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I, Matthew G Hammer, hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in Criminal Justice.

It is entitled:

Place-Based Investigations of Violent Offender Territories (PIVOT): An Exploration and Evaluation of a Place Network Disruption Violence Reduction Strategy in Cincinnati, Ohio

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Place-Based Investigations of Violent Offender Territories (PIVOT): An Exploration and Evaluation of a Place Network Disruption Violence Reduction Strategy in Cincinnati, Ohio

A dissertation submitted to the
Graduate School
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by

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ABSTRACT

This dissertation explores a most recently uncovered criminogenic place network hypothesis, asserting that crime place networks exist, that these infrastructures facilitate criminal activity nearby, and that these networks can be disrupted to reduce shootings and other crimes. Data collected from the City of Cincinnati, in Cincinnati, Ohio, are used to examine this hypothesis. Findings support the assertion that criminogenic place networks exist, that they do facilitate crime nearby, and that they can be disrupted. Evaluations of Cincinnati's Place Based Investigations of Violent Offender Territories (PIVOT), revealed declines in shootings, violent crime, and weapon related calls to police. Statistically significant changes in shootings were detected in four of five projects. Shooting reductions ranged from twelve percent to ninety-two percent in PIVOT sites, after implementation of the PIVOT crime place network disruption strategy.

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To my family –

Thanks brother, for encouraging me. Mom and dad, thank you for providing the foundation upon which I have been able to build, for encouraging character and commitment, service and persistence.

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CHAPTER 1
INTRODUCTION

On a mild fall afternoon in 2017, officers from the Cincinnati Police Department (Cincinnati, Ohio) quickly moved in to arrest a person who had been seen concealing a handgun in his pocket, amidst open air drug trafficking. The arrest occurred without significant incident and the firearm was safely recovered. And so, it received little public attention.

The location where the arrest occurred was a known hot spot of drug activity and violence. And so, it was not a surprise to the community or the police that the described events unfolded here. The lack of surprise further reinforced the arrest's insignificance, as this happened "all the time" here. This arrest occurred within feet of a homicide a year before. And dozens of nonfatal shootings had occurred nearby in the past few years. In fact, this area had the distinction of being one of the most historically violent locations in the City of Cincinnati. Perhaps some felt a sense of relief that an arrest, rather than more violence, was the outcome that day. But if there was any reaction at all, it was not perceptible. The police conducted their business without assistance or interference. No property owners appeared to ask questions. No building managers arrived to offer assistance. No family members of the arrested inquired.

A glance at the landscape revealed a caricature-esque illustration of what the public might come to expect of open drug market spaces. Rest-in-peace (R.I.P.) and gang-related graffiti dotted the nearby structures. Windows were broken. Trash was strewn about. Even a passing glance at area buildings revealed substantial damage – water intrusion, structural failure, partial collapse. Little sign of property management or investment, and little reason to expect much improvement any time soon.

But for those paying close attention, this seemingly straightforward arrest was critically important. To them, it provided clues about behavior and choices – and the interaction between offenders and their environment. To them, it provided evidence that might help explain how a nearby network of places helped to facilitate violence and risky behavior. They hoped that this information could lead to a better understanding of the operative place network. They believed it could help them disrupt the network and make the space safer.

Prior to recognizing the police, the offender mixed among acquaintances on a dead-end street, but near the street's intersection with a heavily traveled roadway. To his right, a sign marked a patch of sidewalk as a bus stop for the local transportation network. No bench. No shelter. Immediately behind him was the remainder of a building foundation now serving the role of retaining wall, about two feet tall at the sidewalk, with a several-foot drop behind it leading to a blank patch of land that provided no clues as to the land's intended use. The retaining wall now served as a bench for those lingering nearby. The parcel to the left was a vacant house, boarded after a fire. The boards were marked with graffiti. Candle wax remnants stuck to the driveway, burned in memory of the murder victim at the site where he fell.

Beyond the vacant lot was an apartment building. But there was no evidence this building was in-fact residential – or that it was occupied at all. A passerby might assume it was a vacant warehouse rather than a multi-unit apartment house. The two-floor structure was dotted with graffiti. Handle and locking mechanisms were entirely missing from the front common door, an ominous web of black metal. The rear steel door stood propped with a cinder block.

It was this building the man fled into when police arrived. This also, was not shocking to the police that responded to make the arrest. They had been there before to retrieve shooting victims and to investigate robberies and burglaries. It was interesting to those paying close

attention, however, that he chose this location over other nearby options such as a vacant house recently used to divide up stolen property, or a nearby abandoned school with ropes hanging from second-story window frames to facilitate access to the unsecured second floor.

Officers believed that nearby offenders were networked, that the nature of their activities influenced other criminally active offenders. Group and gang dynamics were very real here, evidenced by nearby graffiti, public offender interactions, violence, and cyclical retaliation.

And so, there was much to learn from this event if someone was to look closely. But much also could easily be missed. This arrest hid amongst dozens that had occurred just that day. But this was an important opportunity to better understand the interaction between people and nearby places - and to use that knowledge to disrupt offenders' ability to capitalize on place characteristics. A new team of investigators in Cincinnati, called the PIVOT team, sought to capitalize on this opportunity by carefully evaluating offender-environment interplay.

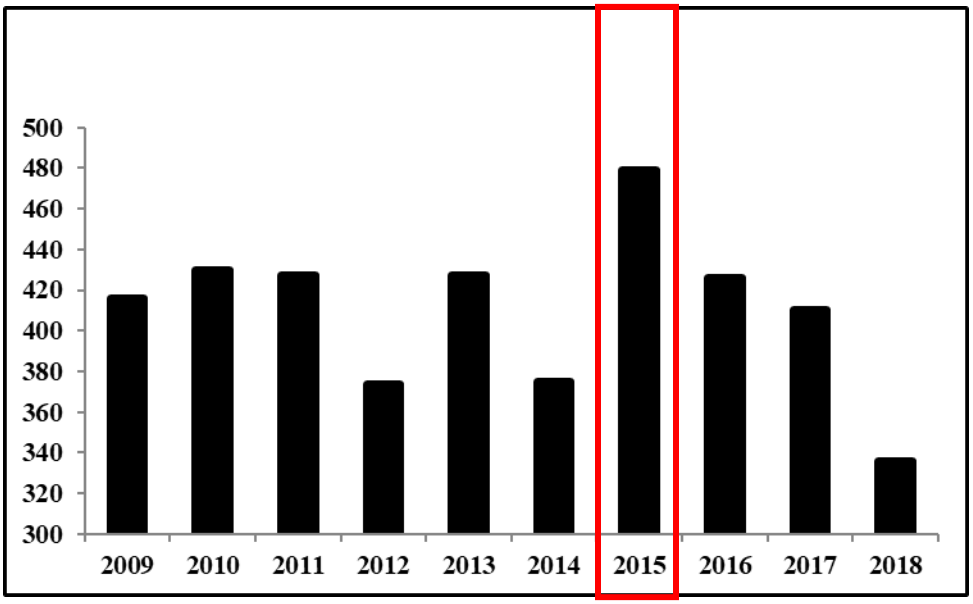
The investigators wondered*: Why did he choose to stand where he stood? Why did he flee to one place instead of another? What characteristics of each of these nearby places made them amenable to his needs? Why did a drug market thrive in this space? What made this area so volatile? How do place characteristics contribute to violent outcomes? Did all nearby places provide opportunities for crime? Why do some addresses appear unaffected by nearby criminal activity? And if there is a network, does the network of criminogenic places add up to more than simply the sum of its parts?*

PIVOT investigators began to look at this and other arrests in the area, seeking answers to those questions. They began to investigate nearby places, and they studied person-place interactions.

PIVOT

From a violent crime perspective, 2015 was a difficult year in Cincinnati, Ohio. It was for many U.S. urban areas that experienced pronounced surges in gunshot victimization and homicide (Williams & Davey, 2016; Pilcher, 2016; Major Cities Chiefs Association, 2016). By spring, it became clear that Cincinnati would be among those cities struggling with a shooting spike. As the summer months passed, local police department and government officials battled a public safety crisis. By fall, as shootings continued to soar, the police chief was replaced, and leaders searched for new answers to old questions.

Figure 1.1. Cincinnati Shooting Victims 2009-2018

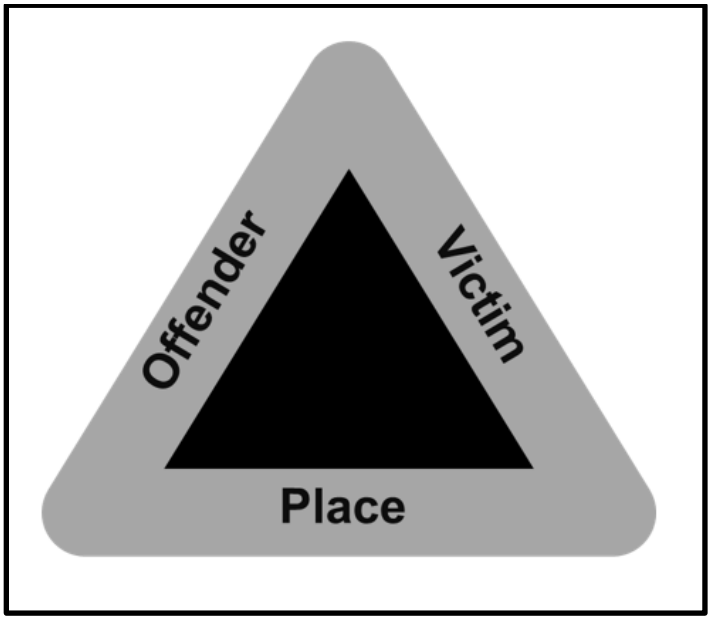


The City re-visited its shooting prevention strategy, searching for something that might curb the newest surge in violence. Since 2007, the local government had been engaged in the Cincinnati Initiative to Reduce Violence (CIRV). A focused-deterrence strategy, it required law enforcement to understand offenders' networks, friends, and affiliates. The Cincinnati Police Department (CPD) had worked with local researchers, government, and service providers to

identify those at-risk for gunshot offending and violent victimization. They worked to communicate messages of deterrence and desistance to at-risk individuals and their close associates, and to offer pathways out of a criminally violent lifestyle. If violence continued after messages of desistance, group/gang enforcement efforts would be launched. Full prosecution would be supported by local and federal prosecutors for those who were persistently violent and refused to desist (see Engel et al, 2008; 2009).

This strategy has been considered a best-practice among offender-oriented approaches and has been evaluated as significant in reducing group and gang member homicides and other gun-related violence in Cincinnati (Engel et al., 2013; Engel, 2018; Braga et al., 2018). Cincinnati's law enforcement practitioners had begun to consider the "crime triangle" and its implications for their practice, and they knew that the highly focused CIRV strategy was oriented largely toward offenders.

Figure 1.2. The Crime Triangle



Source: Herold and Madensen, 2015 (adapted from Clarke and Eck, 2005)

While CIRV focused on offender networks, it had become clear to some invested in crafting police strategy that an opportunity existed. In addition to CIRV and other offender-oriented approaches, Cincinnati had an opportunity to more comprehensively address aspects of place.

Many features assembled in Cincinnati to create this opportunity, but two features perhaps stood out. First, CPD had declared itself a problem-solving agency nearly two decades prior. This helped to lay the foundation for evidence-based practice and the beginnings of organizational attention to places. Second, CPD had begun engaging in research – practice partnership. Project collaboration and the creation of higher education opportunities exposed officers to the potential benefits of the research community: focusing on implementation of best-practices and evaluating the effectiveness of interventions.

Capitalizing on these features, a new model to reduce gunshot victimization was developed. The new plan continued to focus on offenders and their social networks as before, but also directed participants to focus more attention on places and place networks used by offenders. After gathering information about offenders and the places used to facilitate violence, the strategy called for concurrent disruption of those networks. The goal was to reduce violence using methods that were thought to be more effective, fairer, and more likely to sustain (see Madensen et al., 2017).

For a variety of reasons, planners thought this new strategy could be more effective. First, it was designed to attack two components of the crime triangle: offenders and locations. It was thought that this would be more effective than traditional single-sided efforts. Second, place orientation might take better advantage of the differential in predictive power between places and people (as some researchers have suggested there may be as much as four times greater

efficiency by focusing on places versus particular people, such as repeat offenders (Weisburd, 2015; Weisburd, et al., 2016). Third, by attempting to understand and disrupt place networks, planners hoped this new strategy would more comprehensively address deeply rooted, routinized, systemic violence. The goal was that this response would better treat root problems, instead of simply dosing symptoms, as traditional policing strategy is sometimes thought to do. Effective place network disruption was theorized to alter the system of opportunities available to offenders, thereby making offending more resource intensive, with greater risk and less reward (see Cornish & Clarke, 1986; 2003).

PIVOT was launched in the spring of 2016, with a small operational police team and a panel of representatives from local government departments, non-profit agencies, and affected communities. Two of Cincinnati's most violent spaces (approximately three blocks each) were selected as project sites. Three more were selected the year after. Neighborhood community leaders and stakeholders joined the project teams. In addition to traditional law enforcement efforts, place-oriented interventions were crafted to disrupt place networks as they began to be identified.

A wide array of interventions were implemented in conjunction with traditional law enforcement tactics, including restriction and reorganization of street parking, lighting improvement, building demolition, bus stop relocation, high-profile safety camera installation, and barricade of select vacant spaces. These responses were executed in coordination with one-another to address and disrupt the negative use of specific network locations within each identified place network. Team members communicated with property owners to coordinate space management on private property. Sometimes this was voluntary, other times civil and criminal enforcement tools were invoked to generate change.

Soon, evidence of routinized violence at project sites began to wane. Locations where shootings occurred every twenty-four to twenty-eight days were experiencing stretches of three months – six months – nine months – without a gunshot victim. Measurements of robberies, shots fired, and other weapon related activity also showed signs of decline (see Hammer, 2017a/b).

Community-led and city supported efforts were launched to replace negative activity with positive, in project spaces. A closed market was repurposed as a neighborhood thrift store. Two playgrounds were constructed in project areas. Community gardens and other signs of reinvestment began to grow. After years of incalcitrant violence, were dynamics in these spaces beginning to systematically change? Were systems of violence finally curbed? While early observations of outcomes provided some reason to hope that change was taking place, the strategy's theoretical foundation perhaps provided more reason for optimism.

From Criminology to Crime Prevention

Some parallels may be drawn between the evolution of Cincinnati's violence prevention effort and the past 200 years evolution of the fields of criminology and crime prevention. This is particularly so if one accepts traditional law enforcement practice as the product of criminology, and place-based efforts as the product of the newer, smaller, and perhaps less-developed field of crime prevention.

Early criminological perspective focused almost entirely on the individual's decision to offend, persistence of criminality, and desistance (see Weisburd et al., 2016). From the biologically deterministic theorizing of Lombroso, to the life-course work of researchers such as Caspi, Moffitt, Laub, and Sampson, enormous attention has been exerted on the role of the

individual – physiologically and psychologically. At the root, these scholars attempted to answer the question: Why do some individuals offend?

Perhaps as a natural by-product of the breadth and depth of this line of research and accounting for a natural lag from research to practice, traditional systems of justice in the United States generally reflect an extraordinary investment in individual offenders with much less emphasis on other aspects of crime, such as the victims involved or the locations where criminal acts are committed. In fact, it could be argued that in many jurisdictions this reactive approach represents the whole of the criminal justice system's operative practice. Perhaps this method represents an investment in the hope that less future crime will be the outcome of locking-up past offenders. But sadly, this practice reflects a gross oversimplification of the criminological knowledge base. It exudes a deterministic perspective contrary to much of the recent evidence revealed by the field. This limited approach fails on many levels to account for what we know about offenders and why they choose to offend.

More recently, some scholars began to ask questions of an entirely different orientation. As they reflected on spatial concentration of offenders and offenses, they started to consider whether the study of crime, rather than the exclusive study of criminals, was warranted. Early work from the Chicago school's Park and Burgess (1925), followed by Shaw and McKay (1942/69; see also Shaw, 1930/96), proved hallmark in setting a new path of scholarship - challenging ideas of traditional criminology by linking person and place. In one key and widely cited study, Shaw and McKay correlated offenders with place characteristics, concluding: "The findings of this study establish conclusively a fact of far reaching significance, namely, that the distribution of juvenile delinquency in space and time follows the pattern of the physical structure of the American city" (1942; xxv). And so, the door opened to the exploration of

correlative and causative influences of community-level structural and social factors on crime. In the decades that followed, scholars have continued to seek explanations of the spatial patterning of crime, with a heavy focus on community-level factors (i.e. Cohen, 1955; Wolfgang, 1958; Kornhauser, 1978; Sampson & Wilson, 1995; Anderson, 1999; Jacobs & Wright, 2006; Stewart & Simons, 2006; Hagedorn, 2010).

As an outgrowth of community perspectives on crime, environmental criminology developed. Incorporating ideas particularly from the fields of economics and psychology, environmental criminologists began to capitalize on our ability to predict the rational aspects of offender decision making. Although it is frequently believed that the rationality of offender decision making is "bounded" (see Simon, 1987) by natural human limits of perception and understanding, it has also been recognized that rational decision making provides some ability to predict behavior, and by extension may help predict crime events. From an economic perspective, Becker stated: "It is suggested . . . that a useful theory of criminal behavior can dispense with special theories of anomie, psychological inadequacies, or inheritance of special traits and simply extend the economist's usual analysis of choice" (1968; 170). Recognizing offenders as responsive to their perceptions of the level of effort necessary to complete an offense, risks adopted as a result, and rewards to be gained - lays a foundation for the environmental perspective and the importance of the role of opportunity in crime. The current state of the field of crime prevention has grown from this line of thinking.

The Current State of Crime Prevention

Most recent developments in the field of crime prevention reflect an investment in five primary ideas: 1) routine activities theory (Cohen & Felson, 1979), 2) the perspective of rational choice (Simon, 1987; Clark & Cornish, 1985; Cornish & Clark, 1986), 3) crime pattern theory

(Brantingham & Brantingham, 1993a/b), 4) situational crime prevention (Cornish & Clarke, 2003), and 5) a place-oriented perspective (Eck & Weisburd, 1995; Eck, 2001; 2002; 2003; Eck et al., 2007; Weisburd et al., 2016). Together, these ideas suggest that convergence of rational, motivated offenders with suitable targets at specific locations, creates criminal opportunities. These foundational ideas also suggest that understanding the mechanisms of rationally motivated offenders, victims, and places creates opportunities for crime event disruption. Counter to a purely deterministic perspective of offending, which asserts that a criminal act is inevitable, the opportunity perspective offers that crime may be influenced. Reductions in criminal opportunities are theorized to reduce crime events. Emerging research has emphasized the importance of place and crime event orientations in understanding crime (see Cullen, 2011; Weisburd, 2015), specifically focusing on small aggregations such as blocks, street segments, and places.

Early *routine activities theory* (Cohen & Felson, 1979; Felson & Cohen, 1980), rooted in human ecological theory (see Hawley, 1950), attempted to explain macro-level changes in U.S. crime rates by exploring the impact of changes in human activity routines. Cohen and Felson originally focused on three key elements: targets, offenders, and guardians. Later work introduced the place element (Felson, 1987). Most recent explorations of routine activities have organized key features into two tiers. First, victims, offenders, and locations are presented as features which generate criminal opportunities upon their intersection. Second, guardians, handlers, and managers are considered as features capable of influencing (or managing) each of the respective first-tier components (See Felson, 1986; 1987; Eck, 1994; Eck, 2003; Madensen, 2007).

Routine activities theory has more recently been used to explore the impact of changes in criminal opportunity across smaller units of analysis, such as neighborhoods, street blocks, and singular addresses, as some scholars have criticized the use of aggregate data and other macro-oriented approaches to test routine activities theory (i.e. Wilcox & Land, 1996; Thompson & Fisher, 1996). One such critic argued: "[n]o aggregate data, of any type, can test routine activity theory. Aggregate data are simply irrelevant" (Eck, 1995; 792).

While tests of routine activities theory have demonstrated variable strength of support, it has been argued that this is likely due to challenges in the development of a model that is both theoretically and statistically sufficient (see Clarke, 1984, Meier & Meithe, 1993). Direct tests of routine activities theory have not been so clear or robust. For example, in a systematic review of sixty-two studies testing the guardianship construct, Hollis et al. concluded: "[d]espite increasing attention to empirical tests of guardianship, the weakness of the body of research remains the void in empirical evidence demonstrating that high levels of guardianship can lead to lower crime levels. This causal link has been taken for granted, when in fact few studies have explicitly tested this or provided evidence that is representative of empirical reality" (67-8).

Perhaps the strongest evidence favoring routine activities theory comes indirectly, from evaluations of place-based crime preventive efforts and studies demonstrating crime's concentration at place (see Eck & Guerette, 2012; Lee et al., 2017 respectively). Presently, the general principles of routine activities theory appear widely accepted by crime prevention scholars in conjunction with the rational choice perspective.

As with routine activities theory, *rational choice perspective* (see Clarke & Cornish, 1985; Cornish & Clarke, 2003) enjoys wide acceptance in the field of crime prevention today. Generally, current theoretical interest is rooted in adequately understanding how "bounded

rationality" affects the choices offenders make. There has been recent scholarly production to advance our understanding of this topic, particularly reflected in qualitative work (see Wright & Decker, 2007). But while widely accepted in the field of crime prevention, offender rationality and its import for the practice of crime prevention seems not to have manifested widely beyond scholars.

Developed by Brantingham & Brantingham (see 1993a/b), c*rime pattern theory* also contributes to our understanding of crime and place. "Crime pattern theory maintains that crimes occur as offenders seize opportunities discovered while conducting their everyday activities. This explains why crime concentrations are highest in and around places that attract or house offenders" (Madensen & Eck, 2013; 562-3). As such, crime pattern theory is complimentary to routine activities theory and rational choice, but focuses on offender habits, activity spaces, places that generate and attract crime, and how these impact offenders' exposure to criminal opportunities, victims' exposure to risk of victimization, and the overall spatial patterning of crime.

