taking on a greater role in managing these places (see Weisburd and Telep, *forthcoming*).

In both of the catchment areas, as the physical disorder scale on segments increase, so do the odds of an event occurring in situations at these places, regardless of the model examined. As suggested with the average place manager rating of place segment measure, the physical disorder measure may not be significant in the target area because of the impact of the intervention. Prior literature has suggested physical disorder can symbolize to an offender a place is not well tended to and thereby lacks guardianship,

as such the catchment area segments with greater levels of physical disorder may be more attractive to offenders during an intervention. These findings are contrary to those made by Ready (2009), suggesting that street segments with indicators of physical disorder may deflect offenders from committing crime on these segments. Although the physical disorder measures used for the current study are similar to those used by Ready (2009), the difference in the findings may be due to the difference in the outcome variables, as Ready (2009) used resident perceptions of crime as an outcome variable while the current study uses social disorder observed through social observation.

A police officer being present on a segment significantly raises the odds of an event occurring in the situation for both the target area and the first catchment area, regardless of the model. Observers did not report police being the cause of social disorder on these segments, so it is likely police were proactively present or reactively responding to incidents of social disorder during these situations. In either case, it is comforting that the likelihood was greater for police being present for these situations which had incidents of social disorder. It is interesting that the second catchment area did not parallel these findings. It is unlikely this finding signifies police were overly responding to incidents in the first catchment area, a possible decay in the drawn intervention area, since as examined by Weisburd, Wyckoff and colleagues (2004) the integrity original JCDDS intervention was maintained.⁷²

Finally, there is a significant impact of the quality of lighting in the target area and first catchment area, as compared to a daytime situation, those lit poorly/mostly poorly or mostly well have significantly greater odds of an event in the situation, with the

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 $^{^{72}}$ Also note the intervention included changes in place-based opportunities, rather than just an increase in traditional policing techniques.

poorly/mostly poorly lighting having greater odds for an event than the lit mostly well. The whole area lit well category was not significantly different than the day time observation. The second catchment area had no significant differences in regard to the quality of lighting. These findings were similar, with similar odds ratios for the model including the pre-intervention wave and the model not including the intervention wave.

<u>Controls.</u> Two controls were included, temperature of the situation and the occurrence of the event on a weekend or not. The only control that was significant was for the model not including the pre-intervention wave, an incident of social disorder is more likely during a situation if the temperature is cold/cool (32 - 59 degrees F) as compared to cold (under 32 degrees F). This was surprising to find for merely one area, but it is likely some of the temperature difference was also controlled for by including the wave of the intervention variable.

In sum, the situational analysis provides support for the application of place-based opportunity constructs – the presence of guardianship, targets, and offenders – in understanding the occurrence of an incident of social disorder within situations at places proximate to an intervention. Finding for the opportunity measures did vary slightly by the location of the segments (study area), however, for the most part, the direction of the relationships were similar to those expected when considering other place-based research testing these measures (see Felson and Boba, 2010; Weisburd et al, 2010; Weisburd, Morris et al, 2009). As such, it did not appear that in the presence of an intervention the expected relationship between opportunity constructs and social disorder and crime changed, for instance segments with high levels of physical disorder continued to have a greater likelihood of incidents of social disorder during the situation.

Table 9.1: Testing Opportunities in the Situation at Place: Logistic Regression by Area - All Study Waves

			del 3: Ta						4: Catcl						l 5: Cato	hment A	rea 2	
Variables					95%	C.I.for P(B)					95%	C.I.for P(B)					95%	C.I.for P(B)
variables	В	S.E.	Sig.	Odds Ratio	Low	Upper	В	S.E.	Sig.	Odds Ratio	Low	Upper	В	S.E.	Sig.	Odds Ratio	Low	Upper
Intervention Waves																		
Pre-Intervention (Suppressed)			.000***						.000***						.000***			
Wave 1 – Intervention	-1.628	.289	.000***	.20	.11	.35	993	.258	.000***	.37	.22	.61	-1.245	.251	.000***	.29	.18	.47
Wave 2 – Intervention	-1.994	.304	.000***	.14	.08	.25	-1.196	.287	.000***	.30	.17	.53	-1.320	.293	.000***	.27	.15	.47
Wave 3 – Intervention	-1.755	.305	.000***	.17	.10	.32	-1.245	.294	.000***	.29	.16	.51	-1.388	.287	.000***	.25	.14	.44
Wave 4 – Intervention	-2.112	.319	.000***	.12	.07	.23	-1.472	.313	.000***	.23	.12	.42	926	.303	.002***	.40	.22	.72
Wave 5 – Intervention	-1.698	.309	.000***	.18	.10	.34	-1.036	.287	.000***	.36	.20	.62	-1.224	.296	.000***	.29	.17	.53
Wave 6 – Intervention	-1.471	.304	.000***	.23	.13	.42	890	.284	.002***	.41	.24	.72	-1.456	.293	.000***	.23	.13	.41
Post Intervention	-1.904	.283	.000***	.15	.09	.26	-1.093	.258	.000***	.34	.20	.56	-1.582	.273	.000***	.21	.12	.35
Types of Buildings (Offenders/Victims)																		
Public Service Present	698	.189	.000***	.497	.344	.72	120	.192	.531	.89	.61	1.29	193	.141	.170	.82	.63	1.09
Bar Present	1.219	.423	.004***	3.38	1.48	7.75	654	.234	.005***	.52	.33	.82	.518	.251	.039**	1.68	1.03	2.75
Any Retail Commercial (Suppressed)			.000						.009						.001			
Mostly Residential	1.942	.405	.000***	6.97	3.15	15.42	472	.178	.008***	.62	.44	.88	.082	.163	.616	1.09	.79	1.49
Any Industrial Commercial	.307	.264	.245	1.36	.81	2.28	502	.333	.132	.61	.32	1.16	-1.321	.352	.000***	.27	.13	.53
No Commercial or Residential	None m	easured	in the area				-1.167	.493	.018**	.31	.12	.82	109	.333	.744	.90	.47	1.72
Public Flow (Offenders/Victims)																		
Volume Pedestrian and Auto Scale	.320	.067	.000***	1.38	1.21	1.57	.391	.066	.000***	1.48	1.30	1.68	.421	.071	.000***	1.52	1.33	1.75
Bus Stop Present (yes/no)	855	.257	.001***	.43	.26	.70	290	.287	.313	.75	.43	1.32	026	.206	.900	.98	.65	1.46
One lane (Suppressed)									.041						.012			
Two lanes	275	.249	.269	.76	.47	1.24	.414	.175	.018**	1.51	1.08	2.13	.117	.193	.545	1.12	.77	1.64
Four lanes	None m	easured	in the area				.698	.339	.039**	2.01	1.03	3.91	538	.286	.060 [†]	.58	.33	1.02
Number of Entry Turns	.052	.063	.404	1.05	.93	1.19	.016	.058	.782	1.02	.91	1.14	095	.050	.059 [†]	.91	.82	1.00