Situational crime prevention's purpose is to identify and operationalize a set of specific methods by which crime events may be prevented. Eck and Madensen (2009) consider situational crime prevention an operational reversal of rational choice. In Clarke's words, "Situational crime prevention comprises opportunity reducing measures that (1) are directed at highly specific forms of crime, (2) involve the management, design or manipulation of the immediate environment in as systematic and permanent way as possible, (3) make crime more difficult and risky, or less rewarding and excusable as judged by a wide range of offenders" (Clarke, 1997; 4). These methods rely on aspects of opportunity, motivation, and choice.

Clarke and his colleague, Cornish, have identified primary categories of effort, risk, reward, provocation, and excuses in their "25 Techniques of Situational Crime Prevention" matrix (Cornish & Clarke, 2003). Widely discussed and cited within the field of crime prevention, techniques of situational prevention have become a valuable tool for practitioners to consider. Clarke identifies situational crime prevention as fundamentally different from mainstream criminology. "Situational crime prevention departs radically from most criminology in its orientation . . . it is focused on the settings for crime, rather than upon those committing criminal acts" (Clarke, 1997; 2). Unlike more traditional approaches, routine activities theory, situational crime prevention, and even rational choice perspective bring places to the forefront.

Each of the above described perspectives assert ideas contrary to the principles of random chance, instead arguing implicitly and explicitly that particular factors impact human choices about where to travel, who to interact with, and how to proceed during that interaction. If these ideas are correct, crime's distribution in space would be uneven and patterned. And in fact, there is a strong body of evidence supporting crime's spatial concentration. Studies of the spatial concentration of crime have consistently found that it is very highly concentrated at few places. Perhaps most widely cited in literature focused on crime concentration is Sherman's (1989) study of calls to police in Minneapolis (finding nearly half of all calls to fewer than four percent of addresses and intersections, and even greater concentration for serious and violent crimes).

Sherman's findings have since been replicated in Seattle (Weisburd et al., 2004), and later in a series of eight cities of varying size and locale (Weisburd, 2015). Most recently, Lee et al. systematically reviewed forty-four studies of crime concentration. "Based on our review, there is no doubt that crime is concentrated at a small number of places regardless of how crime

is measured, the geographic unit of analysis used, or type of crime" (2017; 11). Evidence in favor of crime concentration has been so pronounced, that scholars have declared this a law. (See the "iron law of troublesome places" (Eck et al., 2007; Wilcox and Eck, 2011. See also Weisburd, 2015; Blair et al., 2017; Haberman & Radcliffe, 2015; and Haberman et al, 2017).[1] Regardless of the impressively strong body of evidence in this regard, it must be tempered by the limited scope of social awareness regarding crime's concentration. Public discourse on crime routinely reflects a lack of awareness that crime concentrates. Public policy and practice often reflect a lack of understanding or capitalization on the properties of crime concentration and crime preventive opportunities that exist as a result. In Sherman's words: "Is crime distributed randomly in space? There is much evidence that it is not. Yet, there are many who suggest that it is" (1989, 27).

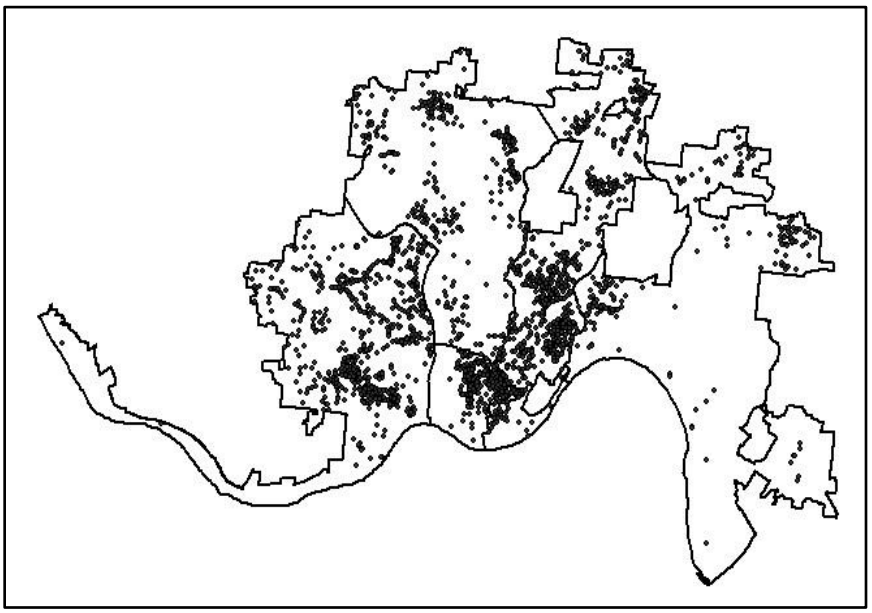
If shootings concentrate non-randomly in Cincinnati as various crime-types have in other locations, what might that suggest about underlying causes? What opportunities might be created for effective preventive efforts? And what support might that provide for the place network perspective?

A look at Cincinnati shootings reveals great spatial concentration, which suggests this data set is aligned with prior assertions about crime's concentration. Evaluating a decade of shooting data, it is clear that Cincinnati's shootings are unevenly distributed throughout the city, instead concentrating heavily in ten of fifty-two neighborhoods. Approximately sixty percent of Cincinnati's shootings have occurred in less than one-fifth of the neighborhoods. If this weren't

[1] Haberman et al. (and Haberman and Radcliffe) also considered temporal variation in relation to the law of crime concentration, finding that the law holds across different time scales but arguing also that refinements should be made by including temporal aspects.

compelling enough, more than forty percent of the city's shootings have occurred in less than two percent of the City's land mass (see Madensen et al., 2017). Why would this be so?

Figure 1.3. Cincinnati Shootings 2009-2018



The *crime-place relationship* and its importance has been the subject of recent scholarship, and most recently it has been asserted to have such an important role that the study of place is key to the discipline's future. "It is time for another turning point in the life course of criminology. Study of the criminology of place represents a distinct departure from the predominant perspectives in criminology. But it offers a focus of empirical investigation that has tremendous potential to advance criminology as a discipline and to make criminology relevant as a policy science" (Weisburd, 2015; 150). Orienting on "crime" rather than "offenders" prioritizes the role of place. But what is a place?

In the study of crime events, spatial concentrations, and related theories of crime, units of analysis have varied from macro to micro. Of particular interest to criminologists of the last century was the mezzo – the neighborhood. While this is understandable for a variety of reasons

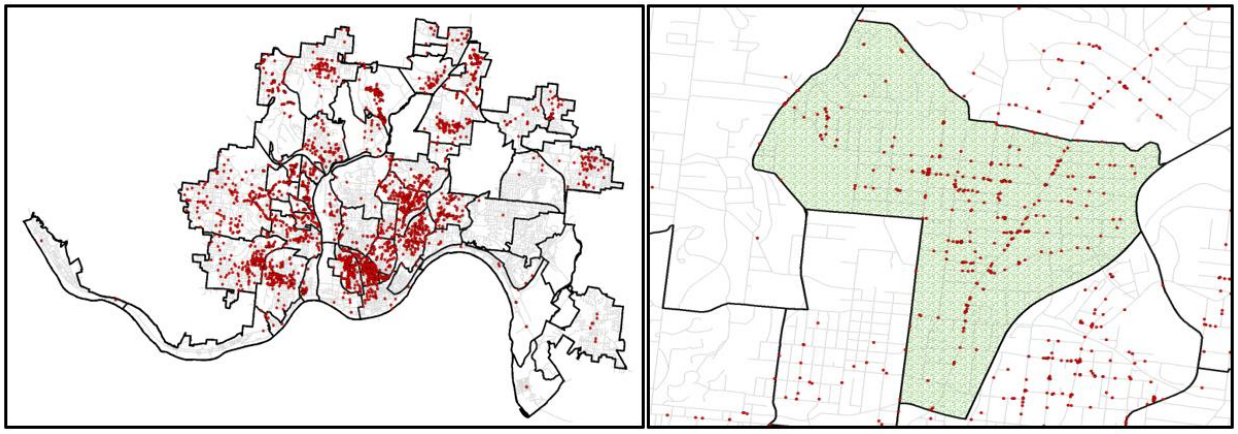
(i.e. building from the work of Shaw and McKay, and studying criminological theories asserting community contextual factors as crime causative) emerging research on place encourages even greater precision.

Most recently, "Advocates of this micro-spatial approach point to discernable within-neighborhood clusters of crime, suggesting the importance of the immediate setting for understanding crime events and implying that a focus on problem place (e.g. hot spots) offers greater crime prevention precision and efficiency than neighborhood-based interventions" (Wilcox & Tillyer, 2016; 1; see also Groff, Weisburd, & Morris, 2009). Some scholars have argued that certain micro-places experience a concentration of crime so great that crime event variation at these few places can alter crime rates for larger aggregates, perhaps even entire cities (see Weisburd et al., 2004; Groff et al., 2010).

From these two points, we may extract that it is important to focus on small spaces, as large aggregations can hide important variation. Crime's extreme concentration and extraordinary variation across space suggests a small-unit approach is more theoretically sufficient in the exploration of crime event causation, and more economically efficient in the application of prevention efforts.

From this, we might conclude that we should focus on "hot dots" - points or addresses with extraordinarily high crime counts. And while that approach could yield results in some regard, it is also possible that the result of this approach would be too narrow given what we know about human-environment interaction and crime places. It would ignore the most recently emerging ideas suggesting places in close proximity are criminogenically connected.

Figure 1.4. Units of Analysis City, Neighborhood & Point



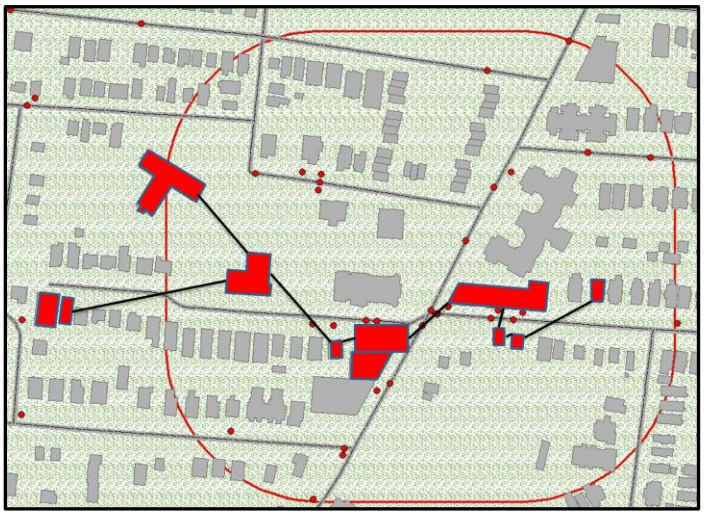
Place Networks

Theory and research in crime prevention suggest that smaller place-level explanations are more productive than those depending on larger units of analysis. But completely focusing on the smallest unit, "pin-points", may not be ideal, as it would ignore much of what we know about human socialization and activity. Further, it is not theoretically clear why or how single addresses would sufficiently explain hot spots that often radiate beyond the hottest point. As a practical matter, law enforcement routinely documents a single address on official crime records, declaring a single spot as the offense location. But it is widely known although routinely ignored, that most criminal events transpire across proximal points.

As an illustration, consider a street robbery between strangers. A target leaves a local pub at 3450 Party Parkway and heads for home on foot. He passes the intersection of Party Parkway and Rob Me Lane. An offender emerges from the shadowed alleyway at 123 Rob Me Lane and begins to follow the target. He pulls a gun on the victim in front of a vacant house at 2500 Party Parkway, but the victim runs for three blocks before he is caught at 2200 Party Parkway and pistol-whipped by the suspect. His wallet is taken, and the suspect flees down

Escape Road. The victim, shaken, walks to a gas station at 2100 Party Parkway and borrows a phone to call the police. If filled out properly, the official report might identify 2200 Party Parkway as the location of offense, but what about where the suspect was staged, where he chose to draw his weapon, and where he fled after taking the wallet? The place network perspective asserts that while the location of crime events is most likely non-random, neither is offenders' use of other nearby spaces in support of criminal goals - before, during, and after a criminal event.

Figure 1.5. Crime Place Network



Background

While criminologists were moving toward recognizing the significance of place in expression of crime events, ideas in the developing field of human ecology were interacting with those of criminology. It has been argued that the first known appearance of the term "human ecology" was in Park and Burgess' 1921 *An Introduction to the Science of Sociology* (Hawley, 1950). Hawley's Human Ecology (1950) has been widely recognized for providing a detailed explanation of the field. Hallmarks of human ecology include the assertion that "[e]very form of

life must act selectively with reference to environment; it is constantly making distinctions, seizing upon that which is appropriate to its needs and rejecting or avoiding that which is not" (Hawley, 1950; 3). Given that human-environment interactivity is recognized across all aspects of human behavior, it seems clear that the sub-set of activity related to crime events would not be excluded. Cohen and Felson identified Hawley's human ecology as critical to the development of routine activities theory. It seems likely to have value when considering place networks as well.

It is commonly recognized within human ecology that while there are interdependencies between people and their environment, humans often institute environmental changes to suit their needs and desires (i.e. development of structures, roads, and other transportation networks). But whether altered or existing within a relatively natural setting, human ecology asserts ". . . it appears that there is a tendency for human behavior to reflect in one way or another the physical characteristics of the area in which it occurs"[2] (Hawley, 1950; 90).

Human ecological theory is generally presented as a macro approach to human-environment interactions, yet it seems to have relevance to finer units of analysis. In considering the development and concentration of human population and the distribution of specialized functions that serve human needs and desires, the web of interconnectedness is undeniable.

Most recently, some scholars have begun to explore and organize the variable roles places might have in relation to crime events. Complimentary to routine activities, rational choice, situational crime prevention, crime pattern theory, and place-oriented perspectives, newly emerging place network publications have focused on four main components of a theoretical

[2] Forces which are considered by Hawley to be permissive and limiting, but not deterministic.

place network: crime sites, convergent settings, corrupting spots, and comfort spaces (see Madensen & Eck, 2013).

Recent Theoretical Development

Each place-type is theorized as supporting criminal activity based on the type's unique characteristics. It seems reasonable that a place network may have more than one of each type. It also seems possible that a network may not require all types of places to be operative. As detailed below, each type of place appears to have specific characteristics and serves certain needs. Understanding each may help in crime-place and network identification, which seems necessary for network disruption and the reduction of crime events. Each of these components will be introduced in the following paragraphs and explored in much greater detail in later chapters.

Crime sites are perhaps the most straightforward place network component. One particularly useful explanation of "hot" crime sites follows. "The most basic form of a hot spot is a place that has many crimes. A place can be an address, street corner, store, house, or other small location, most of which can be seen by a person standing at its center (Sherman et al., 1989). Places typically have a single owner and a specific function – residence, retail sales, recreation, school (Eck and Weisburd, 1995). Crime often is concentrated at a few places, even in high-crime areas. Although hot places often are concentrated within areas, they often are separated by other places with few or no crimes. Because such hot spots are best depicted by dots, they have a dimension of zero." (Eck et al., 2005; 4). Straightforward analysis of crime reports may reveal crime sites, but the number of crimes sufficient to identify a location as a crime site has to-date depended on the larger context within which the site has been identified,

with little standardization across studies. In simplest terms, a crime site is a pin-point location where crimes have occurred.

Convergent settings were identified by Felson (2003) as locations where potential offenders converge, discover each other, socialize, and learn from one another. Felson derived this idea from Barker's theory of behavior settings. Examples of convergent settings might include neighborhood street corners identified as common hangouts for drug traffickers, markets or barbershops where offenders loiter and socialize for periods of time. Felson asserted that convergent settings were relevant for criminal activity in that they provided a method by which participants could be exchanged or replaced, without significantly disrupting systematic criminal activity. Convergent settings provide an opportunity to recruit new members and communicate knowledge about criminal opportunity and offender networks. Essentially, convergent settings serve as a hub for communication, recruitment, and illicit education which ensures an available supply of willing criminal participants. Conversely, disruption of a convergent setting could lead to a reduction in the supply of willing offenders, thereby reducing systematic offending over time.

While convergent settings address the needs of a "criminal workforce", *corrupting spots* (Eck & Madensen, 2013) influence structural criminal choices by inflating rewards associated with criminal behavior or by actively engaging in practices that otherwise support or encourage criminality. Common examples of corrupting spots include scrap metal recycling facilities, unregulated second-hand dealers, and other locations that acquire hot products from the public. Corrupting spots may also include businesses that actively engage in the sale of drug trafficking

paraphernalia (see Madensen et al., 2004)[3]. Corrupting spots may be disaggregated from other more pro-social business enterprises by the extent to which they seek to anonymize hot product transactions, or otherwise engage in business practices that manipulate criminal opportunity calculations in favor of the offender.

Hammer (2011) identified c*omfort spaces* as places that facilitate offending in still other ways. Sub-categorized as staging, supply, or meeting locations, Hammer argues that comfort spaces are private places that support criminal activity before or after the event. Akin to journey-to-crime's recognition of the geographic progression of developing criminal events, comfort spaces can be thought of as an infrastructure of geographic waypoints, fulfilling specific structural needs to accomplish systemic offending. For instance, a street robber might use a staging area to scan for suitable targets while benefiting from specific protective features of the staging area. Supply locations are regularly employed to facilitate the movement and protection of larger quantities of drugs (i.e. stash houses). Meeting locations share some of the characteristics of corrupting spots, but they are private rather than public places (i.e. gang meeting houses). In each situation, a comfort space represents a private or semi-private location that ensures or improves the ability of potential offenders to execute criminal activity nearby.

Past Research, Data, and Methods

While a strong body of research relevant to crime sites supports our understanding of crime's concentration and stability, little research has been conducted regarding convergent settings, corrupting spots, and comfort spaces. These features generally represent untested

[3] Madensen and associates did not explicitly name as "corrupting spots" the locations they discussed. They identified markets which sold drug paraphernalia and other supportive products as "facilitators". The description of markets engaged in this behavior, their function, implications, and recommendations are, however, aligned with later characterizations of corrupting spots.

theoretical assertions. Existing evidence of these criminogenic features is found primarily in qualitative work, practitioner projects, and case studies. Although limited, this evidence is synthesized in the following chapters. Given that the over-arching crime place network theory has only recently begun to emerge, even less evidence is available to help us understand its empirical strength.

Study Overview

The following chapters focus on: 1) reviewing and systemizing the literature relevant to criminogenic places and place networks, 2) identifying the data available and the methods to be used for the purpose of researching place networks within this dissertation, 3) exploring Cincinnati's PIVOT sites and the intervention, and 4) testing the impact of PIVOT and the mechanics of the strategy. I assert the following hypothesis in conducting this research: *Crime place networks exist. These networks provide an infrastructure that facilitates criminal activity nearby. Those concerned with reducing crime may intervene upon the crime place network to reduce crime events.*

This is my humble attempt to make a small contribution to the body of knowledge that represents the field of crime prevention. This is important work, its application having very real consequence as it is translated into policy and practice every day across the United States and throughout the world. Particularly in places where gunshot victimization has become an intractable part of life, sometimes occurring with extraordinary frequency, we must work harder to find more effective ways to prevent future crime and violence. It appears to me that an opportunity exists to make a contribution to that end - to contribute in some small way to our understanding of criminogenic places and place networks. It is my sincere hope that as a result,

our communities will be safer, as will the professionals who work to protect each of us every day.

"Risk varies inversely with knowledge."

-common edict in the field of economics

CHAPTER 2
WHERE RAVENOUS WOLVES GATHER: WHAT WE KNOW ABOUT CRIMINOGENIC PLACE

Spellman and Eck (1989) illustratively used "sitting ducks", "ravenous wolves", and "dens of iniquity" to characterize the components of suitable target, motivated offender, and locations ideal for offending. The authors' dynamic use of these monikers captured our mind's attention while they explored aspects of crime concentration.

Ducks, wolves, and dens are important tools to make us think more comprehensively about crime events as processes. And they have value in extending our thinking toward crime-place networks. Do ravenous wolves simply appear out of thin air to attack a sitting duck? Of course not. Wolves observe and track their prey, take advantage of the benefits of shelter, cover, and suitable terrain along the way, until they find the proper moment to strike.

And while particularly dense sitting ducks might just hang out alongside a road near the wood-line waiting to be gobbled up, more enterprising ducks find locations with protective features, such as a small island in the center of large pond, free of wolves, upon which to sit. Better yet, he might find a particularly friendly human guardian to hang around, with a propensity toward caring for ducks, a strong dislike of wolves, and the wherewithal to keep wild animals at bay. Plotted on a map, wolf attacks of ducks would most certainly not be randomly distributed, and they might provide some evidence of the network of places upon which hunting wolves capitalize.[4]

[4] While I don't specifically remember this analogy being told to me by Dr. Eck, he almost certainly relayed this or some closely related version during a course lecture I attended. I do remember clearly some interesting discussions about the hunting patterns of sharks, but sharks have not enjoyed as much attention in crime prevention literature so far.

Research into criminogenic places did not begin in earnest until scholars became sufficiently interested in crime events, recognized crime's concentration, and began to consider the meaning of micro-spatial variation in the expression of crime. While it was widely known that certain neighborhoods had crime rates higher than others - macro and meso modeling insufficiently explained obvious micro variations inside high-crime neighborhoods. Some blocks, street segments, and addresses experienced most of the neighborhood crime, while others nearby saw little or no criminal activity. As scholars began to explore variation in crime events at a smaller scale, researchers' interest in criminogenic places steadily grew. Most recently, Madensen and Eck asserted that there are four types of crime-involved places that have emerged from crime prevention scholarship and warrant additional attention: crime sites, convergent settings, comfort spaces, and corrupting spots (2013). The pages that follow represent an attempt to systematize what is known about each type of crime-involved place, based on available literature.

Crime Sites

While crime sites are perhaps the most theoretically straightforward of the four types of crime-relevant places to be discussed here, that is not to discount the recency with which crime sites have gained import, nor does it presume that there is widespread recognition of the patterned geographic expression of crime.

In the study of crime prevention, scholars often point to technological progress in computing as critical to the prioritization of places. This is presumably true, although there is evidence of crime mapping extending back hundreds of years. Further, computerized mapping is simply a tool to illustrate what we might already know or discover another way. Yet, wide-scale implementation of computerized crime reports and mapping software have undoubtedly

contributed to our understanding of crime sites and the repetitive aspects of crime expression, as the efficiency with which we can summarize and visualize data sets has exponentially improved.

Theoretical Development

Not until Sherman et al.'s 1989 investigation of Minneapolis police calls does it seem that even more than a few experts in the field took seriously the importance of crime's concentration. It is as if, until recently, it was assumed that there was either no rhyme-nor-reason to account for where crime occurred, or it was so obvious as to need no exploration. But as routine activities theory developed, and as larger volume crime mapping became more efficient, the desire to further explore crime sites began to flourish.

Returning to Eck's explanation of crime sites: "[t]he most basic form of a hot spot is a place that has many crimes. A place can be an address, street corner, store, house, or other small location, most of which can be seen by a person standing at its center (Sherman et al., 1989). Places typically have a single owner and a specific function – residence, retail sales, recreation, school (Eck and Weisburd, 1995). Crime often is concentrated at a few places, even in high-crime areas. Although hot places often are concentrated within areas, they often are separated by other places with few or no crimes. Because such hot spots are best depicted by dots, they have a dimension of zero." (Eck, 2005; 4).

Characteristics of Crime Sites

Crime sites are the specific location, address, or geographic point at which a crime is committed.[5] Ala Felson (2003), they represent the particular geographic point a motivated

[5] It should be noted here that some scholars have identified other units of analysis, such a parcels, street segments or blocks as the preferred unit by which crime events should be investigated. Without discounting the various reasons for such arguments, this paper will treat crime sites as zero-dimensional points, as suggested by Eck et al., 2004.

offender intersects with, and chooses to capitalize on, a suitable target absent a capable guardian to deter such action. Many other aspects of place, offender, and victim are presumably at play which make the offender's choice reasonable to her at that place and time. There are no fundamental features of a crime site's definition that demand a location must be used more than once in order to be so defined. But as a practical matter, scholarly inquiries focused on place make frequency a determinative factor. Within this paper, crime sites will generally be treated as those having recorded multiple criminal events.

Identifying Crime Sites

Crime sites are frequently identified by official crime reports.[6] Repeat crime sites can be identified by creating tables of crimes which include address counts. Crime mapping programs provide a variety of methods by which repeat crime addresses might be expressed, such as graduated symbology and symbology thresholds.

Empirical Support for Crime Sites

From an empirical perspective, interest has focused on crime event concentration, since there is little question regarding whether crime sites exist. Beyond Sherman, non-random concentration of crime has been demonstrated by many others, studying various geographies and facilities, some of which have been assembled into systematic reviews of the topic at hand (see Weisburd et al., 2004; Eck et al., 2007; Wilcox & Eck, 2011; Weisburd, 2015; Lee, 2017).

[6] Of course, there are a variety of alternative methods available for identifying crime sites, including victimization surveys. It has been suggested that victimization surveys address weaknesses present in use of official crime reports by capturing events not reported to police (which can be a significant proportion of events, depending on crime type). Further, victimization surveys might eliminate reporting bias expressed by law enforcement in official records. Regardless, victimization surveys invite their own weaknesses, such as errors in recollection and little ability to independently confirm information.

Techniques for Disruption

While many techniques have been attempted to disrupt crime sites, few have generated clear empirical support. Two policing techniques which have gained empirical support are focused patrols and problem-solving at repeat crime sites.

Although early studies of police patrol patterns questioned their effect on crime (Kelling et al., 1974), it has more recently become clearer that when highly-focused on a discrete high-crime location, intense police patrol can be effective (Sherman & Weisburd, 1995; Weisburd & Green, 1995; Weisburd & Eck, 2004). The widely implemented Compstat police-management approach intended to take advantage of the potential crime reducing impact of highly focused patrols.

Herman Goldstein's (1979) problem-oriented policing strategy has also been considered successful at addressing crime-prone places. Goldstein argued that police should organize their workload into "problems" rather than incidents, and defined problems as repeated events of like nature. In essence, problem-oriented policing was created to address repeat crime sites (as well as problems of other types). This strategy has gained the support of crime prevention scholars.

Convergent Settings

The development of convergent settings as crime-relevant places is credited to Marcus Felson in his 2003 work, *The Process of Co-offending* (see also Andresen & Felson, 2009). Felson identified the roots of convergent settings as coming from Barker's theory of behavior settings and Tremblay's explanation of large, symbiotic systems of criminal cooperation. Barker (1963) identified behavior settings as places where standing patterns of behavior exist. And Tremblay reasoned that "[i]nstead of considering individual or group offending as a basis for

characterizing or classifying offenders, an alternative view might be to conceptualize the frequency and intensity of interactions between offenders as the intelligible outcome of a pattern of individually reasoned choices and constraints that vary across settings, across crime, and over a given offender's life cycle" (1993; 17).

Theoretical Development

The primary purpose of Felson's article on co-offending was to draw attention to the important role of co-offending in creating the volume of crime events we experience. But following this thinking, Felson theorized that we must better understand how offenders connect if we are to create a crime preventive benefit from this information. "At least half of all crime occurs through co-offending, which also helps feed much of the rest. Yet the process by which offenders find their accomplices is not well described or understood. Gangs and networks of offenders are surely important, but are amorphous and unstable. Our problem is to find a more coherent description of how offenders find one another" (Felson, 2003; 149).

Felson argued that the convergence of potential co-offenders (in time and space) "sets the stage" for nearby criminal activity (2003; 151). Because of this, he believed it was important to identify the places at-which potential co-offenders converged. He argued that social interaction with potential offenders influences the likelihood of offending and increases the efficiency upon which criminal opportunities are capitalized. "Likely co-offenders not only reinforce one another's criminal impulses, but also provide each other with information and direct assistance in carrying out illegal acts. The information they provide includes what crime targets are located where, as well as how to attack these targets, avoid apprehension, escape with loot, dispose of stolen goods, and/or win physical contests. These are simple lessons, but a little shared crime knowledge can go a long way" (Felson, 2003; 151).

Characteristics of Convergent Settings

According to Felson, there is no identified structure that explains how offenders find one another. Instead, he offers an evaluation of what potential co-offenders need. Primarily, Felson believes that offenders require the opportunity to informally screen one-another. This demands three key features: availability of - and intersection with - potential co-offenders, the absence of outside interference, and substantial time to test and form opinions of each other. Felson also eludes to a fourth feature, proximity to criminal targets. While he suggests this feature is unnecessary, it has the potential to add value for co-offenders using the space. A high-volume of targets near a convergent setting also has the potential to boost nearby crime rates (Felson, 2003).

Marcus Felson's examples of convergent settings include street corners, school steps/premises, bars, and public housing courtyards. He argues that in some instances temporal patterns impact a space's suitability (i.e. teachers may not closely monitor school steps after hours, thereby making them suitable convergent settings at certain times and not others). In each of Felson's examples, the settings are public and unmanaged, at least regarding anti-social communication and interaction.[7] Potential co-offenders are comfortable enough to interact over relatively long periods of time, to share information, and to build working relationships.

Identifying Convergent Settings

There have been few attempts to identify convergent settings to-date. One recent effort by Bichler, Malm, and Enriquez (2014) focused on using social network analysis (in-degree and

[7] But see Goldsmith & Halsey (2013), who identify stolen cars as "mobile convergent settings". While they serve many of the same purposes as originally identified by Felson (2003), they also contain starkly different characteristics, such as a non-fixed location, limited number of participants, and greater privacy.

centrality statistics) to identify convergence settings.[8] Felson has not explicitly identified methods by which convergent settings might be uncovered. However, given the information available to us, we might extrapolate that convergent settings could be uncovered through social observation or offender interviews. It is also reasonable to consider that given the methods by which convergent settings function (i.e. unregulated social interaction over relatively long periods of time), these places might be found by using law enforcement call-for-service records documenting crowd, loitering, or other group-related social disorder complaints.

Empirical Support for Convergent Settings

A review of available literature did not reveal empirical tests of convergent settings. This is perhaps because there have been few attempts to apply Felson's definition beyond individual cases. It also logically follows that techniques for the identification of convergent settings should be developed prior to wider empirical testing. Regardless, the concept of convergent settings is generally supported by the principles of environmental criminology and research into mechanisms of co-offending (see Andresen & Felson, 2009).

Techniques for Disruption

Felson suggests that absent an offender replacement mechanism, the local offender population will naturally deplete. This is because of two factors. First, offenders routinely cycle out of a criminal lifestyle for a variety of reasons (i.e. incarceration, desistance, aging-out, or death). Second, individuals newly interested in offending often lack knowledge regarding criminal opportunities and assistants. "Most veteran co-offenders already engage in routine

[8] Some researchers have used land-use types to identify *crime generators*, identified as "[a]ctivity nodes that pull a large number of people towards them" (Kinney et al., 2008; 62). This is an important function for understanding the intersection of crime and place, but is a broader conceptualization than Felson's definition of convergent settings, which includes aspects of time and management.

interactions helping them find one another. However, potential new co-offenders need to find partners. Because the search for co-offenders is an age-graded process . . . novices and veterans will tend not to share routine activities or join together in crime. *Thus potential new co-offenders will not automatically replenish the co-offenders who left.* Although adding new co-offenders is an uncertain process, the departure of old co-offenders is dependable, indeed. Veterans are removed by aging, morbidity, or mortality. The *accomplice depletion process* is a natural sequence that grinds down the crime rate" (Felson, 2003; 160).

Given that convergent settings support co-offender regeneration, Felson prioritizes disruption of these settings to reduce crime. He offers two techniques for doing so. First, he suggests modifying settings so "offenders lose access to crime targets". He argues that this reduces "narrow crime problems immediately, sometimes totally, but requires a multitude and variety of prevention efforts" (2003; 161).

Imagine, perhaps, a popular street corner that is a natural pass-through for drunken tourists as they leave a bar and head back to their hotel. These tourists serve as a continual "stocked pond" of victims whose defenses are diminished, but their pockets are full. Co-offenders congregate nearby, learn from one another, and routinely work together to rob victims as they pass near the place where offenders loiter and talk. Suitable victims keep coming, as they are not local and do not learn about the associated hazards of this route. One might imagine police engaging in an education campaign that encourages tourists to take a different route, coaxing the bar into serving patrons a bit less to prevent blatant inebriation, encouraging guardianship along the route and at the place where offenders linger, or limiting the number of suitable targets in proximity to this convergent setting in other ways. By doing so, this setting loses the attributes that made it attractive to offenders. It falls into disuse and robberies go down.

Second, Felson argues that modifying or removing convergent settings entirely is a technique that should reduce a wider range of crime problems than the previously recommended strategy, but it may take longer to work. An example of this technique might be instituting an action to close a bar that serves as a convergent setting. Perhaps through successful objection to the liquor licensing authority or through public nuisance action, the bar closes. Offenders are denied the opportunity to meet at that place, are no longer able to exchange information, and are unable to develop future criminal working relationships, thereby reducing crime nearby.

Corrupting Spots

In 2011, Eck identified corrupting spots as one of four types of proprietary places connected to crime events, at the annual Problem-Oriented Policing Conference (Eck et al., 2011).[9] Both Eck and Madensen have spoken about the role of corrupting spots in a variety of places since. Yet the term appears not to have broken through to more formalized scholarship in relevant publications. A search of the term "corrupting spots" across popular criminal justice databases reveals nothing directly relevant.

Theoretical Development

Eck said corrupting spots are places that ". . . support transactions that facilitate crime elsewhere" (Eck et al., 2011; 15). He used scrap-metal recycling facilities as an example of corrupting spots. Following this line of thinking, places that serve as transaction points for anything taken during a crime might be a corrupting spot if it alters potential offenders' decisions to commit crimes. A shop that purchases secondhand games and game systems might act as a corrupting spot if offenders commit more burglaries, and then off-load their stolen goods at the

[9] Although the concept was originally presented by Eck in 2010 using the name "predatory places" (Herold, personal communication, 2020).

shop. A corner store that promises cash for phones might encourage street robberies and cell phone thefts nearby. In all instances, corrupting spots encourage crimes elsewhere because of the influence they exert on the value of stolen goods and/or the ease by which stolen goods can be transacted into cash.

Characteristics of Corrupting Spots

To benefit offenders, corrupting spots must have two fundamental characteristics. First, they must serve as a transaction point for stolen or illicit goods. Second, they must operate in a manner that minimizes risk of detection or apprehension. Given that both features must exist, there is clear differentiation between corrupting spots and the entire class of secondhand facilities.

Imagine a pawn shop that purchases secondhand items. It is the shop's practice to require a seller's identification, to log the item, to share lists of serialized items with law enforcement, to cooperate with all police investigations, and to refuse future business with anyone previously identified as selling stolen merchandise. By engaging in these practices (and by informing their customers of such practices), the owners do not encourage crime. Thieves are deterred from selling stolen goods. The business does not influence the reward calculus of nearby offenders, and therefore the business avoids becoming a corrupting spot.

Identifying Corrupting Spots

Given the limited information available related to corrupting spots, identification techniques are not well developed. However, as with other types of "hidden crime places" (Eck et al, 2011), highly focused observation or interview techniques may reveal them.

Empirical Support for Corrupting Spots

Corrupting spots do not yet benefit from a body of scholarship exploring their empirical value. But the idea resonates with environmental criminology, rational choice perspective, and the principles of situational crime prevention.

Techniques for Disruption

While techniques for disrupting corrupting spots are as little explored as the underlying mechanics of these places, reversing the two operative features of these types of places appears a good place to start. Disruption might include closing a scrap metal recycling center near a hot-spot of scrap-metal break-ins. It might include regulating transactions using methods that deter offenders without rebuffing those completing legitimate business transactions.

Comfort Spaces

While completing graduate work in 2011 at the University of Cincinnati, under the tutelage of Dr. John Eck, Dr. Robin Engel, and other U.C. faculty, I began to explore a gap in crime-place literature. As a career policeman in Cincinnati particularly focused on violence, it seemed to me that as with convergent settings and corrupting spots, not all crime relevant places were readily identified on a crime map.

Theoretical Development

It seemed to me that multiple locations supported nearby criminal activity – some of which did not readily fit into previously conceived notions of crime-relevant places. Using a series of case studies in Cincinnati, I attempted to identify, explore, and theoretically develop

this idea which resulted in my master's graduate thesis, *Crime Places of Comfort* (Hammer, 2011).

As I made the finishing touches on my graduate thesis, the world's most notorious terrorist was located and dispatched by U.S. Special Forces. The terrorist was found in what struck me as a stunning example of a comfort space. I used the following news report to introduce my thesis:

> *"In the dark of night, U.S. helicopters approached a high-walled compound in Pakistan on a mission to capture or kill one of the world's most notorious terrorist leaders.*
>
> *Less than 40 minutes later -- early Monday morning in Pakistan -- Osama bin Laden was dead, along with four others inside the complex, and the U.S. forces departed with the slain al Qaeda leader's body to fulfill a vow that originated shortly after the September 11, 2001 terrorist attacks on the United States. . .*
>
> *When first built, the compound was secluded and reachable by only a dirt road, the officials said. In recent years, more residences built up around it, but it remained by far the largest and most heavily secured property in the area, they said.*
>
> *The mission ordered Friday by Obama encountered outer walls up to 18 feet tall topped with barbed wire, with two security gates and a series of internal walls that sectioned off different portions of the compound, the senior administration officials said. The main structure was a three-story building with few windows facing the outside of the compound, and a third-floor terrace had a seven-foot privacy wall, they said.*
>
> *Months of intelligence work determined that the compound was custom-built to hide a high-value terrorism suspect, almost certainly bin Laden. The officials noted there was no telephone or internet service at the dwelling, which was valued at more than $1 million, and its occupants burned their trash rather than leave it out for collection as other area residents did."*
>
> - How U.S. forces killed Osama bin Laden
> CNN Wire Staff
> May 2, 2011

Characteristics of Comfort Spaces

Hammer theorized that "[p]laces exist 'under the radar', experiencing relatively few offenses. These places nonetheless influence crime in other locations by providing the necessary infrastructure for those motivated to offend. Intentionally or unintentionally, some places make

offenders more comfortable. They serve as staging, supplying, or meeting locations for those with a criminal purpose. These places (often bars, markets, and drug houses) possess common characteristics which make them appealing to offenders. They make offending more efficient, less risky, and more rewarding (Cornish & Clarke, 2003); and by doing so, facilitate crime" (Hammer 2011; 4).

As a group, these places of comfort were identified as (often) private locations that either provide comfort to offenders or otherwise are used to facilitate crime nearby (Hammer, 2011). Three specific concrete (invariable) characteristics were observed: 1) geographically positioned within criminal group territory, 2) within close proximity to potential victims and offenders, and 3) producing physically defensible space (i.e. positioned on corner, tall relative to surrounding structures with effective sightlines). Comfort spaces that were identified had many of the following variable characteristics (which might be altered by either offenders or others): 1) availability of alcohol, 2) superficial legitimacy (legitimate cover), 3) means for avoiding apprehension, 4) hiding places for contraband (i.e. weapons, drugs), and 5) food, shelter, electricity and entertainment (Hammer, 2011). Beyond the characteristics of comfort spaces more generally, Hammer identified comfort space sub-types including staging, supplying, and meeting locations which met more specifically identified criminal needs.

Staging Locations

"Staging locations provide safe haven in close proximity to customers and targets . . . They give an offender a space in which to observe neighborhood activities without great risk of apprehension by police" (Hammer, 2011; 12). Many types of offending generate risks for offenders not only during or immediately after a crime is committed, but sometimes long before and afterward.

First, active offenders may be wanted or subject to probation or parole checks, regardless of the legitimacy of their activities when authorities spot them. Second, some crimes require possession of contraband, which creates risk of detection for the individual who is holding these items. Third, for a variety of offensive and defensive purposes, offenders may choose to carry firearms despite the legal jeopardy to which past criminal convictions or weapon selection might expose them. Finally, many offenders are at ongoing risk of retaliation from past victims, associates, or rival gangs. For these reasons, an observation post from which to see criminal opportunities without fully exposing oneself, has substantial value. Given this purpose, staging locations have two specific features in addition to the general characteristics of comfort spaces: close proximity to criminal opportunities and refuge from apprehension or attack.

Supply Locations

Supply locations were the second type of comfort space identified by Hammer. "Supplying locations provide products essential to the delivery of black market services in relative close proximity to where there is demand for that product."[10] Drug houses may most commonly be thought of as supply locations, but many types of offenders are in need of supplies. Firearms and ammunition are sometimes unavailable via legitimate commerce for those seeking them. Liquor may be stored in one location to re-stock an illegal unlicensed bar at another place. Stolen goods (including vehicles) may require safe storage prior to re-distribution. In each instance, a supply location may meet that need.

[10] Hammer's 2011 paper noted that although supply locations might be considered as an infrastructure from origination to delivery (i.e. international drug trade), the focus of this research would be on places in *relative* close-proximity to observed crime sites. While it is noted that extensive supply infrastructure might be considered for other contexts, for this dissertation, the focus will remain on supply locations in close-proximity crime sites.

As a result of its function, a supply location's most important characteristic is safe storage of illicit goods. Safe wholesale storage is rarely accomplished at the point of retail-level transaction. Retail transaction places have high traffic volume, and as a result they rapidly become known to many people, including police and crime rivals. Secondary supply location characteristics include balancing the placement of a supply location near enough the final transaction point to be efficient, but far enough to avoid easy detection. This balances risks of detection during the transportation of goods to a transaction site, with the risks of detection of the larger, more valuable quantity of contraband stored at a supply site.

Meeting Locations

"Meeting locations are the least geographically connected facility to offending. A meeting location could be extremely close geographically to an offending location, but could just as easily be a great distance away, as these places do not need to provide shelter or supplies for offenders immediately surrounding criminal events. These locations simply provide a comfortable place for offenders to congregate or socialize" (Hammer, 2011; 16). As with convergent settings, meeting locations facilitate co-offending through exchange of information regarding criminal opportunities and development of cooperative working relationships. But contrary to Felson's conceptualization of convergent settings, meeting locations are likely to be private spaces. This difference is significant in that it alters the purpose of the space.

While a convergent setting may provide the opportunity for introductions of strangers, meeting locations more likely provide the opportunity to strengthen relationships that already exist. One would not be likely to happen upon a meeting location or be permitted entry unless some kind of relationship had already been established. The trade-off in this regard is that although the opportunity for finding new co-offenders is substantially limited, those already

accepted into the group are less likely to be disrupted at a meeting location, and are more able to freely share highly-protected information with less risk of exposure to surveillance or detection.

Identifying Comfort Spaces

Hammer originally identified comfort spaces ex-post facto, following several years of observed patterns and interventions during his time as a police officer, working in and supervising two violent crime squads in Cincinnati, Ohio. The ability to both overtly and covertly surveil suspected locations allowed a relatively rare glimpse at offender movement and space use. Identified staging locations included a bar, a small apartment building, a house, and two markets.