		Мо	del 3: Ta	arget A	rea			Model	4: Catcl	hment	Area '	1		Mode	l 5: Cato	hment A	Area 2	
Variables				Odds		C.I.for P(B)				Odds		C.I.for (P(B)				Odds		C.I.for (P(B)
	В	S.E.	Sig.	Ratio	Low	Upper	В	S.E.	Sig.	Ratio	Low	Upper	В	S.E.	Sig.	Ratio	Low	Upper
"Possible" Offenders/Victims												•						
# Males Loitering	.237	.050	.000***	1.27	1.15	1.40	.185	.062	.003***	1.20	1.07	1.36	.091	.049	.063 ⁺	1.10	.99	1.21
# Females Loitering	.367	.097	.000***	1.44	1.19	1.74	.013	.092	.890	1.01	.84	1.21	.097	.069	.164	1.10	.96	1.26
# People Recreating	046	.039	.244	.96	.89	1.03	.064	.040	.112	1.07	.99	1.15	.080	.035	.020**	1.08	1.01	1.16
Place Manager Measures											I				•		l	
# of Place Managers	037	.015	.016**	.96	.94	.99	.015	.010	.128	1.02	1.00	1.03	027	.009	.002***	.97	.96	.99
Level of Responsibility Scale	.151	.106	.155	1.16	.94	1.43	016	.110	.887	.98	.79	1.22	079	.142	.575	.92	.70	1.22
Average Years Here (Lived, Worked, Hung out)	.026	.014	.055 [†]	1.03	.99	1.05	.010	.013	.458	1.01	.98	1.04	.011	.011	.315	1.01	.99	1.03
Place Manager Rating of Place	150	.114	.188	.86	.69	1.08	476	.169	.005***	.62	.45	.86	390	.153	.011***	.68	.50	.92
Police Present	.242	.121	.044**	1.27	1.01	1.61	.350	.130	.007***	1.42	1.10	1.83	116	.145	.422	.89	.67	1.18
Physical Disorder Scale	.079	.055	.148	1.08	.97	1.21	.096	.049	.050**	1.10	1.00	1.21	.235	.047	.000***	1.27	1.15	1.39
Day Time Observation (Suppressed)			.000						.001						.785			
Area Lit Poorly or Mostly Poorly	.664	.215	.002***	1.94	1.27	2.96	.827	.237	.000***	2.29	1.44	3.64	.059	.256	.819	1.06	.64	1.75
Area Lit Mostly Well	.571	.136	.000***	1.77	1.36	2.31	.464	.146	.001***	1.59	1.19	2.12	.149	.145	.303	1.16	.87	1.54
Whole Area Lit Well	.359	.226	.112	1.43	.92	2.23	.282	.240	.241	1.33	.83	2.12	.083	.257	.746	1.09	.66	1.80
Controls											1			I			I	-1
Weekend Observation	242	.120	.045**	.79	.62	.99	044	.133	.742	.96	.74	1.24	.087	.135	.516	1.09	.84	1.42
Cold - Under 32 F (Suppressed)			.411						.458						.061			
Cool - 32-59 F	.189	.160	.236	1.21	.88	1.65	.226	.181	.213	1.25	.88	1.79	.469	.209	.025**	1.60	1.06	2.41
Warm/Hot - 60 F or Greater	.073	.241	.763	1.08	.67	1.72	.201	.269	.454	1.22	.72	2.07	.310	.288	.282	1.36	.78	2.40
Constant	649	.735	.377	.52			-1.808	.823	.028	.16			951	.763	.212	.39		
	n = 1611; Nagelkerke Pseudo R ² = .217					n = 1	685; N	agelkerk	e Pseud	do R ² =	.211	n =	1637; N	Nagelkerk	ke Pseud	$o R^2 =$.219	

^{*}p<.10 **p<.05 ***p<.01 + For these significant cases the confidence intervals cross one, which limits the generalizabilty of these findings and these indicators should not be treated as significant (see Field, 2009).

Table 9.2: Testing Opportunities in the Situation at Place: Logistic Regression by Area - During and Post-Intervention Waves

14010 7.2. 103			del 6: Ta						7: Catcl						8: Cato			
				3	95%	C.I.for					95%	C.I.for					95%	C.I.for
Variables				Odds	EX	P(B)				Odds	EX	P(B)				Odds	EXI	P(B)
	В	S.E.	Sig.	Ratio	Low	Upper	В	S.E.	Sig.	Ratio	Low	Upper	В	S.E.	Sig.	Ratio	Low	Upper
Intervention Waves				1	1			ı	0.40					1	0.50			
Wave 1 – Intervention			.052						.343						.352			
Wave 2 – Intervention	360	.216	.096 [†]	.70	.46	1.07	172	.240	.474	.84	.53	1.35	151	.255	.553	.86	.52	1.42
Wave 3 – Intervention	113	.214	.598	.89	.59	1.36	249	.250	.319	.78	.48	1.27	200	.258	.438	.82	.49	1.36
Wave 4 – Intervention	473	.226	.036**	.62	.40	.97	449	.268	.094 ⁺	.64	.38	1.08	.277	.273	.311	1.32	.77	2.25
Wave 5 – Intervention	060	.216	.781	.94	.62	1.44	006	.241	.981	.99	.62	1.59	.004	.263	.987	1.00	.60	1.68
Wave 6 – Intervention	.161	.215	.454	1.18	.77	1.79	.154	.240	.522	1.17	.73	1.87	252	.262	.337	.78	.47	1.30
Post Intervention	263	.228	.248	.77	.49	1.20	066	.254	.794	.94	.57	1.54	318	.272	.241	.73	.43	1.24
Types of Buildings (Offenders/Victims)								•			•							
Public Service Present	630	.195	.001***	.53	.36	.78	335	.213	.115	.72	.47	1.09	289	.154	.061 ⁺	.75	.55	1.01
Bar Present	1.236	.437	.005***	3.44	1.46	8.10	739	.259	.004***	.48	.29	.79	.694	.272	.011***	2.00	1.17	3.41
Any Retail Commercial (Suppressed)			.000***						.027**						.000***			
Mostly Residential	2.078	.421	.000***	7.99	3.51	18.23	313	.194	.108	.73	.50	1.07	.040	.180	.826	1.04	.73	1.48
Any Industrial Commercial	.348	.273	.203	1.42	.83	2.42	499	.357	.163	.61	.30	1.22	-1.740	.419	.000***	.18	.08	.40
No Commercial or Residential	None m	easured	in the area				-1.490	.553	.007***	.23	.08	.67	125	.359	.727	.88	.44	1.79
Public Flow (Offenders/Victims)																		
Volume Pedestrian and Auto Scale	.343	.070	.000***	1.41	1.23	1.62	.376	.071	.000***	1.46	1.27	1.67	.457	.077	.000***	1.58	1.36	1.84
Bus Stop Present	815	.264	.002***	.44	.26	.74	276	.315	.381	.76	.41	1.41	255	.230	.268	.78	.49	1.22
One lane (Suppressed)									.016						.007			
Two lanes	302	.257	.240	.74	.45	1.22	.523	.187	.005***	1.69	1.17	2.43	.271	.216	.211	1.31	.86	2.00
Four lanes	None m	easured	in the area				.769	.369	.037**	2.16	1.05	4.45	458	.315	.146	.63	.34	1.17
Number of Entry Turns	.049	.065	.456	1.05	.92	1.19	004	.064	.955	1.00	.88	1.13	150	.056	.007***	.86	.77	.96