Given the types of locations that were identified, it might be clearer how these locations provided close proximity to criminal opportunities, and less clear how some provided safe refuge. Perhaps this highlights some of the perils associated with using constructs such as land-use type to identify these spaces. As an example of how unorthodox spaces might be adapted to serve particular criminogenic needs, bar management and patrons at one comfort space commonly locked entry doors to the location during operating hours, as deemed necessary by those present, and particularly when the police happened to arrive. In this way, an otherwise publicly accessible space was transformed into safe, private refuge for potential offenders. As a second example, an apartment building in question was believed to have privately constructed passages between units, allowing offenders to move between units without using common hallways. Adaptations such as this are sometimes discovered by law enforcement, but it is unclear how, other than through highly detailed observation, investigation, or interview, these types of features might become otherwise known.

Two supply locations were identified by Hammer. Both were primarily identified as a result of intensive criminal investigations. One was a single-family home within known criminal group territory reportedly used to store drugs and weapons. The second was a market, purported to be a weapons stash (2011). Both of these locations were on the periphery of hot spots of criminal activity, and aggregations of law enforcement data (calls and reported crime) did not identify either as high-volume addresses. In fact, the market had recorded zero offenses at the location for the four years prior to identification as a supply location (Hammer, 2011). Given that the over-arching priority of a supply location is to avoid detection, it stands to reason that these may be most difficult to detect by analyzing traditional datasets, or even with less intensive observation or investigation.

One meeting location was described by Hammer (2011). This location was a house, detected when officers eventually observed individuals use the location that were known to operate as a criminally active group in the area. While the site was not a hot spot of criminal activity, two burglaries had been reported. Not long after officers became aware of the location, it fell into disuse.

As detailed above, comfort spaces have previously been identified largely through careful observation of the variety of ways in which criminally active offenders have capitalized on places in or near high-crime areas. It remains to be seen if there are other, more systematic or comprehensive methods by which these locations can be discovered.

Empirical Support for Comfort Spaces

Comfort spaces represent a new academic construct. As such, there appears to be no clear empirical basis upon which to rely. At the present time, support for comfort spaces comes

only from the strong theoretical foundation upon which the construct relies – that places matter to the expression of crime. The only identified comfort spaces I know of have been identified either by me or by the CPD team. Some of these were detailed in the 2011 paper and described above. Others have recently been identified within the Cincinnati Police Department's PIVOT project. These will be referenced, detailed, and investigated in the chapters that follow.

Techniques for Disruption

Again, given that comfort spaces are new to the collection of conceptualized crime places, little is known about the effectiveness of techniques to deny their criminally facilitative properties. However, the limited evidence that exists does suggest that they can be impacted by the same strategies applied to other crime places. Civil and regulatory enforcement may in some instances provide the tools necessary to eliminate or disrupt comfort spaces. In the case of the above described bar as a staging area, the state Attorney General's Office filed a public nuisance action, while the City of Cincinnati objected to the state liquor control commission (Fox 19 news, 2010). Ultimately, the bar closed for a period of one year and forfeited the liquor license. In some instances, comfort spaces have become less comfortable when authorities noticed that offenders were capitalizing on specific features of a property that were also building code violations, (i.e. hiding contraband or weapons in foundation gaps, tall grass, or breaches in fire separation walls). Crime prevention through environmental design (CPTED) principals may have application if they can be leveraged in a highly focused way that directly impacts the features upon which offenders are capitalizing.

As with other places, place management is key to the regulation of conduct at comfort spaces (see Madensen, 2007; Madensen & Eck, 2013). Education and collaboration with property owners and managers may successfully change place-dynamics. In some instances,

sanctioning and compelling may be necessary to alter the relevant aspects of a place. Regardless of the method by which change occurs, changes denying place characteristics that previously provided comfort to the offender disrupts the criminal usefulness of the place. Techniques that devalue the criminally supportive aspects of place are key. To the extent that there is variation in the manner of criminal support a place is perceived to provide, offenders' risk-reward calculus will be altered, and a positive crime preventive benefit will result.

Additional research and practitioner work is needed to identify, disrupt, and empirically test the existence of comfort spaces, their impact on criminal events, and the effectiveness of various interventions. While for theoretical reasons this area shows promise, so little work has been documented that it is too early to comprehensively report on these types of places beyond Cincinnati.

Networking Crime Places

Little is known about some of the types of crime places previously discussed. Yet, even with the limited information available, some have begun to consider the value of exploring the framework of places that might influence crime, rather than simply working with singular problem locations. As suggested by Hammer (2011), while considering multiple comfort spaces in close proximity to crime, it is reasonable to infer that given the variation in means by-which locations facilitate crime, multiple locations might support crime by providing an array of benefits. (This is also implied by Madensen & Eck, describing crime-involved proprietary places (2013; 571), and it has been developed into an operational strategy by a group of researchers and practitioners including former CPD Captain Maris Herold, Crime Analysts Blake and Elizabeth Christenson, Dr. Tamara Herold (formerly Madensen), and others (see Madensen et al., 2017; Hammer, 2018).

Much of the rest of this dissertation focuses on the concept of criminal place networks, the means by which they might be identified, the manner by which they might be disrupted, and the influence place network disruption might have on crime. In Chapter Three I will discuss the data I gathered and the methods I used to research crime place networks in Cincinnati, Ohio. I conclude this chapter by presenting Table 2.1, a summary of the characteristics of places that support crime.

Table 2.1. Characteristics of Place-Types

	Primary Purpose of Space	How Identified and Uncovered	Key Features	Spatial Relationship to Crime	Temporal Relationship to Crime	Harm Generated	Techniques of disruption	Key Literature
Crime Sites	Victimization occurs here (target and offender intersect)	Basic analysis identifying repeats, crime site mapping	Point of intersection between victim and offender, absent guardian	N/A	N/A	Crimes occur here, impacting involved individuals and near community	Hot spot patrolling, chronic offender intervention	Cohen & Felson, 1979; Felson, 2003; Sherman, 1989
Convergent Settings	Offenders meet one another	Observation, offender interview, crowd/ loitering calls, social network analysis	Public spaces where offenders gather and communicate without interference	Most impactful when near crime sites	Offenders meet and share information before crime (although after is also possible)	Accelerates crime in nearby spaces	Modify settings preventing access to targets, modify/remove setting so co-offenders cannot locate one another	Felson, 2003; also Barker, 1963; Tremblay, 1993
Corrupting Spots	Transaction site for stolen goods	Observation, interview, intelligence analysis, or recovery of stolen items	Transacts in stolen/illicit goods, operates in a manner that reduces risk of criminal detection/ apprehension	Near enough for reasonable offender access, but distance may vary relative to transaction volume and value	No direct temporal relationship	May accelerate crime nearby due to increasing market demand for illicit/stolen products	Eliminate site as an intake for product, regulated intake so as to raise risk of detection, apprehension	Madensen & Eck, 2013

	Primary Purpose of Space	How Identified and Uncovered	Key Features	Spatial Relationship to Crime	Temporal Relationship to Crime	Harm Generated	Techniques of disruption	Key Literature
Comfort Spaces	Support offending through a variety of means (i.e. safe harbor, supplying and private meeting)	Observation within group/gang territory or areas of chronic and sustained criminal activity	Within/near criminal group territory, close to victims/ offenders, defensible space (for offenders)	Relatively near, but progressively further for staging, supplying, meeting locations	From long before to long after criminal event	*May accelerate nearby criminal activity, increase severity, and/ or sustain high rates of offending	Disruption/ elimination (i.e. civil/ regulatory enforcement), enhanced place management, CPTED	Hammer, 2011; Madensen & Eck, 2013
- Staging	Safe haven in close proximity to targets	As above, but prioritizing proximity to offending	Refuge from attack/ apprehension, site-line proximity to criminal opportunities	Very near crime sites	Immediately before	Reduces offender risk, increases chance of identifying criminal opportunities (and *above)	Expose potential offenders at site, deny safe haven	Hammer, 2011; Madensen & Eck, 2013
- Supplying	Safe storage of illicit goods	Detailed investigation or informants	Target hardened, low profile	Balanced proximity – near enough to crime site to expedite transaction/ reduce transport risk, far enough to avoid rivals	Long before, just before, and/or after	Reduces offender risk, reduces offender effort (and *above)	Eliminate site via owner cooperation, public nuisance/ forfeiture mechanisms	Hammer, 2011; Madensen & Eck, 2013
- Meeting	Offender can meet and exchange information	Detailed investigation or informants	Private space, low profile	Near or within criminal group territory, not immediately proximal to criminal offending	Long before, just before, and/or after	Strengthens criminal group cohesion/ co-offending (and *above)	Awareness of location may suffice, consider public nuisance action	Hammer, 2011; Madensen & Eck, 2013

CHAPTER 3
DATA AND METHODS

"Everything is obvious - once you know the answer"

- *Unattributed*

Crime-place networks have here-to-fore been afforded little attention. The idea is conceptually new, and so evaluating the efficacy of crime-network theory is unbroken ground. In the chapters that follow, I will explore methods for identification of crime place networks and techniques for evaluating the effectiveness of network disruption strategies. The newly implemented PIVOT (Place-Based Investigations of Violent Offender Territories) strategy presents important opportunities three-fold: 1) to learn more about crime-place networks, 2) to organize techniques for disruption of place network components, and 3) to evaluate the effectiveness of disruption strategies. What follows next is a discussion of the data available to engage in this exploration.

Data

For this research, I have collected three major sources of data from the Cincinnati Police Department (CPD), Cincinnati, Ohio, with Department approval and cooperation. Data available for this research project includes: 1) official crime records recorded by the municipal police agency, 2) police calls-for-service records, captured via the computer-aided dispatch system used by the CPD, and 3) arrest location and charge-type records.

Also available for this project are a series of case studies of PIVOT projects, supporting technical explanations, presentations and videos – many of which have been self-published by CPD and/or the City of Cincinnati - and posted on official city and police department websites.

Given the interwoven relationship between this researcher and CPD's operationalized project, a uniquely deep well of personal observation and communication with operational team members is available to contextualize quantitative analysis.[11]

Information collected by the United States Census Bureau will also be used for this research to provide descriptive and contextual reference. Publicly available aggregate information capturing demographics and socioeconomics will be included where appropriate. Publicly accessible city data related to building permitting will also be analyzed.

Crime Reports

The Cincinnati Police Department participates in the federally supported National Incident-Based Reporting System (NIBRS), employing these methods and standards to capture crimes reported to CPD personnel (see Federal Bureau of Investigation, 2019). The NIBRS system is a reflection of two goals identified federally, encouraged by the Federal Bureau of Investigations' voluntary NIBRS program for local law enforcement. About one-third of U.S. law enforcement agencies currently participate in NIBRS (Federal Bureau of Investigation, 2019). For research purposes, NIBRS participating agencies present an important opportunity, as reflected in the two following goals.

[11] It is clear that the research community at-large has strong preference for independent evaluation. The reasons for this preference are known and understood, and this work represents a clear departure from the preferred course. This author has been intimately involved in CPD's PIVOT operation from its launch in 2016, as the PIVOT Unit Commander in CPD. For those that believe this irreparably taints the current work, so be it. I have attempted to as fairly, impartially, and ethically study this program as I am able. I would offer that having found myself in this unique position, and having struggled with what to do about it, I have landed on the perspective that there are at least as many risks associated with more traditional arms-length "independent" evaluation, but that those risks are rarely articulated. My perspective has created within me a belief that deep understanding of a project is extremely valuable to properly evaluate it. Without a detailed understanding, interventions are misunderstood or mis-identified, variables are mis-specified, and effectiveness or lack-thereof may be misrepresented. These are not insignificant risks. It is certainly possible that independent researchers may achieve this deep understanding. But I wonder how often the detailed understanding of project participants has been under-valued in a way that has fundamentally compromised a particular research contribution.

First, local agencies have been encouraged through NIBRS to capture details of each crime incident, including information on victim-offender relationships, arrestees, and property involved in the offense. Separate offenses committed as a part of the same incident are documented in a NIBRS report. This is different from Uniform Crime Reporting (UCR) standards, which provides less contextual information and generally reports only the most severe crime in circumstances where multiple offenses are committed during the same incident. Second, NIBRS (and UCR) participating agencies apply standard definitions to recorded offenses through a system of coding. This allows for aggregation and comparison of crime data, rates, etc. across agencies with differing state laws and criminal codes.[12]

For this project, representatives of the Cincinnati Police Department provided electronic records of reportable criminal offenses for the time period of interest. These records included fields indicating date and time, offense type, and UCR code. CPD also provided records of shooting offenses, which are not only captured within applicable reportable offense categories, but also separately logged in a standalone shooting database.

Given the agency's attention to shooting victimization, this separate log of shootings presents an important opportunity to analyze data that is more accurate than traditional law enforcement records. Crime analysts in CPD log shootings each day in this database. They distribute this information across the agency daily, routinely summarize and analyze these events, and audit each record for accuracy.

None of the records collected include any information which would identify persons. No names, social security numbers, or other personal identifiers were requested or provided. As this research focuses on places and not persons, information about individuals involved in criminal

[12] But the FBI cautions against drawing conclusions as a result of direct comparison or ranking of agencies.

events is unnecessary. Further, this minimizes privacy concerns regarding crime victims, witnesses, suspects, and offenders.

Criticism of Official Crime Records as a Data Source

Some researchers have expressed concern regarding use of official crime records as a source of data. While it is noted that use of official crime records generates potential weaknesses (i.e. under-reporting, agency recording bias, interpretation error), in this instance it is reasonably argued that the potential benefits outweigh the risks, in light of available alternatives. The most frequently recommended alternative for capturing crime events is victim self-report. Systems such as the National Crime Victimization Survey (NCVS) have been developed to support such a mission.

While victim self-reporting systems do have the potential to address weaknesses in the use of official crime records, they present several flaws of their own (i.e. faulty memory, lack of confirmation by any independent investigative authority, or victim misclassification). In this instance, the greatest challenge to use of victimization survey methods as an alternative to crime reports is the extraordinary capital necessary to create and maintain an independent data collection system. The NCVS captures victimization information from a representative sample of households, for the purpose of extrapolating based on that representative sample. In this instance, the areas of interest are small geographies, much smaller than neighborhoods. There is no reason to believe that NCVS records would capture sufficiently representative samples within these areas. Further, alternative data collection programs generally focus on aggregate time periods and are reported with substantial delay. As a result, victimization survey data is an unrealistic option.

Official crime records provide the benefits of cost minimization while producing perpetual and near real-time criminal event recording. It is noted that there could be risk in using this construct (officially reported crime) as a representation of all crime events, given that some national estimates suggest that more than sixty percent of some types of criminal victimizations are unreported (see Truman & Langton, 2015). This concern is minimized given the current focus on the most serious crimes (i.e. shootings, weapon offenses), which are thought to suffer least from non-reporting.

Police Calls for Service

The Cincinnati Police Department's call-for-service operations are supported by a computer-aided dispatch system (CAD). This system catalogs both emergency and non-emergency calls to Cincinnati's Emergency Communications Center requiring CPD response or follow-up. This system is also used to document and manage proactive efforts by police officers in the field. Computer-aided dispatch records are an important secondary source of crime information, because CAD records catalog many more crime and crime-related events than official crime records. For instance, in 2017 CPD recorded 31,332 reportable offenses, but logged 738,039 CAD records.

Many calls-for-service are captured that reflect criminal events that are not considered "reportable" according to CPD procedure[13] (i.e. third-party reports of shots fired with no known victim, or calls reporting drug activity). In each of these frequently occurring instances, events are generated within CPD's CAD system. However, if investigating officers do not determine that a "reportable offense" (which represent a narrow class of criminal acts) occurred, the event

[13] CPD procedure is reflective of common practice among law enforcement agencies, and reflective of FBI NIBRS/UCR standards.

will be absent from official crime reports. For this reason, some researchers and practitioners believe call-for-service data to be more helpful than official crime reports when seeking measures of some types of community problems.

Like official crime reports, police call-for-service records have previously been used to answer empirical questions in the field of crime prevention. While there are many examples of previous research using call data, some of the most notable include: Sherman et al.'s (1989) use of police call data to study crime concentration, Eck et al.'s (2000) exploration of crime concentration via calls for police service, and Eck, Clark, and Guerette's (2007) use of call and crime data to explore risky facilities.

For this project, representatives of the Cincinnati Police Department provided electronic records of all police CAD events for the relevant time period. As requested, these records included fields indicating date and time, call type, duration, and disposition code. These records did not include any information which would identify persons. No names, social security numbers, or other personal identifiers were requested or provided. This minimizes privacy concerns regarding crime victims, callers, witnesses, suspects, and offenders.

Critiques of Call-for-Service Information

Call-for-service (CAD) records have been criticized by researchers for several weaknesses. First, CAD records often reflect unverified reports which could be false. A citizen may misreport an event, which in turn generates an inaccurate event record. In some instances, investigating officers will discover false reports and call dispositions will reflect this discovery. Astute researchers may be able to filter these events out. But common practice also suggests that in a significant percentage of police calls, officers are unable to either verify or falsify

information reported to police call-takers. To the extent that these include false reports, empirical research is subject to this error. A concern identified previously by criminologists related to use of CAD data is potential call-taker misclassification. Call takers may not have the same level of training as police officers. Further, they are provided limited information and the nature of their function requires rapid information gathering, summarization, and dissemination. As a result, it has been argued that CAD call classifications are less accurate than official crime records. But in this instance, the call-types of interest are unambiguous (i.e. gun, shots fired, weapon) and are therefore less likely to be mis-classified.

Regardless of potential limitations, CAD data may provide invaluable insights. With reasonable caution granted to potential data shortcomings, the breadth, depth, relatively consistent and perpetual large-scale data collection function may not be equaled by any other known source of crime information. More than 1,000 CAD records are generated daily in the City of Cincinnati. This volume of data collection cannot be systematically replicated at a reasonable cost. For these reasons, this source of information, carefully used, may be invaluable in answering some of the most pressing crime-place questions.

Aggregated Arrest Counts

Arrest data can be informative in a variety of ways. First, it may be used as a supplemental database of criminal activity. Only certain crime types are recorded in systems typically referred to as "offense reports", but like CAD information, arrest records capture some crimes not otherwise documented in offense report tables. Crimes such as drug use and trafficking are not available in offense report records at CPD, but may be identified through arrest records. Second, arrest counts may be used to measure levels of traditional law

enforcement. For this research, the latter purpose is of greatest interest. No personally identifying arrest information will be collected or analyzed in this dissertation.

Critiques of Arrest Records

The primary criticism of arrest records is that they may more accurately represent police activity than problem severity. For instance, if officers disproportionately concentrate their time and resources in one area, that is where they are most likely to generate more arrests. This may occur regardless of whether criminal activity concentrates most severely at that area. Additionally, an agency that prioritizes arrests may generate more than another agency, regardless of whether offending rates are higher, lower, or equal. As a result, arrest records have been criticized as an inappropriate indicator of levels of criminal activity. But for this research, arrest data will be used as a measure of traditional law enforcement levels, rather than as a proxy for problem severity, avoiding the greatest potential criticism of this data.

Supplemental CPD Information

The Cincinnati Police Department's PIVOT strategy has been operational for several years. During this time, CPD has produced several case studies relevant to the research at hand. Further, CPD has created many presentations describing the operational PIVOT strategy, project work, crime-place identification, and results. Much of this information is publicly accessible. It will serve as an important tool to help describe aspects of the CPD's PIVOT program that are not easily addressed via quantitative measurement.

U.S. Census Data

Mainstream criminology has focused on indicators such as age, gender, socioeconomic status, and race as crime correlates (see Hirschi & Gottfredson, 1983; Steffensmeir & Ulmer,

2002; National Research Council, 1993: Steffensmeir et al., 2011; Farrington & Loeber, 2013; Land et al, 1990; Blau & Blau, 1982; Krivo & Peterson, 1996; Peterson & Krivo, 2005; Sampson & Groves, 1989, Sampson, Raudenbush & Earls, 1997; Sampson & Wilson, 1995). Given the empirical weight of these explanatory factors, thoughtful research should include these features as model variables or to provide descriptive context, when appropriate. At minimum, these indicators give context to the characteristics of geographies. This may be important particularly when considering whether there might be any generalizability or contextual nuances in empirical findings. This information, publicly available at varying levels of aggregation, will be incorporated as appropriate. U.S. Census data is widely used in the field, and generally considered to be an acceptable operationalization of related constructs.

Indicators of Economic Development

Building permit data is available publicly in Cincinnati. Permits may be sought for new construction and for property rehabilitation. These records will be incorporated where appropriate, to explore the areas of interest. This source of information may help to explore alternative explanations that relate directly to development and economic factors, to further inform and contextualize PIVOT project areas.

Methods

To-date, crime place networks have not been thoroughly explored. This presented a significant challenge for the current research, as there is not a clear methodological framework upon which to build. This is an opportunity to present one such option for consideration. Further complicating the present study is its focus on shootings in relatively small spaces. The infrequency of shootings and violent crime (vs. property crime) in small areas can present

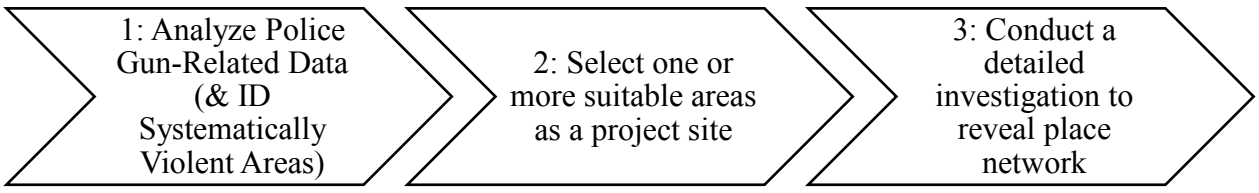
analytical challenges. Regardless, it is this author's hope to explore quantitative methods in this paper to better inform the empirical questions surrounding a place network hypothesis. *Fundamentally, does an evaluation of this place network intervention support the sense that this strategy is effective?*

Identifying Place Networks

Much of what has been uncovered about crime-relevant places has been discovered ad-hoc. This is to be expected, as this is common in the pursuit of new information (see Eck, 2014, for two methods by which we learn and advance). While we might continue to assemble crime-related place and place network information by the same method, one might also ask, is there a better, more quantifiable, systematic, and effective method by which we might uncover crime-related places and place networks?

To-date, CPD's PIVOT strategy has sought to identify crime place networks by following several chronological steps. First, detailed analysis of relevant crime data (i.e. shootings, robberies, gun-related crime) was conducted to identify geographies where these problems have disproportionally concentrated and sustained. Second, the CPD PIVOT team has selected one or more of these geographies as a project area. Third, detailed analysis, observation, and investigations are conducted within these spaces to identify place network components.

Figure 3.1. CPD Process for Site Identification



The Cincinnati Police Department has uncovered five operative place networks in the past two years. CPD identified each place network component, using the framework of crime-related places discussed in this paper. Crime sites, corrupting spots, comfort spaces, and convergent settings were identified among these networks. While methods of identification were thorough, detailed, and data-informed, they were also time-intensive, and a product of "craft-like" decision-making, representing a data-informed judgement rather than application of strict quantitative criteria. CPD personnel relied on all available resources, including crime, call, arrest, contraband recovery, site observation, surveillance, and input from informants and sources, to make these judgements.

Once network components were identified, PIVOT investigators attempted to disrupt the criminally supportive mechanisms operative at each component. If the theory is correct, and if network disruption was successful, then decreases in shooting victimization should be observed after project implementation.

Evaluating the Impact of Place Network Intervention

The Cincinnati Police Department's PIVOT project presents an opportunity to evaluate the effectiveness of strategy implementation in several sites within one city. It is this author's belief that much may be learned by moving forward as thoughtfully as possible with the information at-hand. It is also hoped that a bit more knowledge will be created regarding the potential benefits and challenges of applicable evaluative frameworks. And so, the following components were identified with which to compose this paper's evaluative models.

Unit of Analysis

Systematically violent locations selected as PIVOT project sites are my identified unit of analysis. CPD identified twenty-four systematically violent locations during pre-project analysis.[14] Five of these twenty-four sites were subject to PIVOT intervention by 2017. These sites are discrete areas of approximately one-twentieth of a square mile.[15] As discussed previously, they are much smaller than a neighborhood, but larger than a point, or address. They were originally selected by CPD through a process of identifying clusters of 100'x100' cells that recorded high levels of violence in the past year, past three years, and past five years. If cells were not both extreme and persistently violent, they were not considered suitable. Using this as a frame, CPD analysts drew a boundary line encompassing these cells. These became the intervention sites, once selected.[16]

Crime prevention scholars have increasingly valued units larger than a point and smaller than a neighborhood for research. While some scholars have prioritized neighborhoods as an appropriate unit of analysis due to the interconnectedness of individuals frequenting neighborhoods, others have rightly pointed out that there is dramatic within-neighborhood variation that is lost if the neighborhood is the unit. Still others (i.e. Braga, 2019) have lobbied for segments as the appropriate unit of focus, arguing: "Street segments are found to capture unique patterns of spatial variability that could otherwise not be observed at larger, place-based units of analysis such as a neighborhood". Groff, Weisburd, and others have made a similar

[14] CPD originally identified twenty-three systematically violent locations, but added a new location later which became an intervention site. Two sites were geographically altered after the original identification, but before they were selected for intervention. Where altered, the newer geography will be used for analysis.
[15] Intervention sites range from .043 to .071 square miles.
[16] The description above is a simplification of the process used to originally identify suitable sites. The exact steps by which CPD identified suitable sites, while informative, is irrelevant to this paper's evaluation, and so I will not spend the time to explain it in detail here. Slight spatial modifications were made in some instances after original analysis but before intervention.

case. But this argument for the use of segments, while valuable in explaining the avoidance of neighborhood or address points, does not exclude other between-size units which may be even more relevant.

PIVOT project areas are particularly appropriate research units given that they were not arbitrarily defined by political boundaries, nor by block segment cut-offs, but rather by studying how violent behaviors have historically concentrated and by defining the area of interest based on the observation of past persistent clusters.

Although the methods used for site identification could be disputed, this is of little relevance for the current study. For CPD's project, these represent areas CPD identified as persistently violent by a systematic standard, and five of these locations were selected and intervened upon. Maps of the agreed upon boundaries were reviewed and discussed throughout the project. Investigators walked these spaces and reviewed crime reports within these defined boundaries. Places within these spaces were studied to identify the operative network, and interventions began to disrupt the network. For the purpose of studying the effect of this project, this was the intervention space, and so it is appropriate to use these sites as the unit to be evaluated.[17]

Repeated Sampling

By repeatedly sampling each time-variant variable, monthly, I have introduced a time component to my evaluation. I did so for two reasons. First, these areas are unique. Efforts to identify areas similar enough to act as controls to the intervention sites could be confounded by a

[17] This is not to say that investigators were prohibited from working beyond these boundaries. Rather, the vast majority of focus and intervention was within this boundary. Network components were occasionally identified outside this boundary. Later chapters discussing the PIVOT initiative provide extensive detail regarding this. It is fair to say that most police initiatives diffuse beyond project boundaries to some extent. In this author's experience, this project was far more focused than most within defined project boundaries.

multitude of factors.[18] Measuring the same location repeatedly allows for comparisons over time where a suitable control site may not exist. And so, sites may be compared to themselves which seemed most appropriate in this instance. Second, because a time component allows for repeated measurement of the same unit over time, I am also able to address questions related to temporal order.

Dependent Variables

Shooting victimization is the primary dependent variable. In Cincinnati, gunshot victimization was the over-riding reason the strategy was originally developed and implemented. An evaluation of the strategy should naturally consider shootings as the primary dependent variable. As previously mentioned, CPD maintains a log of gunshot victimizations reported to police. I used data from this log to operationalize the dependent variable.[19] In secondary models, violent crime (as recorded in official records previously described) and weapon-related calls for service will also serve as dependent variables. I do not expect these to have the same relevance as the shooting victimization variable, given stated project goals. Nonetheless, they may be informative regarding secondary or diffusive effects of the intervention.

[18] A number of factors complicated efforts to identify a control group in this instance. One of these was the limited number of spaces originally identified as persistently violent in Cincinnati (23). If this is considered the population from which the intervention and control groups should be drawn, the removal of nine of these which were selected for intervention (by 2018) leaves a population of fourteen from which to identify proper controls. Given these numbers are so small and each intervention site is so unique, one might consider the challenges associated with finding a matched control site for each intervention location. Differences in socioeconomics, racial composition, population density, and many other known factors among the remaining few sites makes this task challenging, if not entirely unreasonable. Further, there is reason to be wary that this intervention diffused to the other sites. Intervention diffusion appears to have occurred at a low, irregular, and incalculable level to other spaces in Cincinnati, again challenging the applicability of using controls in this study.

[19] As a result, the operationalized dependent variable will include events reported to police where a victim was struck by gunfire during a reportable criminal offense. Accidental shooting of another is included in this data (as it is reported as Negligent Assault), although the vast majority of these events are Felonious Assaults. Self-inflicted fatal and nonfatal wounds, whether accidental or purposeful are not included. Neither are instances of obviously justifiable self-defense at the time of first report (i.e. a store clerk shooting a robber in self-defense).

Independent and Control Variables

A PIVOT intervention variable is used to represent implementation in the binary form (on/off). As data will include multiple sites over time including intervention and non-intervention time periods, this will serve as the principle independent variable of interest to answer the question: Does PIVOT intervention significantly correlate with the dependent variable, shootings?

A temperature variable is used in the model to control for any potential impact of seasonality and to search for an impact of temperature on the dependent variable. The National Oceanic and Atmospheric Administration makes temperature data publicly available through the Applied Climate Information System (ACIS), which is a project of Regional Climate Centers, the National Centers for Environmental Information (NCEI) and the National Weather Service. For this research, I downloaded a table of mean monthly temperature data for Cincinnati from the NOAA Online Weather "NOWData" portal located at https://nowdata.rcc-acis.org/iln.

Building permit data is also incorporated. This data is hosted at Cincinnati's Open Data Portal, located at: https://data.cincinnati-oh.gov. The specific data set used for this research consisted of all building permits. As with other time-variant factors used in my primary models (excepting temperature data), I geocoded this information for the relevant time period, spatially joined PIVOT site data, and summarized building permits by PIVOT site and month.

I used ArcGIS 10.4 to manage spatial data for this project. In some instances, coordinate data (X/Y, lat./long.) was available. In other instances, it was necessary to geocode based on address. Geocoding rates varied between 97 and 99 percent for all data sets, far better than commonly accepted geocoding standards.

Timeframe to be Analyzed

The PIVOT strategy was developed in the fall of 2015, and publicly announced by Cincinnati city leaders at a press conference on February 1st, 2016 (see City of Cincinnati, 2016). Intervention locations were not revealed at that time.

By March, 2016, the PIVOT strategy was operationally launched in the first two sites. A review of internal work product, presentations, and meeting agendas affirms March of 2016 was the date that PIVOT was implemented in Sites One and Two. By July of the same year, local media were publicly reporting on initiative interventions (Local 12, 2016). Project interventions lasted approximately two years, before the sites entered ongoing post-project assessment and maintenance.

The next three project sites were launched in January of 2017 (affirmed by internal document review). Again, project interventions lasted approximately two years.

For this paper, I analyze data spanning from January 2014 through December 2018. This five-year period provides sufficient opportunity to capture more than two years of activity prior to each intervention, and at least two years' observation after projects were initiated. For most comparisons in this paper, forty-eight months of data are used, creating a relatively straightforward two-year pre and two-year post evaluative framework, consisting of forty-eight total measurements.

Modeling Challenges

Aside from the "normal" challenges and adaptations to be met (i.e. normalizing distributions) in order to fit a statistical model to the research question, two primary challenges

exist in the quest to answer this research question. Overcoming both to find the most appropriate model is challenging.

Frequent Zeroes

First, the primary dependent variable measuring shooting victims has a high number of zeroes, as was expected given the research interest in small spaces and short time periods, and the relative infrequency with which shootings occur, even in highly violent areas. Seventy-four percent of the shooting victim dataset is coded as zero, with the remaining range demonstrating a right skew between one and six. Because of the zero frequency, normalizing the distribution via variable transformation does not completely resolve attempts to meet assumptions of normalcy. Most of the remaining variables behave relatively better. The variable measuring building code permits suffers from the same issue as shooting counts, but less severely.

A researcher in a similar situation might apply a variety of adaptations, yet most appear unappealing for the current project.[20] One might increase the size of the area of interest, thereby reducing the likelihood of zeroes. Yet in this instance, the area of interest is the project space. Increasing the size might reduce the relevance of the findings. Alternatively, one might increase the duration of measurements, improving the likelihood of a non-zero outcome. But this approach pushes the boundaries of small sampling. Given the recency with which this intervention occurred, collapsing measurements (i.e. two-month increments instead of one) would halve the sample size (i.e. from twenty-four in each intervention condition to twelve). A

[20] A "Zero-Inflated Model" has been applied in some instances to handle data with a high number of zero values, but this method is based on the assumption that some measurements are coded zero because of the lack of opportunity for event occurrence. This is theoretically incongruent with the sampling method in this case and therefore not applicable.

sample this small is not likely to generate enough statistical power to properly inform the relevant research questions.

It might appear that a reasonable approach could be to apply a logistic framework to the dependent variable. Logistic regression is built to handle data of a non-normal distribution where the outcome can be expressed as a binary. Recoding the dependent variable to two conditions (shooting/no shooting) at each measurement is straightforward and easily interpreted, and the frequency of each condition appears sufficient (with 223 instances of no shooting and 77 measurements where one or more shootings occurred). Even after segmenting by intervention and non-intervention measurement periods, each cell contains data that appears sufficient for analysis (19, 58, 102, and 121). But the second model challenge has yet to be considered.

The Assumption of Independent Observations

Many statistical tests assume independent observations. This is true for OLS and it is also true for logistic regression. But in this instance, the observations are not independent as they represent repeated samples from the same unit over time. The most common method by which repeated measures data is handled is through time series analysis, and so it would seem that time series analysis is the most appropriate method by which to handle this data. But traditional time series models assume a continuous dependent variable.

Statistical Models

As a result of these challenges, I proceed with three types of statistical tests. I model paired sample t-tests, present ARIMA time series results, and demonstrate the outcome of

negative binomial tests. With these tests, I intend to appropriately address the methodological challenges, and better inform the reader as to the effect of the PIVOT intervention.[21]

Paired Samples T-Test

I begin by conducting a paired samples t-test for dependent variable measurements at each site. By testing the sample mean value for shootings in the non-intervention condition against the mean value for shootings in the intervention condition, I will be able to test for statistically significant differences in these values. I hypothesize that the intervention condition will reduce the mean value for shootings. I will also conduct these tests for the dependent variables of secondary interest, violent crime and weapon-related calls for service. While this test does not introduce control variables, its simplicity overcomes some challenges presented by more sophisticated tests. Further, this test extends the evaluation beyond descriptive and qualitative accounts by applying a statistical test to the values. For these reasons, this is a reasonable place to begin statistical testing. I will extend the tests in this project as described in the paragraphs that follow.

Time Series Analysis with ARIMA

As mentioned previously, some of the most common statistical tests (i.e. OLS) assume independence among observations, which may be violated in instances of repeated measurement, such as in the present case. As a result, time series analysis is considered more appropriate when using repeated measures data. "Much statistical theory is concerned with random samples of independent observations. The special feature of time series analysis is the fact that successive

[21] I will present significance test results including $p < 0.01$, $p < 0.05$, and $p < 0.1$. Given the exploratory nature of this work, and the small sample size, I believe this will best inform the reader. Those concerned about the interpretability of significance at $p < 0.1$ may choose to disregard those findings, as differences in significance levels are explicitly marked.

observations are usually *not* independent and that the analysis must take into account the time order of the observations. When successive observations are dependent, future values may be predicted from past observations" (Chatfield, 6; 1980).

Fox shares this sentiment, extending an explanation of how dependent observations may impact a model. "It is not generally reasonable to suppose that the errors in a time-series regression are independent: After all, time periods that are close to one another are more likely to be similar than time periods that are relatively remote. This similarity may well extend to the errors, which represent (most importantly) the omitted causes of the response variable. Although the time dependence among errors may turn out to be negligible, it is unwise to assume a priori that this is the case" (2008; 427).

I perform time series modeling using autoregressive integrated moving average (ARIMA) model testing, for each site. This method appropriately handles repeated measurement because it accounts for the influence of past values over repeated observations. Therefore, ARIMA modeling addresses concerns regarding independence of observations.

Repeated measures modeling, such as ARIMA, need not include variables that are constant during the time period of interest, because the statistical methods employed consider observed relationships (covariance) between repeated measures, thereby controlling for constants that are not included in the model. Further, ARIMA modeling can be used to handle observed seasonal effects. While it is important to use time series models to explore the possibility of dependent observations, if there are no such influences, other regressive models may also be used.

Poisson and Negative Binomial Regressive Models

I will also prepare Poisson and negative binomial regressive models for my exploration of PIVOT's effect. In instances where the outcome of ARIMA modeling suggests that past measures are not exerting influence on future measures, regressive models may be appropriate and have been recently favored. But given that data such as this is likely not to follow a normal distribution, OLS regression is inappropriate. Poisson models are appropriate to deal with right-skewed variables, when a variable's mean and variance are the same. Negative binomial models are more general than Poisson models, and can be used to handle distributions with variances greater than the mean. It is hoped that producing these models, when appropriate, the interpretability of findings will be improved.

For these tests, I include independent variables measuring the PIVOT intervention, building permits, and mean temperature, modeling against repeated measurements of shooting victim counts. I hypothesize that shooting victim counts will be lower when the PIVOT intervention has been activated. I plan to test the same model using violent crime data as the dependent variable, and again using weapon-related calls for service. Although I am hopeful that significant reductions will also be observed in these alternate data sets during PIVOT intervention, I am less confident given that these data are more diffusive and likely include events beyond the stated purpose of the PIVOT intervention.

Arrest data will not be included in statistical models. This is because arrests are likely to be considered a component part of the PIVOT intervention and could, therefore, be considered inappropriate to include in a model that separately accounts for PIVOT. However, descriptive analysis of arrests will be conducted to inform alternative explanations for any observed effect.

Demographic variables will not be included in these models, given that measurements of these data are fixed during the intervention period. Rather, this data will be presented throughout the paper where appropriate, for the purpose of contextualizing these places and for speaking toward the generalizability of any results.

Other Testing Methods

An argument could be made that other testing methods might be employed to test PIVOT. In fact, these arguments could always be made (and often are). There may be more sophisticated or otherwise more appropriate methods. However, I believe the methods detailed above are the most appropriate that I know of, that properly balance relevant assumptions and provide interpretable results to readers. I believe both of these goals are of equal importance.

Future researchers might consider some variation of HLM in order to better incorporate demographic variables into a statistical test. But given the limited number of sites available for statistical testing at this time, the manner in which time series analysis accounts for unmeasured fixed effects, and the inclusion of this information as descriptive context, it appears that HLM would not be likely to add much more than complexity to the current paper.

Final Notes

In addition to the statistical modeling outlined above, I include an array of spatial analyses throughout the paper. These analyses focus on the spatial distribution of shootings in relation to PIVOT project sites, and violent crimes and weapon-related calls for service. While these are not formal statistical tests, detailed visualizations and tables of the aforementioned, demonstrating changes in the distribution of crime over space and time, may add substantially to our understanding of the potential effects of PIVOT intervention. At the conclusion of this paper

I include notes based on my experiences with the application of these statistical tests. I will also make further recommendations regarding the direction of future evaluations of this type, given the conditions another researcher might face.

Institutional Review Board

An application for a declaration that this proposed research does not constitute human subject research was submitted to the University of Cincinnati Institutional Review Board (UC IRB). This application was approved as exempt from human subject research oversight by the UC IRB. Documentation reflecting such appears at the end of the paper, Appendix D.

CHAPTER 4
THE CONTEXT OF PIVOT

Environment provides countless combinations of conditions which, although constantly subject to change, are always limited in the opportunities they afford living things. The relation between the two is a fundamental dependence of one on the other, of organism on environment.

-Amos Hawley, 1950; 14

In the following chapters, I will pursue four major objectives. This chapter and the next will seek to describe Cincinnati's PIVOT sites and their surroundings in detail. In Chapter 6 I will address the component interventions that make up the PIVOT strategy. These interventions will be presented in the context of other well-known policing strategies such as community policing, broken windows policing, focused offender deterrence, and working with property managers. Chapters 7 will explore the impact of the PIVOT strategy. Chapter 8 will focus on displacement. In Chapter 9 I will discuss evaluative findings. Chapter 10 will outline key mechanisms by which the strategy is thought to function. In the final chapter, I will draw from the information presented in past chapters and identify potential avenues for future research. By presenting each of these chapters within the context of this complete work, it is hoped that the reader will leave with a clearer understanding *of what PIVOT sites look and feel like, what the strategy truly is (and is not), what impact this strategy has made on systematically violent locations in Cincinnati, and how and why it is thought to reduce crime*.

PIVOT is an experimental approach to an enormously harmful, seemingly intractable problem. Intervening on the problem of concentrated gun violence may be analogized with

cancer treatment efforts.[22] As with the current problem at hand, experts not-so-long ago did not understand how or why cancer developed.

It seems there were two fundamental factors that limited our ability to reduce cancer harm in the 1800's. First, experts had little understanding of the disease and its development. Second, physicians were hindered by the scope of their professional skillset at the time. Surgical anesthesia was not available until 1846, and so physicians avoided many procedures that are commonplace today. As experts' understanding of the problem improved and capabilities within the field grew, medical professionals were able to systematically improve their approach to the disease. Once they enhanced their methods for diagnosis and for treatment, survival rates improved, and public hope grew. Diagnosis has become simpler and less invasive. Treatment regiments have become more focused on the places where cancer concentrated. Collateral harm to nearby healthy tissue and organs has been reduced because of these advancements in diagnosis, focus, and treatment effectiveness (see American Cancer Society, 2014).

This recent example should serve as a reminder that *substantive advancements can be made to seemingly intractable problems*, both by improving our understanding of a problem and by refining our technical abilities to intervene upon that problem. But one might imagine that we are nearer the nineteenth than the twenty-first century as it relates to the problem of systemic gun violence in our communities. Public opinion about professionals' ability to reduce gun violence is low (Roper Center, 2019). Frustration with the problem is high, but understanding is not - as reflected by current public discourse of broadly espoused general explanations which are not well-supported by evidence.

[22] Many others have drawn similar comparisons (see Papchristos et al., 2014 for one such example. See also Bullock & Tilley, unk. for comparisons between advancement of knowledge in policing to advancements in advancements in evidence-based medicine). Other examples exist not mentioned here, particularly within public health approaches to gun violence where ideas like this are often discussed.

It seems widely believed among the general population that some combination of poverty, education, unemployment, drugs, and firearm availability cause gun violence in America's urban areas. It seems many feel that this cocktail of social ills results in the specified harm of gun violence. But these assertions are not helpful for practitioners interested in improving matters. More helpful might be clear and distinguishable evidence leading practitioners to solutions more proximal, than distal. Perhaps some of the reason for this fog lies with the relative youth of both the field of crime prevention, and professional law enforcement in the United States.

In Chapter Two I discussed the development of crime prevention and the field's relative youth as compared with standard criminology. It is also important to note the limited research attention that has been dedicated to gun harm. As compared with other problems, gun violence has received a relatively small slice of researchers' attention, which must also contribute to our limited base of knowledge. (See Stark & Shah, 2017, for a stunning comparison of research funding versus mortality, by type of harm – and the lack of proportionate funding for gun violence). Not only is the field of crime prevention relatively young, but so is the policing profession.