	Model 6: Target Area							Model 7: Catchment Area 1						Model 8: Catchment Area 2					
Variables	В	S.E.	Sig.	Odds Ratio		C.I.for P(B)		S.E.	Sig.	Odds Ratio		C.I.for (P(B)	В	S.E.	Sig.	Odds Ratio		C.I.for P(B)	
					Low	Upper	В				Low	Upper					Low	Upper	
"Possible" Offenders/Victims																			
# Males Loitering	.236	.053	.000***	1.27	1.14	1.41	.249	.068	.000***	1.28	1.12	1.47	.135	.055	.015**	1.14	1.03	1.28	
# Females Loitering	.368	.101	.000***	1.45	1.19	1.76	021	.104	.841	.98	.80	1.20	.147	.085	.082 [†]	1.16	.98	1.37	
# People Recreating	042	.043	.320	.96	.88	1.04	.073	.048	.128	1.08	.98	1.18	.031	.043	.465	1.03	.95	1.12	
Guardians																			
# of Place Managers	038	.016	.017**	.96	.93	.99	.018	.010	.077 ⁺	1.02	.99	1.04	018	.010	.059 [†]	.98	.96	1.00	
Level of Responsibility Scale	.170	.110	.123	1.19	.96	1.47	057	.121	.638	.94	.74	1.20	255	.160	.110	.78	.57	1.06	
Average Years Here (Lived, Worked, Hung out)	.025	.014	.072 [†]	1.03	.99	1.05	.010	.015	.515	1.01	.98	1.04	.020	.012	.091 ⁺	1.02	.99	1.04	
Place Manager Rating	223	.118	.060 ⁺	.80	.63	1.01	516	.182	.005***	.60	.42	.85	358	.171	.036**	.70	.50	.98	
Police Present	.270	.125	.030**	1.31	1.03	1.67	.356	.141	.012**	1.43	1.08	1.88	136	.161	.398	.87	.64	1.20	
Physical Disorder Scale	.086	.059	.143	1.09	.97	1.22	.106	.052	.043**	1.11	1.00	1.23	.243	.052	.000***	1.28	1.15	1.41	
Day Time Observation (Suppressed)			.000***						.011						.736				
Area Lit Poorly or Mostly Poorly	.679	.224	.002***	1.97	1.27	3.06	.791	.259	.002***	2.21	1.33	3.66	.098	.275	.721	1.10	.64	1.89	
Area Lit Mostly Well	.545	.140	.000***	1.73	1.31	2.27	.364	.158	.022**	1.44	1.06	1.96	.174	.159	.274	1.19	.87	1.63	
Whole Area Lit Well	.319	.228	.162	1.38	.88	2.15	.268	.253	.291	1.31	.80	2.15	.011	.284	.970	1.01	.58	1.76	
Controls		l l				1									ı				
Weekend Observation	241	.126	.055 [†]	.79	.61	1.01	115	.146	.432	.89	.67	1.19	.002	.150	.991	1.00	.75	1.35	
Cold - Under 32 F (Suppressed)			.430						.533						.029**				
Cool - 32-59 F	.178	.160	.267	1.20	.87	1.64	.198	.183	.280	1.22	.85	1.74	.515	.213	.016**	1.67	1.10	2.54	
Warm/Hot - 60 F or Greater	.047	.244	.848	1.05	.65	1.69	.126	.287	.661	1.13	.65	1.99	.237	.317	.455	1.27	.68	2.36	
Constant	-2.310	.717	.001	.10			-2.458	.880	.005	.09			-1.594	.848	.060	.20			
	n = 1	n = 1438; Nagelkerke Pseudo R ² = .156						n = 1503; Nagelkerke Pseudo R ² = .195						n = 1444; Nagelkerke Pseudo R ² = .186					

^{*}p<.10 **p<.05 ***p<.01 + For these significant cases the confidence intervals cross one, which limits the generalizabilty of these findings and these indicators should not be treated as significant (see Field, 2009).

Chapter 10: Conclusions, Limitations, and Implications

CONCLUSIONS

Past research examining spatial displacement and diffusion from targeted police interventions has primarily traveled along two methodological tracks. The first research track has been macro level quantitative examinations of the net effects of the intervention, considering parallel spatial intervention effects to large geographic areas bordering the target areas. Looking at this prior work, the prevailing orthodoxy is that spatial displacement does exist, although rare, as compared to the diffusion of intervention benefits (Bar and Pease, 1990; Eck, 1993; Guerette and Bowers, 2009; Hesseling, 1994). The second research track in spatial displacement and diffusion research has employed micro level qualitative examinations of offenders' adaptation and movement techniques explaining these spatial parallel effects (Guerette and Bowers, 2009; Holt et al, 2008; Ready, 2009; Weisburd et al, 2006). This research has suggested the theoretical justification for specific places experiencing parallel spatial intervention effects is nested within routine activities theory; simply the offenders, targets, and guardians present at the place provide the opportunities for the crime to occur (Cohen and Felson, 1979). Integrating rational choice theory with these place-based opportunities and considering research on offender travel patterns; provides additional understanding of offender adaptation which may result in spatial displacement or diffusion of intervention benefits to places proximate to an intervention. Although the research in this realm is rich and vibrant, to this point there has been a lack of deductive, statistically-powerful research employing quantitative data analysis to test the significance of these place-based opportunity constructs as an explanation for parallel spatial intervention effects.

Building on this prior work, this dissertation examined the relationship between spatial displacement and diffusion and criminal opportunities at the street segment level. Using the street segment as the assumed target for spatial displacement and diffusion, this study first examined the presence and variability of these side effects across the span of the intervention, laying the foundation for the predictive analyses of this variability. Following this exploration, the next set of analyses examined the relationship between place-based opportunity constructs, including constructs from crime pattern theory, and parallel intervention spatial effects at place. The summary and discussion of the study findings will begin with a discussion of the intervention effects at the street segment level, including the net intervention effects and the simultaneous presence of spatial displacement and diffusion effects across study segments. Finally, the findings from the analyses examining the relationship between place-based opportunity factors with the parallel spatial intervention effects across the study segments as well as the occurrence of an incident of social disorder in the situation at place are both discussed.

In summary of the analyses examining the *net* intervention effects, it appears that the intervention resulted in *net* reductions in social disorder levels in all of the study area segments (target and catchment areas) at the beginning of the intervention. For the next intervention period, the first half of the intervention, there were small additional benefits felt in the target and first catchment area segments, but not in the second catchment area segments. For the last intervention period, the second half of the intervention there is a lack of evidence of any intervention effects (increases or decreases in social disorder) for all of the study area segments (target and catchment areas). The steep declines in social disorder at the beginning of the intervention do parallel prior research evaluating hot-

spots policing interventions, which suggests the majority of the intervention effects, are felt at the beginning of the intervention (Nagin, 1998; Sherman and Rogan, 1995a; Weisburd, Wyckoff et al, 2004; 2006). However, for the street segment level, there is little evidence of a *net* rebound effect of social disorder for any of the intervention periods.