Cincinnati did not establish a night watch until 1803 and did not have a police chief until 1850 (see police-museum.org, 2019). Just beyond 150 years into the development of a professional local police, it is perhaps no wonder opportunities to further refine professional tools and techniques remain. And so, this dissertation reflects an attempt to incrementally improve our understanding of the problem of disparately concentrated shootings and the tools and techniques necessary to confront this seemingly intractable problem, while considering side effects and collateral harm. And to do so, I discuss how crime place networks theoretically

situate among some of the nearest ideas in environmental criminology, before moving to a discussion of the characteristics of PIVOT neighborhoods in Cincinnati later in this chapter.

Neighborhoods, Subcultures, and Ethnographic Context

Thinking of place networks in the context presented here may strike some familiar chords. Particularly within some of the most well-known ethnographies, such as Anderson's *Code of the Street* and Liebow's *Talley's Corner*, we find some resonant themes which merit mention, and discussion of how, or if, these ideas fit amongst one another.

A reader familiar with Anderson's or Liebow's work might believe that how people assemble and spend their time is relevant to this conversation, as is the relationship between these activity spaces and crime events. Elloit Liebow presented a "street corner world", where against a backdrop of resource deprivation, physical deterioration, and a lack of legitimate opportunities, the street corner was socially important - for conversation, assembly, and social connections. But Liebow's focus is not so much on places as it is on the people who use the space - their actions, norms and adapted values. His efforts are principally rooted in gaining a better understanding of how structural features impact the lives and decisions of those he studied. And while the street corner plays an integral role, Liebow doesn't conduct a deep exploration of this place, perhaps leaving this opportunity for others.

Anderson's research takes place in a neighborhood in Philadelphia where violence is familiar, as is physical degradation and interpersonal struggle. He highlights a "code of the street" arguing that in this environment, some people develop cultural norms that are oppositional to the broader socially accepted values. This oppositional culture is the "code of the street". Anderson uses the words "staging areas" in his book. So as not to confuse a reader of

his work, I will briefly discuss the differences between his use of the term and the use of the same term in this dissertation.

Anderson presents staging areas in the following way: "Just before Chelten Avenue, a major artery that intersects Germantown Avenue, comes Vernon Park . . . On warm days, couples "making time" sit about on the benches, on the steps of statues, and on the hoods of cars parked along the park's edge. But even during the day, in public, men drink alcoholic beverages out of paper sacks, and at night the park becomes a dangerous place where drug dealing and other shadowy businesses are conducted. This is a "staging area," so-called because the activities that occur here set the stage for other activities, which may be played out either on the spot in front of the people who have congregated here or else in less conspicuous locations" (Anderson, 1999; loc:218).

This illustration carries familiar overtones to some of the conditions and activities observed in PIVOT sites. But Anderson's use of the term "staging area" seems broader than its use in the context of this dissertation and in other discussions of comfort spaces. Anderson's characterization appears to encompass aspects of crime sites, comfort spaces, *and* convergent settings without distinguishing between them and, without exploring the mechanics of these places. The most detailed clue Anderson provides as to his intention of the term's meaning appears later in his book. "Staging areas are hangouts where a wide mix of people gather for various reasons. It is here that campaigns for respect are most often waged" (1999; 77). Anderson identifies neighborhood establishments (carry-outs, liquor stores, and bars), business strips, and large population venues (theaters, sports complexes, skating rinks) as staging areas. He includes places where criminal acts (such as drug dealing) take place, which lead to further criminal activity at other places in his conceptualization of staging areas.

As such, we can see that Anderson's conceptualization is broader and also different than that which is discussed in this dissertation. In some instances, he approaches Felson's description of convergent settings, but in others, he draws on aspects of comfort spaces, crime sites, and corrupting spots. There is no theoretical conflict here, but Anderson's use of the "staging area" term is notably broader and different. His observations are through a different lens with a differential focus, driving more toward an exploration of interpersonal relationships and social norms than on the nexus between people and places. As with Liebow, Anderson seems to have largely left a detailed exploration of the role of these spaces to other researchers, focusing instead on the people occupying such places.

Crime Pattern Theory and the Crime Journey

Some readers may initially think of crime pattern theory or journey to crime literature as a plausible, and perhaps disconfirming alternatives to a crime network explanation. While there are some similarities among these perspectives, such as a common recognition of spatially patterned criminal activity and connections between crime patterns and peoples' activities, the theories are not the same. Regarding crime pattern theory, Evan Sorg offered: "Crime pattern theory holds that crime is not a random phenomenon; rather, the theory posits, crimes are greatly influenced by the physical make up of a jurisdiction's landscape and the movement of offenders and victims within and through that physical environment" (2016; 267).

But Sorg expounded on this, arguing that central to a crime pattern theory explanation is that crime concentrates "in and around nodes and paths that are most frequented and that produces the greatest number of interactions where a potential offender comes into contact with a suitable target during times when guardianship is inadequate" (2016; 267). In this latter portion is found the key points of emphasis in crime pattern theory – routine travel patterns and their

opportune intersection with potential targets. But an explanation of place networks goes further, focusing not just on routine travel patterns, nodes and edges but also on an array of other crime opportunities produced by an infrastructure of places that lead to differential criminal opportunities in areas where crime place networks exist.

A theory of crime place networks would suggest that once fully discovered, offenders travel and linger where they do as a result of the benefits of the network itself – that the crime place network influences patterns of travel – *that offenders alter their routines as a result of the benefits associated with networks*. Offenders may also alter spaces to their routines, maximizing criminogenic benefit by creating or improving place network components. Offenders may alter their choice of sleeping arrangements (or residences) due to the opportunities presented within a place network. Perhaps place network theory represents an evolution beyond that originally suggested by crime pattern theory. When comparing crime pattern and crime network ideas, a theory of crime networks reduces the relative reliance on the inevitability of criminal conduct within an awareness space generated from legitimate routine activities, and on the conceptualization that offenders' awareness of spatial benefits influencing opportunity are limited to target proximity and the presence or absence of guardians.

In this sense, crime pattern theory presents a plausible explanation of crime's concentration under certain conditions. But the place network focus, at least in Cincinnati, has centered not on all hot spots of criminal activity, but instead on the most extreme of outliers for gun violence, chronic and sustained. Perhaps crime pattern theory more adequately explains hot spots in early or middle temporal development ranges – which are most certainly more common. And perhaps place network theory is most suited for places where the volume of serious crime is

extreme and sustained. But these ponderances are untested and beyond the scope of this dissertation. I leave these explorations for future researchers.

Explorations of travel distance vis-à-vis criminal activity is also worth considering in relation to this exploration of crime place networks. Most recently, Lallan Johnson reconsidered Reuter and MacCoun's distance-related typology of drug market violence. Johnson explained: "They assert that the mixing of buyers and sellers from various distances has implications for the amount of violence expected to occur within them (drug markets) . . . Four categories of markets compose the typology. Local markets are described as low-violence exchange sites where buyers and sellers travel relatively short distances to engage in illicit exchanges with those of which they are familiar. Export markets are composed of non-local buyers and sellers interested in suppressing violence to avoid scaring clientele. Public markets tend to be high-violence, well-known places with non-local, unfamiliar sellers and buyers. Import markets have the highest levels of violence with local buyers and non-local sellers without social ties to the community" (Johnson, 2016; 1466).

Again, offender residence and proximity to offending space is theorized to have an impact on violence. This work is offered specifically in the context of drug market violence. And as a result, readers familiar with this work may naturally consider its implication within PIVOT sites, given the universal presence of drug market behavior across Cincinnati's PIVOT sites. While not a rival to a theory of place networks, this spatial typology appears to present more ambiguity in terms of its practical application. Reuter and MacCoun theorized that import markets – those where non-resident dealers enter neighborhoods for the purpose of selling to neighborhood residents – would be more violent than local drug markets (buyers and dealers are

residents), export markets (local dealers serving non-residents), or public markets (where neither are area locals).

If true, one might wonder what to do about such a thing. A practice of targeting non-resident dealers over local competitors for sanction seems somewhat implausible. And while Johnson found some evidence supporting the assertion that versus local buyer-seller markets, longer travel patterns were associated with more violence, the typology was not fully supported.[23] "According to the typology, import markets were expected to be the most violent. Yet, not only did import markets have lower than expected violence counts, they also failed to achieve any statistical significance" (Johnson, 2016; 1480).

As asserted when considering crime pattern theory, it is unlikely that proximity between residence and offending is irrelevant. But assuming its relevance, it does not seem that this would disconfirm a theory of crime place networks. These ideas are not oppositional. In fact, observation and investigation at one of the PIVOT project sites supports the conclusion that import drug market activity was contributing to violence. While some of the PIVOT interventions would have likely disrupted an import dealers' ability to operate, it also seems possible that because a crime place network exists, offenders may transition from import to local dealers – changing their own residence to take advantage of the criminal opportunities. Taking this into account, dealers' desire to become "local" should reduce violence as now local dealers

[23] Of particular concern to this author when reviewing research that includes offender residence as a variable of interest, is my belief that among law enforcement records, this record is low quality when considering the subset of highly active criminal offenders. Law enforcement routinely gathers home address information directly from offenders. Active offenders have particular motivation to hide legitimate addresses where they might be found from law enforcement. As a result, these records are more likely to represent a distant relative from which to occasionally retrieve mail, an "official address" rather than a legitimate activity space or sleeping quarter. If represented otherwise, findings may be confounded. While the accuracy of this information probably improves among infrequent offenders, we tend to be least interested them when studying patterns of offending.

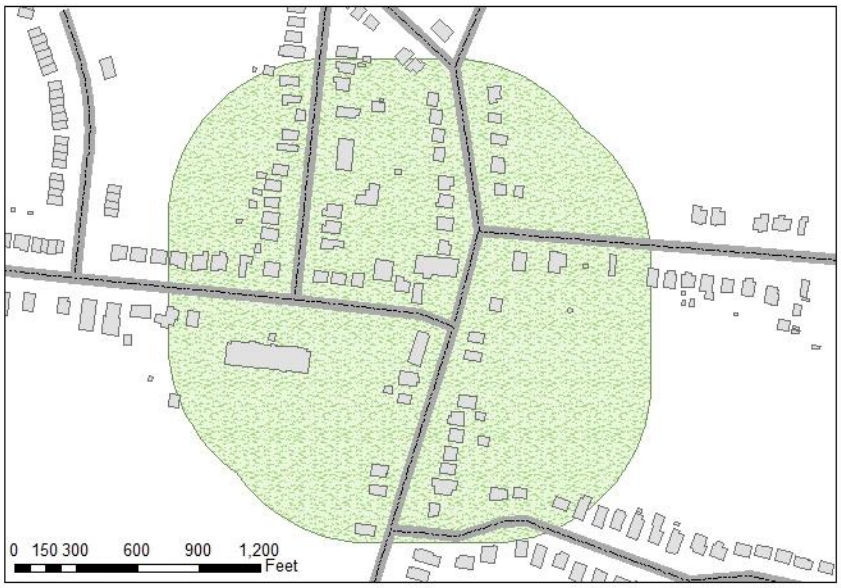
become more interested in the community in which they lived. This neighborhood "investment" was not observed in any meaningful way by PIVOT investigators.

The influence of offenders' residence in proximity to drug market activities does not seem clear, nor does the distance typology fully track with this authors' observations. It is my sense that this interplay, while exerting some influence, is far more complex than that which has been produced by this line of research so far. And if we assumed to know the truth about the relationship between violence and travel distance among drug markets, we might still wonder what to do about it within the context of an intervention.

PIVOT Neighborhoods and Common Site Characteristics

During the fall of 2015, a team of CPD analysts in consultation with researchers, studied the concentration of Cincinnati shootings and identified twenty-three small geographic areas which suffered from disproportionate and sustained gunshot victimization, calling them systematically violent locations (SVLs). Collectively, these areas represented a small percentage of the City's land mass (approximately 1.4% - Madensen et al., 2017). These sites that were identified as suitable for PIVOT, were relatively small areas of approximately three square-blocks. CPD analysts assigned SVL boundaries by drawing a shape around groups of 100' cells where violence disproportionately concentrated over time. As a practical matter, a person can see most of a project site while standing at its center. Figure 4.1 shows the spatial extent of one of Cincinnati's PIVOT sites.

Figure 4.1. Spatial Extent of a PIVOT Site



Over the past three years, nine sites have been selected for PIVOT project intervention. Project interventions have lasted approximately two years. Five have been completed, a sixth is nearing its mid-point, and three more are in early stages of project intervention at the time of this writing. What follows is a brief descriptive overview of the five sites which have been completed.[24]

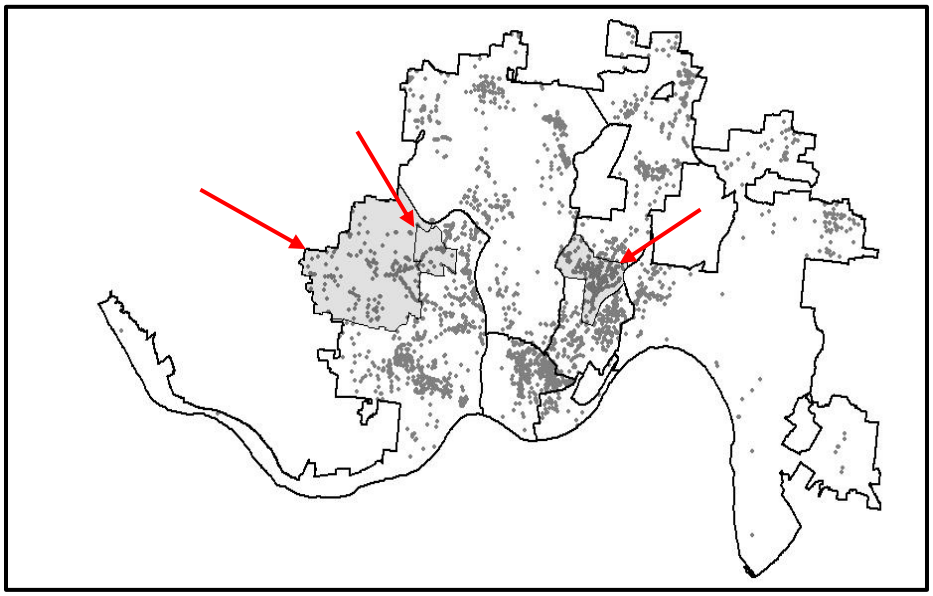
Common PIVOT Site Characteristics

Intervention sites were each selected due to consistently high levels of gunshot victimization. This single characteristic is what binds these five spaces. PIVOT sites are spread throughout the City of Cincinnati. Two sites are located on the City's west side, in adjoining neighborhoods, less than two miles from one another. The remaining three sites are within a

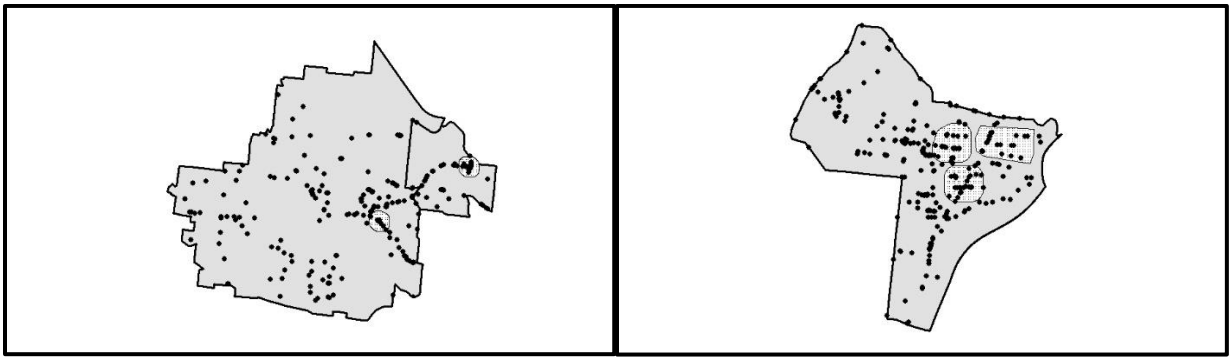
[24] While PIVOT project sites reach a point where they are considered complete by CPD, assessment and observation has been perpetual for each that has been taken on. Some post-project maintenance steps have been taken by the team when conditions warrant. "Completed" projects might also be characterized as perpetually in a maintenance phase where the sites are monitored for change.

neighborhood that lies a few miles northeast of the city's central business district. Approximately seventeen percent of the city's gunshot victimization in the last decade, has occurred in the three neighborhoods in which PIVOT was implemented. This should be stunning news, given that the City of Cincinnati is comprised of *fifty-two* neighborhoods. Proportionally, these three neighborhoods represent one/seventeenth of Cincinnati neighborhoods, yet account for nearly one/fifth of shooting victims.

Figure 4.2. Cincinnati and PIVOT Intervention Neighborhoods



Figures 4.3 & 4.4. Westwood & East Westwood, Avondale



PIVOT Neighborhoods

Cincinnati is a city where neighborhoods matter. Neighborhood councils are formally recognized by city administration, neighborhood boundaries are the subject of public discussion, and crimes are reported both by media and police with emphasis on the neighborhood within which the crimes occurred. City officials regularly attend neighborhood council meetings where they routinely speak about community concerns.

But wide disparities exist across Cincinnati's fifty-two neighborhoods. These are reflected in size, population, composition, and reported crime. Given this, it is worth contextualizing the three neighborhoods in which PIVOT interventions took place prior to focusing more closely on the sites themselves. PIVOT neighborhoods varied dramatically by resident population, between 2,445 and 29,950. This difference is more reflective of neighborhood size than housing density. Housing unit volume parallels population variation. Differentials in median housing income were noted, with one PIVOT neighborhood approaching the mean city income ($33,681). Another was half that value ($18,120). Owner occupancy varied by ten points among the three neighborhoods, and percentage owned-occupied housing units in project neighborhoods ranged from twenty-four percent to thirty-seven percent, near the

city's mean. Table 4.1 (below) shows each of these population and housing characteristics for the city, and in PIVOT neighborhoods.

Table 4.1. Neighborhood Population and Housing[25]

	Population	Housing Units	Median HH Income	Prop. Occ. Housing	Prop. Owned Occupied
Avondale	12,466	7,498	$18,120	0.75	0.24
E. Westwood	2,445	1,475	$27,097	0.76	0.26
Westwood	29,950	15,890	$33,922	0.85	0.37
Cincinnati	296,943	161,095	$33,681	0.83	0.39

Project neighborhood demographics demonstrated relative stability by age and gender, but dramatic variation by race. Measures of gender and age for these neighborhoods deviated from the city mean by no more than three points, while estimates of racial makeup varied widely. One neighborhood (the largest) approximated the city's 0.49/0.45 White/African-American residency, while another PIVOT neighborhood was estimated at 0.91 African-American. Neighborhood demographic information is summarized in Table 4.2 below.

Table 4.2. PIVOT Neighborhood Demographics

	(Proportions) Male	White	African American	Age under 25
Avondale	0.46	0.08	0.91	0.38
E. Westwood	0.45	0.17	0.81	0.39
Westwood	0.47	0.46	0.48	0.36
Cincinnati	0.48	0.49	0.45	0.37

While PIVOT sites represent smaller units within the larger neighborhood context, it is hoped the presentation of this information will aid the reader's understanding of neighborhoods in which PIVOT operated. These neighborhoods tended to trend below median levels for the

[25] Data for this table was adapted from City of Cincinnati City Planning documents, which used U.S. Census Bureau 2010 data, as well as 2006-2010 American Community Survey estimates to create Cincinnati's statistical neighborhood approximations. See: https://www.cincinnati-oh.gov/planning/maps-and-data/census-demographics/ for complete Cincinnati statistical neighborhood approximation information.

city on basic economic and residential stability indicators. And substantial differences were noted in the racial makeup of these neighborhoods.

Place Network Identification

Within each site, CPD PIVOT team members engaged in an extensive process to identify a network of places theorized to provide the infrastructure perpetuating violence and shootings. The process has included six general steps. First, detailed analysis of police call, crime, and arrest data was conducted and studied to identify place network components. From this, crime site identification was relatively straight-forward. Comfort spaces, convergent settings, and corrupting spots were much more challenging to locate, requiring several additional steps. Next, initial data analysis was thoroughly reviewed for indicators of the existence of additional place network components (i.e. Why does 123 Hidden Place Parkway have zero reported crimes and only one call to police in the last two years, but 5 weapon-related arrests?).

Third, investigators reviewed every report of violent crime over the past two years in the PIVOT area, searching narratives and investigative notes for clues regarding patterns of spatial use and hidden places. Fourth, the team observed the locations covertly, overtly, and with the use of CCTV, to identify patterns of behavior consistent with crime-place use. Investigators then queried informants and engaged the community regarding their observations. Finally, the CPD team identified remaining place network components by making informed qualitative judgements using the aggregate of all information gathered in steps one through five, and applying this information to the theoretical framework for convergent settings, comfort spaces and corrupting spots. Figure 4.5 summarizes the process by which place network components were identified in Cincinnati.

Figure 4.5. CPD Process for Place Network Identification

CCTV and Site Observation as Particularly Valuable Tools

One of the most valuable techniques for place network identification across CPD's sites has been the use of CCTV, and covert and overt site observations. Particularly in early project work, investigators noted the challenges of identifying patterns based largely on crime reports and calls for service. Particularly with crime relevant places that hide from view, methods other than analysis of crime and call data must be used to uncover them.

This purpose of using public safety cameras is different from the more traditional use of cameras, which prioritizes capturing images to aid in the identification of perpetrators. While this is important, it is rarer that public safety cameras capture images that serve this purpose. It is more common that these cameras capture the movement of people, where they linger, how they associate, and where offenders choose to spend their time.

PIVOT team members used cameras to review past events of interest, to "virtually patrol" spaces and to make apprehensions when criminal offenses were identified. Several new cameras were placed in project sites during these interventions to assist with the overall investigative effort.

The Importance of Networks

It is important to understand the value of networks beyond individual component parts. In simplest terms, networks appear to provide durability. Consider a person-based example. A single serial offender, once arrested, is prevented from committing future crimes in the community for the duration of his incarceration. And so, the community experiences relief. But offenders working in groups can persist even while a few of their co-conspirators are apprehended. If the offender group is large enough, even more than a few, the group may be able to adapt the operation and continue offending at the same rate as before, despite some participants' incapacitation. In this scenario, the community feels no relief as crime rates persist at the same level as before.

The same seems true for crime facilitating places. While there may be individual places that produce criminal opportunities, intervening on only one is not likely to produce an effect when a place network is present. Substantial changes in a criminal opportunity structure may only occur after the most critical and unique network components are disrupted, or when several network parts are disrupted. Assuming this is true, a place network approach seems critical to the success of place-based interventions aimed at reducing systemic violence. Nearer the end of this dissertation I will re-visit this idea in a more detailed discussion of the operative mechanisms of the PIVOT strategy.

Network Connections

PIVOT is based on the idea that crime sites are sometimes a part of a network of crime involved places. So it is important that I describe how the PIVOT team made connections between places thought to be a part of a network. Evidence supporting the connectedness of network places came from a variety of sources across the CPD PIVOT sites. As with

identification of site components themselves, evidence of connectedness was not found via one source alone.

Types of Connections

Evidence of place connection included: common owners, graffiti that identified territorial use, observations of offenders travelling between places, police records associating offenders with places, and police records associating places with other places. But as with identification of network component, investigative judgement weighed heavily into the decision to include a place as a result of these observations. Principle questions were: *does this place have value as a network component? If so, what is its role and what connects it with other network places?* In some instances it was obvious how different places provided complimentary benefit to nearby offenders. In other cases it was not.

Place networks were not identified by simply aggregating common owner records, or by documenting all addresses with graffiti, or by identifying active offenders and highlighting each address with which they were associated. Rather, investigators first looked within the project site for clues regarding the criminally supportive relevance of places, and then studied records of ownership and use-patterns for clues as to how places were connected to each other.

Place Ownership

Public record of ownership was helpful in furthering the place network investigation in some instances. Property ownership records are publicly available from the Hamilton County Auditor's Office. These records show the registered property owner. However, determining "true ownership", the individual(s) responsible for the place, was often far more complicated. Many properties researched during Cincinnati's project investigations were owned by corporations, including LLC's (Limited Liability Companies). And one individual or ownership

group sometimes created multiple corporations, distributing a portfolio of properties across an array of seemingly unrelated corporation names. This made determinations of common property ownership far more daunting.

Investigators needed substantial time and energy to identify the actual person(s) rather than the legal entity, responsible for a place. And while finding the individual responsible for the place was usually critical when trying to mitigate problems at network places, the value of using this approach "backwards", to ferret out common ownership and then to determine if other owned properties were components of a place network, did not often prove to be the best use of limited resources.

Graffiti

Offenders do not always hide their preferences for certain spaces. Sometimes they declare these preferences emphatically. One way in which offenders broadcasted their preference for some spaces in Cincinnati, was through graffiti. Territorial graffiti was found in project sites two through five. In several instances, graffiti known to be used by individuals affiliating with "sets", groups, or gangs, was scrawled on exterior walls of properties. While this was not singularly sufficient for inclusion as a place network component in Cincinnati, there were no instances where this graffiti was found without other supporting factors that would suggest the property was a part of a place network. In a few instances, graffiti inside common hallways provided spatial cues as to which specific section of a building was most relevant to the criminally active group.

At first blush, it may not make sense why offenders so blatantly solicited this attention to place network locations that they valued. But if we consider that police are probably a distant third in importance, behind rivals and offenders' need to assert community dominance, these

advertisements make more sense. Adding to that the infrequency with which police actually use this information to disrupt a place network or network component, there is rarely a reason for offenders to be concerned about the consequences of publicly broadcasting these spatial claims.

Records Associating Offenders and Addresses

The PIVOT team looked for patterns among past histories of addresses to search for important place network components as well. This was helpful in some instances to see the frequency with which offenders have been associated with particular addresses and to investigate these further.

Records Associating Places with Other Places

Investigators sometimes came across records associating places with each other. An example of this might be a call for police service where a witness observed a robbery and also saw the location to which the offender fled afterward. This observation might support associating a crime site with a comfort space (staging area). This type of information was sometimes developed during follow-up investigations of reported crimes. Although this type of information was valuable for making network connections, it was not very common.

Offender Observation

A valuable means of network association for Cincinnati's PIVOT team were officer observations. Whether in uniform and marked patrol car, or covert, simply observing a space for an extended period revealed many clues as to the use of space by offenders. These observations often informed the importance of certain places, the features which provided value, and indications of the connectedness of nearby network components.

Observing patterns of offender behavior led to the recovery of firearms, drugs, and paraphernalia from perpetrators and from places where these items were secreted. Observations

also provided indications of offenders' level of comfort in certain spaces relative to others, which was an important avenue of exploration for network interventions.

Public safety cameras were extraordinarily helpful in this regard, as previously mentioned. These cameras provided the means for more subtle observation, even when accompanying signage was posted informing the public that surveillance cameras were present. Cameras were economical, in that they eliminated travel time to sites and between them, and several locations across the city might be monitored at a given time by a single officer.

A Final Word on Connections

The methods described above represent Cincinnati's approach to place network connections. As with much of this work, there are many questions that remain. Police used a mixed-methods approach to identifying and describing connections. Much of this work is characterized as qualitative, supplemented by official records. These claims of connectedness therefore have both the strengths and weaknesses of the qualitative approach. This includes reliability concerns. I cannot be sure that a different group of investigators would define or describe the networks precisely the way they have been described here. But I believe the core features would most likely be identified by another investigative group. It is the smaller details, subject to greater judgement, that I believe would be more likely to be subject to interpretive differences.

If PIVOT interventions based on the team's understanding of the network result in fewer shootings and less violence, then we may assert that perhaps these descriptions are good enough. If not, one possibility for failure is that the networks were not properly understood or described.

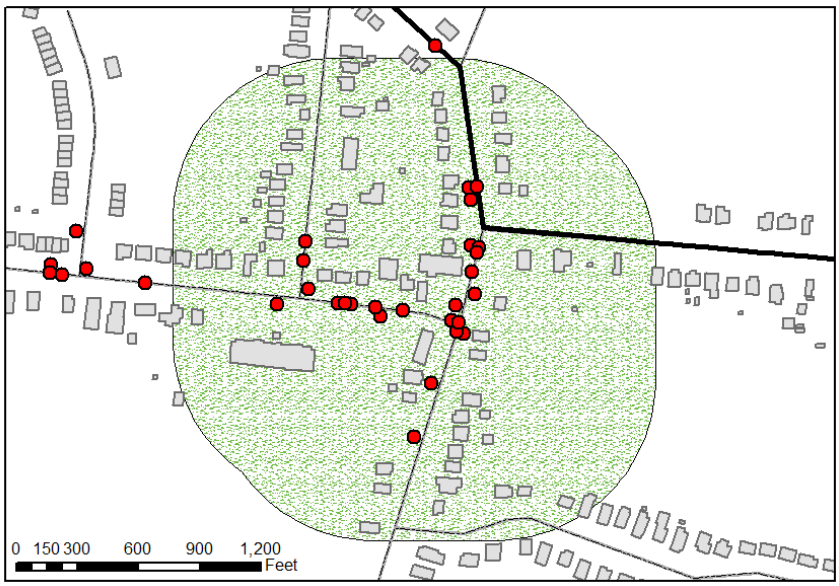
CHAPTER 5
PIVOT SITES

This chapter describes PIVOT intervention sites. These are the five violent hot spots where PIVOT focused from 2016-2018. My research is centered on these sites. I use maps to provide spatial references regarding project areas and shooting locations. I provide figures to help visualize identified place networks. I use photographs to illustrate site features and conditions. Finally, I include tables to itemize basic information regarding network components. The organization of this chapter is simple: I describe each site using a standard format.

Site One Overview and Observations

The first place network to be identified after PIVOT was launched in Cincinnati was in an area where crime might seem improbable. It was centered on relatively low-population density, low-traffic volume intersection in one of Cincinnati's smaller neighborhoods. East Westwood's population is estimated at 2,445. It has fewer than 1,500 housing units.

Figure 5.1. PIVOT Site One & Shootings



This site's relative low-density of residency, travel, and shopping may be the most impactful observation. The site's central roadway is a two-lane residential street. A stop sign governs the central intersection, as vehicular volume is insufficient to warrant an electric signal. In fact, there are no traffic signals present in this site at all, and there are no streets wider than two lanes.

Clustered at the central intersection is a small group of commercial buildings, some open, others empty and blighted. Two small markets operate here. Both have parking lots. One multifamily apartment building is situated near the project area's center. It is a residential facility for the elderly with on-site staff and access control features. Another three-story general-use apartment building sits about a block from the central intersection.

Most of the remaining structures are small, one and two-family homes. While these homes are mostly situated on lots smaller than that which would be found in outlying suburbs, they do not share exterior walls. Most homes appear to have fifteen-to-twenty feet between them. Many have driveways. As the area is hilly, some also have single-car garages underneath their first floor. Some of the roads are wide enough to afford on-street parking on both sides.

A passerby might believe this to be a sleepy neighborhood with a couple small markets and a park nearby. It does not have any of the hallmarks of a stereotypical dense urban crime-ridden zone. None-the-less, in these few blocks, twenty-six people were shot during 2014 and 2015. Forty individuals have been shot here during the past decade. Figure 5.1 highlights the extreme concentration of shootings on two intersecting block segments. In this figure, like in all subsequent maps in this chapter, red dots denote shooting locations. The green zone represents the PIVOT focus area. Streets are depicted as black lines, and gray rectangles are buildings.

Site One's Place Network

The PIVOT team's analysis identifies ten places as making up this network. Crime sites, convergent settings, comfort spaces, and a corrupting spot were present within the originally defined project area. This network is more geographically compact than other site networks. Perhaps there is a relationship between network density and shooting density, as both are tightly compact in this space.

The most obvious instance of violent offenders capitalizing on aspects of place here, was identified when PIVOT investigators recovered concealed firearms hidden in tall grass next to a residential sidewalk hillside staircase. Partially concealed but placed for rapid retrieval, a loaded semi-automatic handgun lay in the grass to the right of the stairs about half-way up. On the other side, also staged for use, was a long gun concealed in the untended grass. Investigators found additional ammunition in a box nearby. Hidden from behind overgrowing vegetation in near proximity were drug scales and packaging materials. All of this was found outdoors, on place network property that showed no sign of caretaking for quite some time. When PIVOT team investigators made this discovery, they also noticed small children playing in the very same space.

The second most obvious space-use in this site related to offender convergence. Loitering crowds were commonplace in this space, particularly at two places. First, individuals gathered in the property and immediately in front of one of the two corner markets (this shifted after the project to the other market). Second, groups gathered on the public sidewalk adjoining this market. This area was ideal for a variety of reasons, such as the presence of comfort spaces (weapon and drug staging opportunities) behind, and vehicles in front which could serve as protection from incoming bullets when a drive-by shooting occurred. The vehicles also served

as a physical and visual barrier between police and offenders, when necessary. Figure 5.2 is a photograph of this sidewalk. Street-parked vehicles are in the foreground. The background is a retaining wall and hillside that is also the front yard for the three comfort spaces where drug materials and guns were found. These spaces meet Felson's (2003) characterization of convergent settings - where offenders might gather, find cooperative partners, and share information about criminal opportunities. The proximity between these convergent settings and offending opportunities seemed to make them very valuable, as Felson theorized.

Network Components

Locations making up Site One's place network included four single or two-family homes, three commercial properties, two public spaces (sidewalk and street), and one multi-family apartment building. Seven of the ten locations were occupied or used in socially intended ways. Three places were vacant (two homes and one commercial site). Of note, two of these spaces were public. One section of public sidewalk, which was identified as a convergent setting, was discussed in the preceding paragraphs. Another, a small section of a dead-end street, was identified as a crime site. Investigators received information that this section of street was frequently being used for car-to-car drug transactions between dealers who capitalized on the combination of darkness, vacancy, low foot traffic, and low likelihood of police patrols.

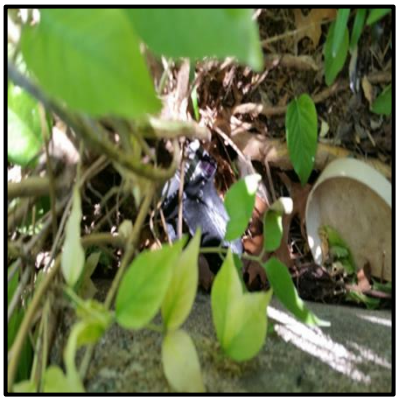
Three residences that were side-by-side were all identified as comfort spaces. The uniqueness in this instance was that the homes' interiors seemed not to be of as much value as the private land upon which they sat. At project start, two of these three homes were tenant occupied. The third was empty and showed no sign of intrusion. Firearms previously mentioned, were recovered on either side of the stairwell depicted in Figure 5.3, which led to this empty home. In addition to the tall grass, bushes and a tree had grown so large as to hide

portions of the side yard and house so that any person standing in the side or rear of the house could not be seen from the street.

Figures 5.2 & 5.3. Roadway & Blighted Property. Photo Credit: CPD PIVOT Team

The house backed up to a wooded area. There were obvious signs of travel between the rear yards of these homes and the rear of the nearby markets. This alternative pathway was completely sheltered from street view. On the side steps to this empty home, officers found digital drug scales and packaging materials to prepare drugs for sale (see Figure 5.5 below). The rear steps leading to the basement appeared to have become a restroom. Officers working this area prior to project launch reported suspects fleeing by way of this path. By taking advantage of the privacy of this land as a means of re-supplying the nearby drug market, and to stage weapons in defense of any attack, offenders had converted these private properties into comfort spaces. A close look at the image in Figure 5.4 reveals a semi-automatic handgun (the black object in the center of the photo) partially concealed in the tall grass of one comfort space.

Figures 5.4 & 5.5. Hidden Gun & Drug Packaging Materials: Photo Credit: CPD PIVOT Team



The third home became a staging site for offenders to engage in drug sales. As the project began, investigators found that this property's front porch was regularly occupied by drug traffickers. Upon questioning, the resident reported that he knew that offenders had established a pattern of hanging out on his front porch, and while he did not condone this, he was too fearful to take any action to prevent it. This represents another instance in which offenders capitalized on the natural limits of actions that police will take to investigate activity on private property, unless they witness overtly criminal acts.

The value this place had for active offenders was that it was private land. Even though they had neither owned the land nor had permission to be present on it, they capitalized on the benefit if provided. Offenders took over this private land, exerting control in such a way that those who had a legitimate right to the property were too fearful to fend them off. Such intimidation reduced offenders' chances of being challenged by police.

The two operating markets were crime sites. One of the markets appeared to also act as a corrupting site by making products supportive of the nearby drug trafficking operation available (i.e. selling scales used for weighing drugs). In one instance officers recovered several firearms hidden within shelved products on display. In other instances, officers noted several spots on the

property where offenders hid contraband. This provided a benefit to offenders, who would not be caught "holding" if confronted by police.

Figure 5.6 is a visualization of the first site's identified place network. Each polygon represents a site identified as a place network component. These polygons are used for network component visualization in figures throughout this chapter, and are representative of buildings, plots of land, or discrete sections of public sidewalk or street. These components are color-coded to demonstrate the type of place each component is thought to be. Each polygon is labeled so the reader might cross-reference the figure with the table that follows it. The geographic relation among these polygon components is a scaled approximation.

The methods and redundancies by which these places are connected within the network would overly complicate the visualization, so the lines connecting these polygons serve only as primary connections when secondary and tertiary interconnections often also exist. These lines remind readers that the figure is not simply a representation of a cluster of places, but that these places are thought to have interdependent utility. Each of the place network visualizations in this chapter follow this same formula.

Figure 5.6. Site One Place Network

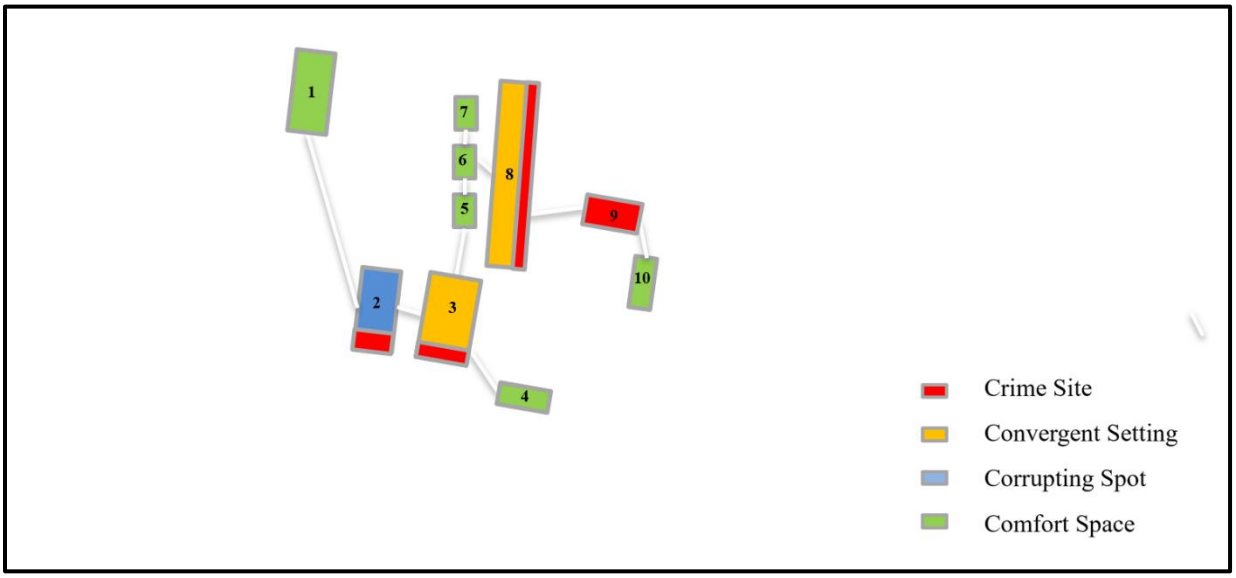


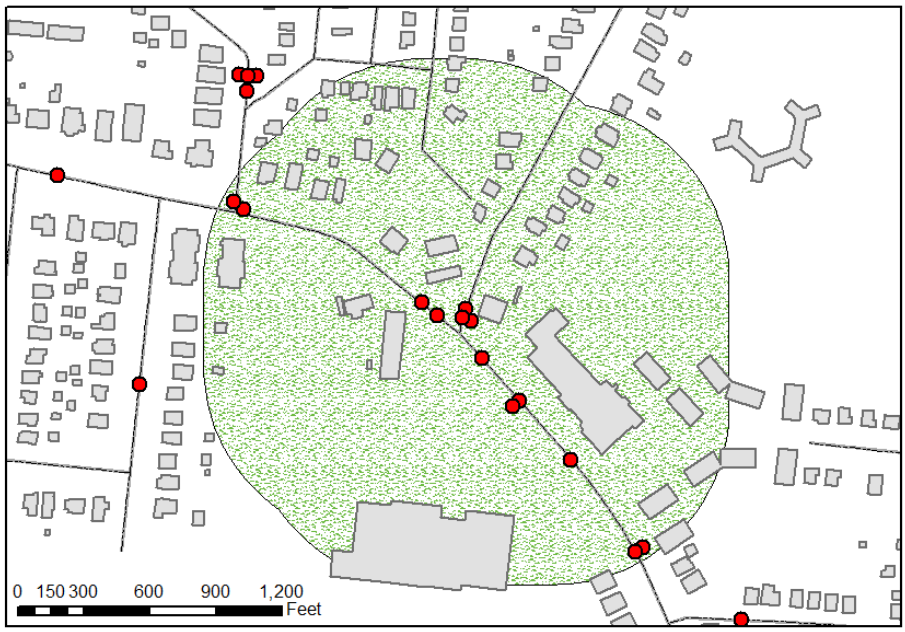
Table 5.1. Site One Network Components

Site/Place ID	Type	Land Use	Occupied	Violent Crime	Arrests	Police Calls/Weapon Calls
1.1	Comfort space (staging)	Multi-family apt.	Yes	1	4	18/0
1.2	Corrupting spot/crime site	Commercial	Yes	3	109	115/4
1.3	Convergent setting/crime site	Commercial	Yes	5	49	116/16
1.4	Comfort space (meeting)	Commercial	No	1	0	4/1
1.5	Comfort space (staging)	Single-family home	Yes	3	7	4/0
1.6	Comfort space (staging/supplying)	Two-family home	No	1	21	6/0
1.7	Comfort space (staging/supplying)	Single-family home	Yes	0	22	28/2
1.8	Crime site/ convergent setting	Public sidewalk	Yes	N/C	N/C	N/C
1.9	Crime site	Public street	Yes	0	0	0/0
1.10	Comfort space (meeting)	Single family home	No	0	0	1/0

Site Two Overview and Observations

PIVOT's second site was located approximately one-and-a-half miles from the first site, in the adjoining neighborhood of Westwood. This neighborhood is Cincinnati's largest, with approximately 30,000 residents and nearly 16,000 housing units. In many respects, Westwood could be a city unto itself. The population and land mass of Westwood is in-fact larger than several of the cities outlying Cincinnati.