These findings suggest that at the street segment level, for each of the periods, there is little evidence of significant offender intervention adaptation techniques resulting in *net* spatial displacement effects for any of the study areas. These findings reinforce those made in previous research on spatial displacement and diffusion, which test these effects aggregated to the larger geographic catchment area level (see Guerette and Bowers, 2009). In the beginning of the intervention, because the catchment areas follow a social disorder reduction trend similar to the target area, there is a lack of evidence of an offender adaptation lag, as suggested by Bowers and Johnson (2003). As well, at the beginning of the intervention, diffusion of benefits were experienced by segments in both catchment areas, with greater benefits felt in the first catchment area. For the second intervention period, the first half of the intervention, diffusion of benefits was only felt in the first catchment area. These findings are logically consistent with findings from prior qualitative research, suggesting offenders, unaware of the scope of the intervention, may abstain from committing social disorder in areas close to the intervention target area or abstain from committing social disorder during these periods all together (Weisburd, Wyckoff et al, 2004, 2006).

Although the intervention resulted in *net* decreases in social disorder with a lack of evidence of a significant return to pre-intervention social disorder levels (rebound

effects), there is still evidence of variability of change in social disorder effects (displacement/backfire, diffusion/deterrence, no change) at the street segments level, including displacement of social disorder. Examining this variability in intervention effects across the street segments, a minority of segments experienced an increase in their level of social disorder for each period, approximately 26% at the beginning of the intervention, 39% for the first half of the intervention, and 37% for the second half of the intervention. Although these segments increasing in social disorder do not significantly impact the *net* intervention effects for these periods, they do suggest the presence of offender adaptation resulting in spatial displacement, which may vary over the course of the intervention.⁷³ Surprisingly for the first two periods of the intervention, the beginning and the first half of the intervention periods, when *net* intervention effects were still significantly declining, a greater proportion of the second catchment area segments experienced an increase in social disorder events as compared to the other areas. This finding suggests, contrary to research on offender travel patterns (Bernasco and Block, 2009; Brantingham and Brantingham, 1993; Rossmo, 2010; Wiles and Costello, 2000; Wright and Decker, 1997), that displacement for the first two periods of the study proportionally occurred *further* from the target area in areas likely less familiar to offenders moving from the target area. However, it is important to note, that although

⁷³ For the beginning period of the intervention, the actual *increase* in social disorder from these *increasing* segments (+25.54) is quite small relative to the simultaneous decrease in social disorder from the decreasing segments (-227.63), so there was clearly an overall net decrease in social disorder events (-202.09). For the second intervention period, first half, the variability in intervention effects across the segments nearly washed out the intervention effects (segments increasing= +28.95; segments decreasing =-57.53; net segments decrease=-28.59). For the final intervention period, second half of the intervention, the variability in the intervention effects across the segments did wash out the intervention effects (segments increasing=+53.60; segments decreasing=-48.50; net segments increase=+5.10). This suggests that as the intervention progressed there were greater social disorder events. However, it is important to point out there was not a test from period to period comparing segments within their change categories (increase, decrease, no change categories), for instance some segments that increase in social disorder in the begging intervention period may decrease in the first half of the intervention. This would be a place for additional analysis.

these segments are further from the target area, they are still in walking distance from the target area and still may be somewhat familiar to the offenders, especially considering it is unknown where these offenders live.

As compared to the distribution of the segments increasing in social disorder, the majority of segments decreased in social disorder for each of the study periods, evidencing a general diffusion of benefits. In examining the proportional distribution of the diffusion of crime control benefits across the street segments for the beginning intervention period, when the greatest intervention impacts and net benefits were felt across the study areas, 25% of the segments were responsible for approximately 70% of the total decline in the level of social disorder. These findings suggest that similar to prior studies on crime at place, which find a "tight coupling" of crime at place (Weisburd et al, 2010), a small proportion of the segments are responsible for the majority of the *net* declines in social disorder for the study area street segments. In sum, the findings that there is variability in intervention effects across the segments in all of the study areas, provides the foundation to test if opportunity factors explain this variability.

The next set of analyses focused on identifying if specific place-based opportunity factors were involved in parallel spatial intervention effects. Three different types of analyses were conducted for this examination. The first analysis tested if the specific opportunities at target area segments provide a means to understand the types of places which experience differential displacement or diffusion effects. This was conducted by testing the difference between the change in social disorder levels for catchment area segments matched to target area segments on specific opportunity factors and catchment area segments unmatched to catchment area segments on these specific opportunity

factors. Second, for the beginning intervention period, in which there were the greatest intervention net reduction effects, an examination was made to see if specific place-based opportunity factors predict segments fall into a high diffusion/deterrence group or a displacement group as compared to a low/moderate diffusion/deterrence group. Third, an analysis was conducted examining if opportunity factors in the situation at place predict the occurrence of social disorder in segments during the intervention in the catchment area segments as compared to those in the target area segments. The following section provides a summary and brief discussion of these findings.

For the first analysis testing the comfort level of segments with specific opportunity factors, there was little evidence of displacement of social disorder or diffusion of benefits to catchment area segments with specific opportunity factors. However, this finding may be due to the types of opportunity factors used to conduct the matching, which relied heavily on place use measures, including the types of buildings present on the street. The second analysis employed a broader spectrum of opportunity factors to predict if segments fall into the displacement group of segments or a high diffusion/deterrence group, as compared to a low diffusion/deterrence group. The only area effect found in this analysis was that the target area was significantly more likely to have segments which fall into the high diffusion/deterrence group as compared to the second catchment area, which is not surprising considering the target area is the focus of the intervention. However, the target area was not found to have significant differences from the catchment areas in regard to segments falling in the displacement/backfire change group. As well, the catchment areas were not significantly different from one another for change group prediction for either of the models. Surprisingly this finding

indicates that while including the other place-based opportunity measures the relative distance of the segments, measured through catchment area, is not significant. This finding suggests the opportunity measures located at the place may be more important to predicting group membership than the location of the place within the relatively close two catchment area.

In examining opportunity measures for the group based analysis, there were few significant results. For the displacement group, as compared to the low/moderate diffusion group, there was only one significant variable - the average level of responsibility was significant in the positive direction. However, the confidence in this finding is not maintained for the model excluding the target area, so it is unlikely this variable is part of the displacement relationship for the catchment areas. In contrast, the average level of place manager responsibility scale and public flow scale both predict a greater likelihood of segments falling into the high diffusion group as compared to the low/moderate diffusion group. This finding suggests that the places which fall into the group of greatest social disorder declines, as compared to the low/moderate group, are likely to have greater amounts of accessibility, more people moving through the area, and on average place managers who have a greater responsibility over the area. The positive significant finding that segments with a higher average of place manager responsibility are more likely to fall in the high diffusion group supports Weisburd and Telep's (forthcoming) idea of a process of diffusion of social control, in which the "community empowerment" from positive changes in the target area is spread to segments proximate to the target area (p. 16). It may also be offenders, unaware of the scope of the intervention, assume segments with a greater level of place manager responsibility have a greater risk of apprehension for their offending. In regard to the findings for public flow, it would be expected offenders have a greater familiarity and greater accessibility to places with greater public flow, so one would expect these places to have greater displacement effects, rather than high diffusion effects. It may be the case that offenders are detracted at a higher level from places with greater public flow because they may perceive these places as being a focus of the intervention.

Considering the presence of the intervention, the third analysis examines the relationship between place-based opportunity factors in a situation and the occurrence of an incident of social disorder within the situation by intervention area. This analysis provides some suggestion of the opportunity factors, which may play into incidents occurring within a situation at a place during an intervention. In this analysis, the relationship and direction of a number of the opportunity factors measured act in a similar direction as would be expected from prior crime and place literature exploring routine activities theory (see Felson and Boba, 2009; Weisburd et al, 2010), despite these measures representing situations taking place at segments proximate to a targeted intervention during an intervention. For instance, a number of situational and place-use measures which may indicate a greater attractiveness of a setting or suggest the place has a greater number of "possible offenders," "possible targets," or even (in this case) "possible customers" had a positive relationship with an event of social disorder within the situation. These measures included a greater volume of pedestrian and auto traffic as well as a greater number of males loitering, which were significant within the situation for each of the study areas. A similar measure, the number of lanes of a street segment, which may indicate greater numbers of people and also more anonymity to offenders,

was also significant, but only in the first catchment area. In addition, the presence of a bar or liquor store, likely attractors to offenders, victims, and customers, increase the odds of a social disorder event in the target area and the second catchment area situations on segments. All of these relationships were in the direction that was expected based on prior crime and place literature exploring routine activities theory, suggesting similar processes are still occurring at places proximate to intervention areas during the intervention.

In inspecting the different guardianship measures, there were a number of significant relationships between measures of guardianship and the likelihood of an event occurring within a situation. First, police presence had a significant and positive relationship with an event of social disorder occurring within situations across all of the areas, but in the present analysis it is difficult to determine if this is due to police reacting to an event or because they are being proactive and more likely to be present at places where events are likely to occur. In either case, this is a comforting finding, especially considering the police were targeting the target area with extra resources. It should be noted, observers did not report police instigating an event occurring, so it is unlikely police would be the cause of an event of social disorder. Second, places with a greater average rating (in the positive direction) of the place in both the first and second catchment area were less likely to have an event occur within the situation. Finally, the quality of lighting and the physical disorder scales also acted in the direction that would have been expected from past crime and place literature. Places with greater physical disorder experienced a greater likelihood of an event within a situation for the two catchment areas and situations with poor lighting experienced a greater likelihood of an

event of social disorder for the target area and first catchment area. Again, these findings reinforce routine activities theory, including the fact that capable and committed guardianship may be used to explain the presence or absence of a social disorder event in these situations occurring during a nearby intervention.

However, not all findings reinforce those from past crime and place literature. Opposite of the finding for the target area and the second catchment area, the presence of a bar or liquor store had a *negative* relationship with an event of social disorder within the situation for the second catchment area. It is difficult to determine the reason for this differential distribution of the effects of bars/liquor stores across areas, but it may be a result of the inability to specify between liquor stores and bars in the data, which may have a differential effect on the occurrence of event. It is also the case that situations in segments with commercial buildings that are industrial or warehouses are less likely to have incidents of social disorder. Interestingly, 50% of the street segments in the target area have commercial buildings that are industrial or warehouse buildings, which may suggest offenders from the target areas are steering clear of segments in the second catchment area with these types of buildings, although this may be unlikely considering the first catchment area places with these types of buildings do not evidence a similar effect. Another anomalous finding for the second catchment area is the number of turns entering the segment significantly reduced the likelihood of an occurrence of an incident of social disorder in situations at place, but this finding is not present for the first catchment area. This finding is contrary to prior literature which suggests that places that are more easily accessible with greater entry turns are more likely to have incidents of crime. It may be that offenders from the target area are less likely to offend in these

places due to reasoning that the intervention from the target area may be targeting these more accessible places as well; however, this is unlikely the case since the number of turns was not found to be significant in the first catchment area. Taking these few anomalous findings in stride, it appears the situational analysis is primarily supportive of routine activities theory as an explanation for incidents occurring in the situation at places proximate to an intervention.

In sum, using the JCDDS data the greatest impact of the intervention occurred at the beginning of the intervention. Although diffusion effects were felt in the majority of street segments across the study area, displacement of social disorder was present in a minority of segments. There is clearly variability of parallel spatial effects across the area street segments, which differ by relative location (target area or specific catchment area) and by period of the intervention. There was little support that the opportunities at the target area places provided a comfort for social disorder, which would suggest a different level of parallel spatial effects to matched opportunity segments as compared to unmatched segments from the catchment areas.

The analysis testing if place-based opportunity measures predict if segments fall into a high diffusion/deterrence group or displacement/backfire group, as compared to a low/moderate group, had few significant findings. Findings from this analysis suggested that places with a greater public flow are disproportionally affected by the benefits of the intervention, perhaps because offenders assume the intervention has a larger scope, including these areas. These findings also suggest that the presence of place managers with greater responsibility over place may be increasing the intervention benefits. These findings do provide some limited evidence that a place's opportunity factors may assists

in an explanation of street segments disproportionate distribution of parallel spatial effects.

Finally, the situational analysis provides evidence that measures of the presence of guardianship, targets, and offenders in a situation provide theoretical support for an incident of social disorder occurring at place within a situation. Although there are some anomalous findings in the situational analysis, this analysis does hold promise that in places nearby an intervention, the situations which have an incident of social disorder during an intervention have a relationship with place-based opportunity measures similar to what would be predicted from research literature testing these opportunity constructs, regardless of an intervention.

In all, opportunity constructs at place provide a promising theoretical explanation in the systematic testing of the parallel spatial intervention effects during a nearby intervention. However, the tests and measures in the present analysis do have limitations, which should be considered in the interpretation of these findings. Considering these limitations and the findings in the present research, future research on this subject is warranted.

LIMITATIONS

In considering the findings discussed in this research, it is important to recognize that there are a number of limitations to this research. The findings from this research did not fall into a neat, logical argument as one may have expected. One reason for the lack of significant findings for the analyses examining parallel spatial effects was the way in which spatial displacement and diffusion were measured. Using the change in social disorder as it was measured for this study, may not be the most effective means to

measure social disorder at the street segment level. There were a lack of prior studies to consult for the construction of this measure and although a number of change type techniques were considered, these alternate techniques were not tested. Considering the findings from this study, future research should attempt to develop better measures for displacement and diffusion.

It was optimal for the study at hand that the outcome measures and a number of the independent variables were constructed from social observations gathered at the street segments level, which provides rich data including observations of activity that are not available through other measurement sources. In addition, social observations were collected during the most methodologically sound study of displacement and diffusion to date – the JCDDS. However, because the observations were originally collected as part of a sampling strategy to generalize to the unit of analysis of the larger study areas; these measures do suffer from a lack of efficiency causing a wide standard error due to the differential distribution of the observations across the street segments. Future research testing these effects at the street segment level employing a social observation methodology should consider collecting the same number of social observations for each street segment at the same times and days of the week (see Braga and Bond, 2008). In addition, although sample size does not appear to be a problem with the situational analysis, the small number of segments tested in the group based predictive analyses (all areas n=135 and catchment areas n=105) does present the possibility of inefficient power for these tests, which lose degrees of freedom due to multiple groups and independent variables. Although a power analysis was run at the beginning of the study, at the time the exact size and number of groups was unknown. As such, the findings from this

analysis should be viewed with caution and future research of this nature should use a larger sample size.

Another limitation of this research is the inability to control for city wide trends for each of the analyses. As indicated previously, the JCDDS intervention took place at the same time as the rest of Jersey City was experiencing a decrease in calls for service, most likely due to the seasonal change to cold temperatures. The intervention came to an end as the warm weather returned and city-wide trends of social disorder began to rebound. For the situation specific analysis both temperature and wave of the data are included, which control for results considering the change in temperature across the city. However, for the aggregate analyses the city wide trends were not controlled for. The reader should be aware if city-wide decreases in social disorder were not present, street segments in the study area would likely experience fewer decreases in crime (diffusion effects) and may evidence greater increases in crime (displacement effects). Simply, the outcome variable for the aggregate analyses for each place would likely be shifted away from diffusion and towards displacement. For the analysis matching segments from the target areas to segments in the catchment areas based on opportunity factors, the city wide trends should not differentially affect the matched and unmatched catchment areas segments. As such, controlling for city wide trends would have added an unneeded and possibly artificial control to the analysis. For the analysis predicting if segments fall into the displacement group or the high diffusion/deterrence group, city wide trends are again not controlled for. This is because it is unlikely the street segments which fall into the extreme categories of crime change (high diffusion and displacement) will move out of these categories if city-wide declining trends were not present. In reality, it is these

categories of extreme or *tightly clustered* diffusion effects that are of greatest interest in this study. For this reason, changing the outcome variables using a correction technique, such as the trends from call for service data, seemed unwise for the current study. Especially considering the drug and prostitution markets investigated in this study were historically stable and the social observation measures captured may not be frequently reported to the police, so the data available for adjusting these trends, call for service data, may be subpar for correcting the study areas for the city wide trends. For this reason, the aggregate data were not adjusted or controlled by city-wide trends in the analyses. However, when interpreting the results, it is important to consider that both of the aggregate analyses are likely biased against understanding displacement effects due to these city-wide trends in the reduction of social disorder. Regardless of these limitations, the research does provide a spark for future research and some implications for police practice, which will be discussed next.

FUTURE RESEARCH

The current research sought to explore the link between parallel spatial intervention effects and place-based opportunity factors. This manuscript provides a touch stone for additional research on this topic. First, as argued in the manuscript, the continued reliance on units of analysis of large geographic areas for measuring spatial displacement and diffusion washes away significant variation at smaller units of analysis, such as the street segment. As such, the way in which catchment areas are drawn, including and excluding smaller units of analyses, may drastically affect the findings of net intervention effects to these large geographic units. A change in perspective to a smaller unit of analysis, such as a street segment, provides a better means for measuring

and understanding parallel spatial intervention effects, since it is conceptually salient in place-based theory, is a relatively homogeneous activity space, and it may be directly applied to police practice. Future research should continue to explore how a smaller place-based measure, such as the street segment, may be use to measure these intervention effects.

Second, considering the amount of research pondering the measurement, the quantitative research testing for net intervention effects, and qualitative research exploring routine activities theory as part of the explanation of spatial displacement and diffusion, it is surprising at the dearth of systematic research testing the reason for displacement and diffusion at place. It is hoped that this research will provide an impetuous for additional research focused on the topic, since understanding the presence of displacement and diffusion effects at place deserves greater attention in the field. In addition, future research should continue to improve upon the measurement techniques for displacement and diffusion at place as well as the place-based opportunities, as suggested in the study limitations section above. Additional research would continue to advance the study of spatial displacement and diffusion, while also providing more specific policy implications.

IMPLICATIONS FOR POLICE PRACTICE

In the case of police practice, police interventions have increasingly taken on a place-based focus, highlighting the need to gain a better understanding of the causal mechanisms involved in displacing crime and diffusing crime-control benefits to places proximate to the intervention area. The current research suggests that the occurrence of social disorder on street segments proximate to an intervention area is likely dependent

on the same opportunity factors which explain social disorder absent of the intervention. Considering this empirical generalization, when planning and conducting a focused intervention police agencies would be well served to consider the opportunities for social disorder located in segments proximate to the targeted areas. Findings in the present study suggest that guardianship at places – such as greater levels of place responsibility or greater pride of the place – may magnify diffusion effects at places proximate to an intervention. This finding implies the need for increased police presence and, if possible, community building, increasing levels of social control, for segments absent of these attributes. In addition, research suggests the greater presence of "possible targets" and "possible offenders" (as measured through the volume of pedestrian and automobile traffic as well as loitering males) as well as the presence of a bar (an attractor of social disorder) may lead to an increase in social disorder to places proximate to intervention areas. These types of high traveled places, evidencing high levels of loitering males, and having a greater public flow, may be easily identified in areas proximate to targeted areas. Finally, the segments proximate to the target areas with poor lighting and greater amounts of physical disorder may also experience greater amounts of crime during the intervention. As such, it may be possible to identify and target these places as the intervention unfolds.

It is important to note that these policy recommendations are in the early stages and should be further developed in hot-spot interventions through a practice based approach (Boba, 2010). In addition, the beauty of hot-spots interventions is that they are focused on a tight cluster of places, or segments, where crime is high. These recommendations should not be taken to imply focused interventions should be extended

and washed out to cover a greater area, but rather that as an intervention is taking place the limited police resources assigned to places proximate to hot-spot areas should deploy and respond in a means to heighten the positive effects of the intervention. These findings do suggest that although rare, crime displacement does exist, which reinforces why police agencies should institutionalize the systematic identification and response to short term crime problems, including crime patterns (e.g., robberies with similar M.O.) and locations evidencing high levels of disorder (e.g., blocks high on calls for street level disorder activity) (see Boba, 2009; Boba, 2011; Boba and Santos, 2011), which will provide a means to identify and immediately address parallel intervention spatial effects as the intervention is underway. These results also underline why police agencies should have additional training and understanding of the opportunities for crime at place, which may be curbed or magnified to impact hot-spot areas but also areas proximate to targeted interventions which may experience displacement of social disorder or diffusion of benefits.

Appendix A: Study Street Segments

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
11	Drug	Target	Storms Ave (from Monticello to Howard – A)
12	Drug	Target	Storms Ave (from Monticello to Howard – B)
13	Drug	Target	Nevin St (from Storms to End)
13	Drug	Target	Storms Ave (from Bergen to Monticello)
14	Drug	Target	Bergen Ave (from Fairmount to Storms)
15	Drug	Target	Fairmount Ave (from Bergen to Monticello)
16	Drug	Target	Monticello Ave (from Fairmount to Storms)
17	Drug	Target	Monticello Ave (from Reed to Fairmount)
18	Drug	Target	Reed St (from Bergen to Monticello)
19	Drug	Target	Bergen Ave (from Reed to Fairmount)
110	Drug	Target	Bergen Ave (from Fairview to Reed)
111	Drug	Target	Fairview Ave (from Bergen to Monticello)
112	Drug	Target	Monticello Ave (from Fairview to Reed)
221	Prostitution	Target	Cornelison Ave (from Ivy to Westervelt)
222	Prostitution	Target	Cornelison Ave (from Westervelt to State)
223	Prostitution	Target	Cornelison Ave (from State to Bishop)
224	Prostitution	Target	Cornelison Ave (from Bishop to Johnston)
225	Prostitution	Target	Cornelison Ave (from Johnston to Fairmount)
226	Prostitution	Target	Ivy Pl (from Summit to Grand)
227	Prostitution	Target	Westervelt Pl (from Cornelison to Grand)
228	Prostitution	Target	State St (from Cornelison to Grand – A)
229	Prostitution	Target	State St (from Cornelison to Grand – B)
2210	Prostitution	Target	Bishop St (from Cornelison to Grand – A)
2211	Prostitution	Target	Bishop St (from Cornelison to Grand – B)
2212	Prostitution	Target	Johnston Ave

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
			(from Cornelison to Grand – A)
2213	Prostitution	Target	Johnston Ave
			(from Cornelison to Grand – B)
2214	Prostitution	Target	Fairmount Ave
			(from Cornelison to Amity)
2215	Prostitution	Target	Fairmount Ave
			(from Amity to Amity)
2216	Prostitution	Target	Fairmount Ave
		_	(from Amity to Grand)
2217	Prostitution	Target	Grand St
2210	D	TD .	(from Johnston to Fairmount)
2218	Prostitution	Target	Grand St
2219	Prostitution	Target	(from Bishop to Johnston) Grand St
2219	Prostitution	rarget	(from State to Bishop)
2220	Prostitution	Target	Grand St
2220	Tiosutution	Target	(from Westervelt to State)
2221	Prostitution	Target	Grand St
2221	Trostitution	rarget	(from Ivy to Westervelt)
113	Drug	Catchment Area 1	Bergen Ave
	8		(from Jewett to Fairview)
114	Drug	Catchment Area 1	Jewett Ave
	C		(from Bergen to Monticello)
115	Drug	Catchment Area 1	Monticello Ave
			(from Jewett to Fairview)
116	Drug	Catchment Area 1	Fairview Ave
			(from Monticello to Fairmount)
117	Drug	Catchment Area 1	Fairmount Ave
110	Т.	G + 1 + A 1	(from Monticello to Fairview)
118	Drug	Catchment Area 1	Fairview Ave
119	Denta	Catchment Area 1	(from Kennedy to Bergen – A) Duncan Ave
119	Drug	Catchinent Area 1	(from Kennedy to Bergen – A)
120	Drug	Catchment Area 1	Fairmount Ave
120	Diug	Catelinient / trea 1	(from Boland to Bergen)
121	Drug	Catchment Area 1	Fairmount Ave
	6		(from Britton to Boland)
122	Drug	Catchment Area 1	Boland St
	C		(from Fairmount to Montgomery)
123	Drug	Catchment Area 1	Montgomery St
	· .		(from Britton to Boland)
124	Drug	Catchment Area 1	Britton St
			(from Fairmount to Montgomery)
125	Drug	Catchment Area 1	Montgomery St
. =			(from Boland to Bergen)
126	Drug	Catchment Area 1	Bergen Ave
105	Б	Carlo 4 4	(from Storms to Montgomery)
127	Drug	Catchment Area 1	Montgomery St
120	Denra	Cotohmant Area 1	(from Bergen to Tuers)
128	Drug	Catchment Area 1	Montgomery St (from Tuers to Jordan)
			(110111 Tuers to Jordan)

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
129	Drug	Catchment Area 1	Montgomery St (from Jordan to Summit)
130	Drug	Catchment Area 1	Monticello Ave (from Storms to Orchard)
131	Drug	Catchment Area 1	Jordan Ave (from Orchard to Montgomery)
131	Drug	Catchment Area 1	Orchard St (from Montgomery to Monticello)
132	Drug	Catchment Area 1	Orchard St (from Monticello to Maiden)
133	Drug	Catchment Area 1	Orchard St (from Maiden to Crawford)
134	Drug	Catchment Area 1	Crawford St
135	Drug	Catchment Area 1	Maiden Lane (from Orchard to Summit)
136	Drug	Catchment Area 1	Summit Ave (from Maiden to Montgomery)
137	Drug	Catchment Area 1	Summit Ave (from Crawford to Maiden)
139	Drug	Catchment Area 1	Howard Pl (from Storms to Summit)
140	Drug	Catchment Area 1	Storms Ave (from Howard to Fairmount)
142	Drug	Catchment Area 1	Fairmount Ave (from Fairview to Storms)
144	Drug	Catchment Area 1	Jewett Ave (from Monticello to Summit – A)
145	Drug	Catchment Area 1	Jewett Ave (from Monticello to Summit – B)
146	Drug	Catchment Area 1	Jewett Ave (from Kennedy to Bergen – A)
2222	Prostitution	Catchment Area 1	Amity St (from Fairmount to Fairmount – A)
2223	Prostitution	Catchment Area 1	Amity St (from Fairmount to Fairmount – B)
2224	Prostitution	Catchment Area 1	Grand St (from Fairmount to Manning)
2225	Prostitution	Catchment Area 1	Grand St (from Manning to Prior)
2225	Prostitution	Catchment Area 1	Prior St (from Grand to Colden)
2226	Prostitution	Catchment Area 1	Colden St (from Prior to Fremont)
2227	Prostitution	Catchment Area 1	Manning Ave (from Johnston to Grand – A)
2228	Prostitution	Catchment Area 1	Manning Ave (from Johnston to Grand – B)
2229	Prostitution	Catchment Area 1	Johnston Ave (from Grand to Manning)
2230	Prostitution	Catchment Area 1	Garfield Ave (from Communipaw to Grand – A)

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
2231	Prostitution	Catchment Area 1	Garfield Ave (from Communipaw to Grand – B)
2232	Prostitution	Catchment Area 1	Grand St (from Ivy to Summit)
2233	Prostitution	Catchment Area 1	Summit Ave (from Cornelison to Grand)
2234	Prostitution	Catchment Area 1	Summit Ave (from Grand to Communipaw)
2235	Prostitution	Catchment Area 1	Grand St (from Summit to Communipaw)
2236	Prostitution	Catchment Area 1	Communipaw Ave (from Summit to Grand)
2237	Prostitution	Catchment Area 1	Summit Ave (from Cornelison to Astor)
2238	Prostitution	Catchment Area 1	Summit Ave (from Astor to Belmont)
2238	Prostitution	Catchment Area 1	Summit Ave (from Belmont to Clifton)
2239	Prostitution	Catchment Area 1	Clifton Pl (from Summit to Fairmount – A)
2240	Prostitution	Catchment Area 1	Clifton Pl (from Summit to Fairmount – B)
2241	Prostitution	Catchment Area 1	Fairmount Ave (from Clifton to Cornelison)
2242	Prostitution	Catchment Area 1	Cornelison Ave (from Fairmount to Bright – A)
147	Drug	Catchment Area 2	Bergen Ave (from Kensington to Jewett)
148	Drug	Catchment Area 2	Kensington Ave (from Kennedy to Bergen – A)
149	Drug	Catchment Area 2	Kensington Ave (from Kennedy to Bergen – B)
150	Drug	Catchment Area 2	Kennedy Blvd (from Kensington to Jewett)
151	Drug	Catchment Area 2	Jewett Ave (from Kennedy to Bergen – B)
152	Drug	Catchment Area 2	Kennedy Blvd (from Jewett to Fairview)
153	Drug	Catchment Area 2	Fairview Ave (from Kennedy to Bergen – B)
154	Drug	Catchment Area 2	Kennedy Blvd (from Fairview to Duncan)
155	Drug	Catchment Area 2	Duncan Ave (from Kennedy to Bergen – B)
156	Drug	Catchment Area 2	Kennedy Blvd (from Duncan to Fairmount)
157	Drug	Catchment Area 2	Fairmount Ave (from Kennedy to Britton)
158	Drug	Catchment Area 2	Kennedy Blvd (from Fairmount to Montgomery)
159	Drug	Catchment Area 2	Montgomery St (from Kennedy to Britton)

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
160	Drug	Catchment Area 2	Kennedy Blvd (from Montgomery to Glenwood)
161	Drug	Catchment Area 2	Glenwood Ave (from Bergen to Kennedy – A)
162	Drug	Catchment Area 2	Glenwood Ave (from Bergen to Kennedy – B)
163	Drug	Catchment Area 2	Bergen Ave (from Glenwood to Montgomery)
164	Drug	Catchment Area 2	Mercer St (from Bergen to Tuers)
165	Drug	Catchment Area 2	Tuers Ave (from Montgomery to Mercer)
166	Drug	Catchment Area 2	Mercer St (from Tuers to Jordan)
167	Drug	Catchment Area 2	Jordan Ave (from Montgomery to Mercer)
168	Drug	Catchment Area 2	Mercer St (from Jordan to Summit)
169	Drug	Catchment Area 2	Summit Ave (from Montgomery to Mercer)
170	Drug	Catchment Area 2	Mercer St (from Summit to Baldwin)
171	Drug	Catchment Area 2	Baldwin Ave (from Montgomery to Mercer)
172	Drug	Catchment Area 2	Montgomery St (from Summit to Baldwin)
173	Drug	Catchment Area 2	Baldwin Ave (from Clifton to Montgomery – A)
174	Drug	Catchment Area 2	Baldwin Ave (from Clifton to Montgomery – B)
179	Drug	Catchment Area 2	Gardner Ave (from Monticello to Summit – A)
180	Drug	Catchment Area 2	Gardner Ave (from Monticello to Summit – B)
181	Drug	Catchment Area 2	Monticello Ave (from Gardner to Jewett)
2243	Prostitution	Catchment Area 2	Cornelison Ave (from Fairmount to Bright – B)
2244	Prostitution	Catchment Area 2	Bright St (from Cornelison to Florence – A)
2245	Prostitution	Catchment Area 2	Bright St (from Cornelison to Florence – B)
2246	Prostitution	Catchment Area 2	Bright St (from Florence to Fremont)
2247	Prostitution	Catchment Area 2	Fremont St (from Colden to Bright – A)
2248	Prostitution	Catchment Area 2	Fremont St (from Colden to Bright – B)
2249	Prostitution	Catchment Area 2	Bright St (from Fremont to Merseles – A)
2250	Prostitution	Catchment Area 2	Bright St (from Fremont to Merseles – B)

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
2251	Prostitution	Catchment Area 2	Colden St (from Prior to Merseles – A)
2252	Prostitution	Catchment Area 2	Colden St (from Prior to Merseles – B)
2253	Prostitution	Catchment Area 2	Merseles St (from Colden to Grand)
2254	Prostitution	Catchment Area 2	Grand St (from Prior to Woodward)
2255	Prostitution	Catchment Area 2	Grand St (from Woodward to Barbara)
2256	Prostitution	Catchment Area 2	Grand St (from Barbara to Merseles)
2257	Prostitution	Catchment Area 2	Woodward St (from Grand to Johnston – A)
2258	Prostitution	Catchment Area 2	Woodward St (from Grand to Johnston – B)
2259	Prostitution	Catchment Area 2	Johnston Ave (from Manning to Woodward)
2260	Prostitution	Catchment Area 2	Communipaw Ave (from Berry to Manning)
2260	Prostitution	Catchment Area 2	Communipaw Ave (from Garfield to Berry)
2261	Prostitution	Catchment Area 2	Berry Ln (from Communipaw to End)
2262	Prostitution	Catchment Area 2	Lafayette St (from Manning to end)
2262	Prostitution	Catchment Area 2	Manning Ave (from Communipaw to LaFayette)
2263	Prostitution	Catchment Area 2	Randolph Ave (from Communipaw to Harmon)
2264	Prostitution	Catchment Area 2	Randolph Ave (from Harmon to McDougal)
2265	Prostitution	Catchment Area 2	Harmon St (from Grand to Randolph)
2266	Prostitution	Catchment Area 2	Harmon St (from Randolph to Garfield)
2267	Prostitution	Catchment Area 2	Grand St (from Communipaw to Harmon)
2267	Prostitution	Catchment Area 2	Grand St (from Harmon to Arlington)
2268	Prostitution	Catchment Area 2	McDougall St (from Arlington to Randolph)
2269	Prostitution	Catchment Area 2	Arlington Ave (from Grand to McDougal)
2270	Prostitution	Catchment Area 2	Arlington Ave (from Communipaw to Grand)
2271	Prostitution	Catchment Area 2	Communipaw Ave (from Grand to Park)
2272	Prostitution	Catchment Area 2	Prescott St (from Communipaw to Park – A)
2273	Prostitution	Catchment Area 2	Prescott St (from Communipaw to Park – B)

Street Segment ID	Study Site	Study Area	Street Name (start and end cross streets)
2274	Prostitution	Catchment Area 2	Park St (from Communipaw to Prescott)
2275	Prostitution	Catchment Area 2	Park St (from Prescott to Astor)
2276	Prostitution	Catchment Area 2	Astor Pl (from Summit to Park)
2277	Prostitution	Catchment Area 2	Astor Pl (from Park to Crescent)
2278	Prostitution	Catchment Area 2	Crescent Ave (from Astor to Belmont)
2279	Prostitution	Catchment Area 2	Belmont Ave (from Summit to Crescent – A)
2280	Prostitution	Catchment Area 2	Belmont Ave (from Summit to Crescent – B)
2281	Prostitution	Catchment Area 2	Summit Ave (from Clifton to Gardner)
2288	Prostitution	Catchment Area 2	Merseles St (from Bright to Colden)
138	Overlap	Catchment Area 2	Summit Ave (from Crawford to Howard)
141	Overlap	Catchment Area 2	Summit Ave (from Howard to Fairmount)
143	Overlap	Catchment Area 2	Fairmount Ave (from Storms to Summit)
143	Overlap	Catchment Area 2	Summit Ave (from Fairmount to Jewett)
175	Overlap	Catchment Area 2	Clifton Pl (from Baldwin to Fairmount – A)
176	Overlap	Catchment Area 2	Clifton Pl (from Baldwin to Fairmount – B)
177	Overlap	Catchment Area 2	Fairmount Ave (from Summit to Clifton)
178	Overlap	Catchment Area 2	Summit Ave (from Gardner to Jewett)

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