Figure 5.7. PIVOT Site Two & Shootings



With respect to population, density, and travel volume, Site Two is approximately ten-fold that of the first site. The primary street that divides the site is a four-lane arterial roadway. The central intersection is governed by a traffic light. Aprons for a gas station and a market are within a few steps of this intersection. A commercial shopping center sits on the southern edge, fronted by a large parking lot. An imposing commercial structure is situated on the site's south-eastern side. Behind that is a set of a dozen multi-family apartment buildings that make up a

residential complex. Just beyond the northeastern edge is a large multi-family structure as well. Some single and two-family homes are located inside this space, but the defining structures are commercial and apartment-style. Vehicular traffic is substantial, and buses are frequently visiting the many public transportation stops lining the streets of this site.

Just beyond the site's northwestern edge is a street lined with repeating brick two-story apartment buildings – housing between four and eight units apiece. Formerly an apartment community, the ownership of these properties had fractured at some point in the past. At project start, nearly every property along this street had different owners. A cluster of shootings was noted in this space, just outside the project site's boundary line. This cluster can be seen in Figure 5.7, near the upper left corner.

Twenty-eight people were shot in this space (green area of Figure 5.7) since 2010. Eight were shot in 2015, the year prior to project launch. Six individuals were shot in 2016, as the project got underway. In one instance in early 2016, two people engaged in a gun battle across the street from each other near the site's central intersection during daylight hours. While no person was struck during this gunfight, a motorist's vehicle was hit as the driver entered the intersection, unaware of what she was driving toward. She had a young child in the car at the time a bullet ripped into the passenger door.

At a community meeting, in the adjoining neighborhood, this intersection came up for discussion. One citizen remarked, "Oh that corner? It's crazy up there. I won't ever go up there without my gun on me". This was not a citizen unfamiliar with criminally active spaces. This was a citizen who comfortably frequented the hotspots of PIVOT's Site One.

Site Two's Place Network

Open air drug market activity was present in this space, concentrated primarily at the two central crime sites, both commercial properties. Bus stops fronted both crime sites, which frustrated one owner's attempts to control trespassing and disorder on his lot. The owner reported to us that when he attempted to manage activities on his lot, he was routinely told, "I'm waiting on the bus". He could not challenge this assertion. As a result, he had generally abandoned attempts to control his lot by the time the project began. He instead retreated into the store itself, where he could exercise exclusive management rights.

Management at the second crime site had no such problem with the bus stop in front of their business, as they appeared uninterested in addressing activities outside of their store. But those loitering nearby gave police the same explanation; "I'm waiting for the bus". Longer-term surveillance revealed drug market activity often to be the true reason for their presence in these spaces, so the bus stop was again a handy excuse for dealers.

This network was the most populous and most complex of the five sites presented in this dissertation. As a result, the PIVOT team struggled to understand, identify, and intervene upon this network. The sheer number of different owners, the scale of their operations, and the volume of legitimate activities intermingling with illicit behavior presented a significant challenge to the team.

Several foot paths cut behind network locations, conveniently concealing pedestrian travel from street-side view. One of these paths was used to launch an armed attack on drug market rivals. A person was shot on another of these paths in a separate event just prior to project launch. Investigators exploring these spaces found shell casings and other signs of use by offenders.

Network Components

In addition to the items already discussed at the two central crime sites, two more items merit mention. At one of the sites, milk crates were found to have been used to create a makeshift table and chairs concealed in the wood-line at the property's rear edge. This is depicted in Figure 5.8 below. While individuals seated there could keep a close eye on activities at the intersection, they were unlikely to be seen by passersby. Milk crates were also used to create stairsteps to the structure's roof, again presenting evidence that surveillance of this corner was important to those occupying the space. One of the crime sites also expressed elements of a corrupting spot. The site facilitated drug trafficking by selling items supportive of drug sales and use from within the business. Some nearby fences erected to enforce property boundaries had been defeated, where they acted as obstacles to covert travel (see Figure 5.9).

Figures 5.8 & 5.9. Concealed Observation & Broken Fencing. Photo Credit: PIVOT Team

Next door to one of the crime sites was a single-family home which became a comfort space for offenders. While elements of this may have been present all along, it was only noticed by the PIVOT team after the crime site beside it had been closed. Beside the other crime site was an abandoned commercial structure, captured in Figure 5.10. There were bullet holes in the

building's front window (see Figure 5.11). Investigators had reason to believe that individuals met on the private property behind the building, which concealed them from street view.

Figures 5.10 & 5.11. Blighted Business & Bullet Holes: Photo Credit: PIVOT Team

After gathering information that on more than one occasion those committing robberies at the primary intersection fled toward a side street just outside of the project site, the PIVOT team explored this side street for evidence of staging or meeting locations. They discovered four adjoining properties which to greater and lesser degrees appeared to be used for these purposes. One property was missing a front door. In the laundry room investigators found graffiti expressing a profane view of police, promotion of a local criminal group set, and disrespect for another. As mentioned previously, near these buildings was a spatial cluster of shootings.

A corrupting spot was also identified outside of the primary project site. Located nearly a mile away, this component was one of only a few places identified outside the original PIVOT site boundaries across all five identified networks, and the furthest outside the site by a wide margin. This place was a commercial/retail space. District investigators developed information that the location was re-selling stolen retail product. They executed a search warrant on the place and recovered property consistent with this assertion. Given this, it is fair to speculate that

this spot encouraged theft-related offending in the vicinity, particularly from other retail establishments.

Figure 5.12. Site Two Place Network

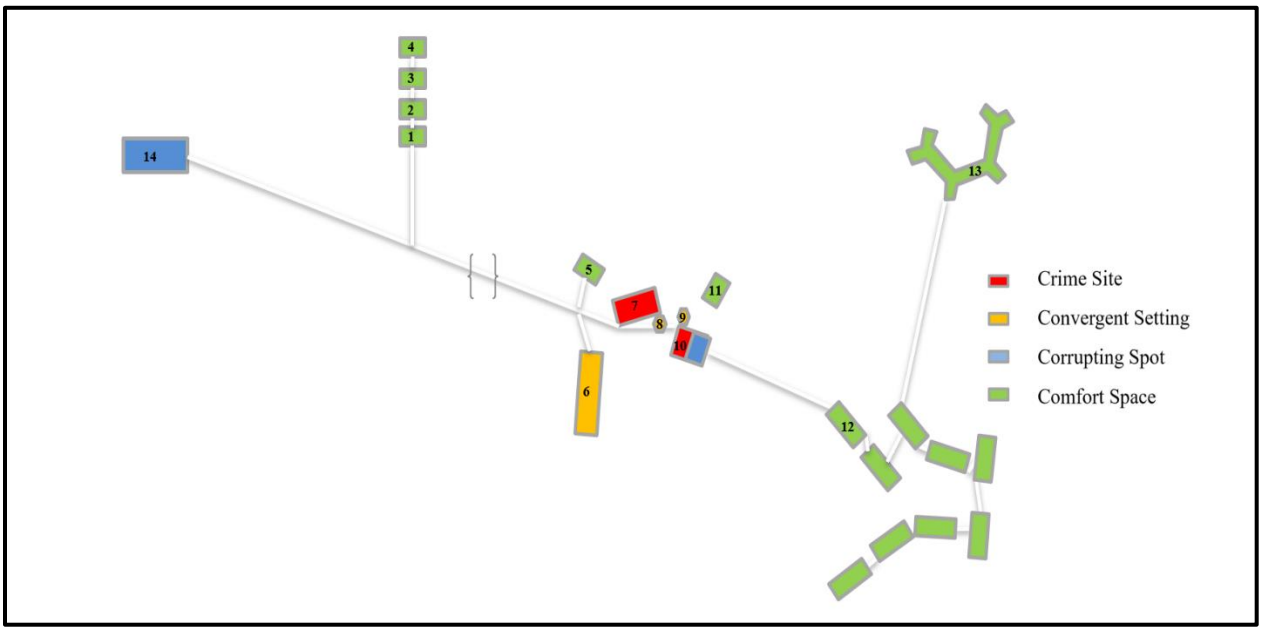


Table 5.2. Site Two Network Components

Site/Place ID	Type	Land Use	Occupied	Violent Crime	Arrests	Police Calls/Weapon Calls
2.1	Comfort space (staging)	Multi-family apt.	Yes	0	4	45/2
2.2	Comfort space (staging)	Multi-family apt.	Yes	3	0	45/3
2.3	Comfort space (staging)	Multi-family apt.	Yes	1	0	44/0
2.4	Comfort space (staging)	Multi-family apt.	Yes	0	0	16/1
2.5	Comfort space (meeting)	Commercial	No	1	0	7/0
2.6	Convergent setting	Commercial	Yes	2	8	71/1
2.7	Crime site	Commercial	Yes	7	47	313/5
2.8	Convergent setting	Bus stop	Yes	N/C	N/C	N/C
2.9	Convergent setting	Bus stop	Yes	N/C	N/C	N/C
2.10	Crime site/corrupting spot	Commercial	Yes	2	17	68/0
2.11	Comfort space	Single-family home	Yes	1	0	11/0
2.12	Comfort space	Multi-family apt.	Yes	13	46	709/22
2.13	Comfort space	Multi-family apt.	Yes	1	17	174/4
2.14	Corrupting spot	Commercial	Yes	3	6	40/1

Site Three Overview and Observations

The third site selected for intervention lies within Cincinnati's Avondale neighborhood. It is about four miles east of the first two sites as the crow flies, and about a fifteen-minute drive. Community leaders and resident stakeholders have long prioritized neighborhood safety and violence reduction as a primary goal - and for good reason. In the two years prior to PIVOT intervention at this site, nearly ten percent of the city's gunshot victims were reported in this single neighborhood. And fifteen percent of the neighborhood's gunshot victims were concentrated in the small space that composed Site Three.

Figure 5.13. PIVOT Site Three & Shootings

The landscape of this site demonstrated great variation. Divided near the middle by an arterial roadway, a substantial number of vehicles traveled through it at all hours of the day. This road was intersected by a quieter residential street, which dead-ended just past the western edge of the site. Historically, more than half of the site's gunshot victimizations occurred on these two streets. A person standing at this intersection could see almost all the twenty-three

spots where gunshot victims were struck in the past ten years - without taking a single step in any direction. To place this in proper context, two Cincinnati neighborhoods, in their entirety, have not recorded so much as a single gunshot victim in the last decade. Yet a small patch of land in this neighborhood has suffered twenty-three.

High-density apartment housing was not universal within this space, but several residences of this type were present. At the site's edge stood a nine-story affordable housing tower with 120 apartment units. Another apartment complex with many units was situated just north of the site's center, and a third high-density apartment building stood at the site's central intersection. At the beginning of the project, the apartment building at the central intersection was empty and undergoing rehabilitation. Several months into the project, the apartment building was re-inhabited. This increased the population of this small space by at least one-hundred residents. Someone walking through this area would recognize two other notable features – abandoned structures, and many single and two-family homes lining the site's streets.

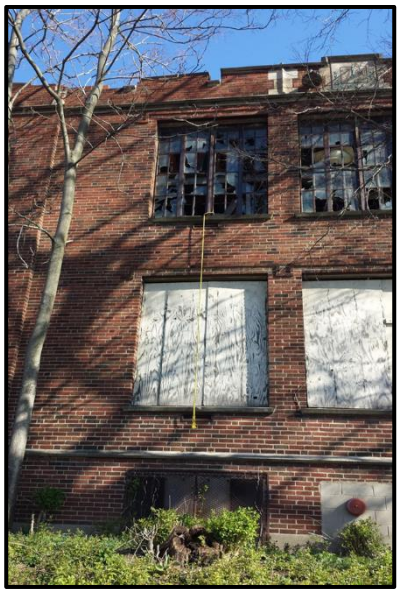
The abandonment of large structures in this space left a striking impression. These included an old school with a collapsing roof, and a three-story apartment building with many broken out windows that was dotted with graffiti. On the land which this building stood were large piles of trash and tires from illegal dumping. Figures 5.14 and 5.15 are photographs of this abandoned apartment building. The cumulative impression left by such obvious degradation, particularly of these large buildings within sight of one another, was pronounced.

Figures 5.14 & 5.15. Abandoned Apartments & Dumping Site. Photo Credit: CPD PIVOT Team

The school's first floor was boarded up, but ropes had been tied to the metal framework around the open second story windows so people could still access the structure's interior. On either end of a residential street segment, homes had burned but remained standing - noticeably damaged from past fires. Figures 5.16 and 5.17 show the front and back of the vacant school. Figures 5.18 and 5.19 show how ropes were tied to the building to circumvent the barricaded first floor. Figure 5.20 is of one of the homes that had suffered a fire.

Figures 5.16 & 5.17. Deteriorating School (Front & Back). Photo Credit: Matthew Hammer

Figures 5.18, 5.19, & 5.20. Access Ropes (Front and Side), & Burned Out House.
Photo Credit: Matthew Hammer



The third striking feature of this area was the substantial number of houses. While these properties mixed between owner occupant and rental, rentals were heavily favored. This was not surprising, as homeowner occupancy for the neighborhood-at-large is estimated at twenty-four percent.

Site Three's Place Network

Investigators identified eleven places that made up the place network within this site. These included crime sites, convergent settings, and comfort spaces believed to be providing an

infrastructure facilitating violent criminal activity. All but two sites were within the originally defined project boundary, although one sat at the site's edge. The two identified places outside this boundary line were only a few hundred feet beyond it.

Some of the clearest examples of features that facilitated violence included a partial foundation wall behind which guns were sometimes hidden, low visibility apartment common hallway areas with little-to-no natural or artificial light where drug trafficking and use occurred, and a vacant home where robbery suspects subdivided stolen goods immediately after committing an offense, just before they were apprehended by police.

Figure 5.21 below is of the partial foundation wall. Figure 5.22 shows several subjects congregated in the same space, some sitting on this wall, while one pulled a handgun out of his pocket and showed it to the others gathered around. Throughout this network were examples of private land and structures that had been long abandoned by their owner. Offenders did as they pleased on these properties without challenge from owners or place managers.

Figures 5.21 & 5.22. Lot with Partial Wall/Seat & Subject Retrieving Handgun. Photo Credit: Cincinnati Police Department

While offenders' use of public space may generate the attention of law enforcement, use of private land often requires a better understanding of ownership and private cooperation than is

usually available to police. As a result, lower-level patterns of activity appeared to have developed in this space without any intervention by anyone. Police only intervened on these private spaces when criminal conduct was blatant, and their intervention was limited to enforcement of the singular behavior witnessed by police, rather than taking action to disrupt negative patterns. This left the troubling pattern of activity in place - for lack of a clear means by which to address it.

Network Components

The figure and table below demonstrate the spatial relationship and provide basic information about network components. Counts of violent crimes, arrests, and calls to police are listed for each singular location. This data summarizes events for the twenty-four months prior to PIVOT intervention. As demonstrated in the table below, the majority of the sites in this network were not occupied or in-use for their intended purpose (i.e. vacant apartment building, disused school, abandoned house). The number of disused properties within this network was greater than any other network discussed in this paper. Eight of the eleven identified place network components in this site were not legitimately occupied. Five multi-family apartments, two single family residences, two land parcels without structures, one multi-family home, and one school made up the place network.

Figure 5.23. Site Three Place Network

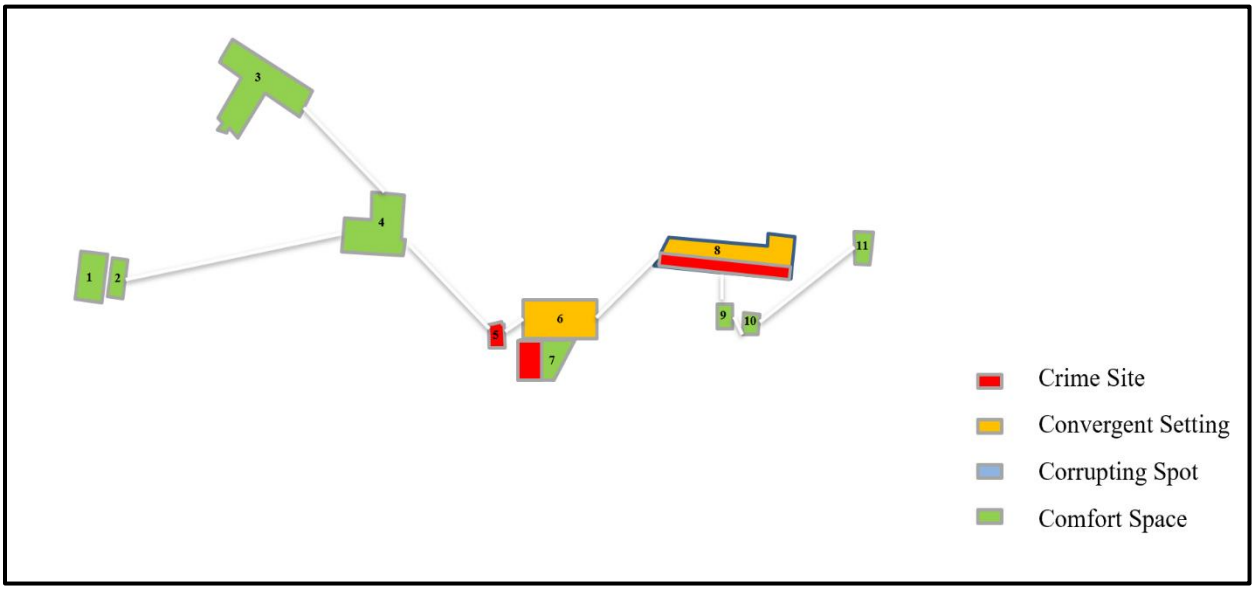


Table 5.3. Site Three Network Components

Site/Place ID	Type	Land Use	Occupied	Violent Crime	Arrests	Police Calls/Weapon Calls
3.1	Comfort space (staging)	Multi-family apt.	No	1	0	2/0
3.2	Comfort space	Land parcel	No	0	0	1/0
3.3	Comfort space (staging)	Multi-family apt.	Yes	12	14	235/9
3.4	Comfort space (meeting)	School	No	0	0	0/0
3.5	Crime site	Multi-family home	No (Yes after project)	2	6	6/2
3.6	Convergent setting	Land parcel	No	1	0	0/0
3.7	Crime site/ comfort space (supplying/meeting)	Multi-family apt.	Yes	9	12	100/8
3.8	Crime site/ convergent setting	Multi-family apt.	No (Yes after project began)	3	9	12/1
3.9	Comfort space (staging)	Land parcel	No	0	0	1/0
3.10	Comfort space (staging)	Single family home	No	0	1	2/0
3.11	Comfort space (meeting)	Single family home	No	0	2	7/0

Site Four Overview and Observations

The fourth PIVOT site was in the Avondale neighborhood of Cincinnati, as were Sites Three and Five. Police recorded forty shootings in this area over the past decade. Nine of these occurred during the twenty-four months prior to PIVOT. As visualized in Figure 5.26, shootings were most concentrated along the primary arterial roadway that proceeds generally north-south, along the leftmost side of the project area.

While this site was originally identified as systematically violent, violence ebbed in the year following this original analysis. The PIVOT team believed this occurred because a relatively large multi-family apartment building, an important network component, was emptied for renovation and remained closed for about one year. It was re-occupied in the fall of 2016.

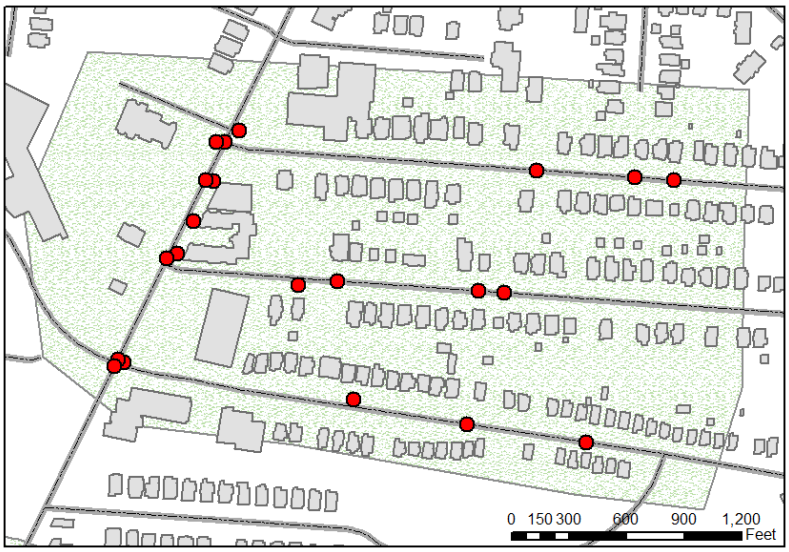
During the closure of this building, crime and violence dipped. Investigators found that those of interest to the police department moved to a building virtually identical to the one that closed, approximately one-quarter mile away (see Figures 5.24 and 5.25, the original apartment building and its suitable replacement). It appeared to investigators that this group formed a new place network nearby when the first was disrupted due to the apartment closure. Shootings in the vicinity of the new alternative location spiked. Although this area had not previously been identified as systematically violent during analysis, it was selected as the fifth PIVOT site based on these observations and outcomes.

Figures 5.24 & 5.25. U-Shaped Buildings One & Two: Photo Credit: Matthew Hammer

The team believed that to be successful in this unique circumstance, they would need to disrupt both place networks simultaneously (Site Four's network and this newly formed alternative, Site Five). Otherwise, as the original building re-opened, success in Site Five would most likely encourage offenders to shift back to the original network. And so, activities and

outcomes in Sites Four and Five were often considered together. The figures and discussion immediately below represent the original place network. Site Five, which represents the alternative network, is presented at the end of this chapter.

Figure 5.26. PIVOT Site Four & Shootings



Site Four's Place Network

Six components made up this place network. All four place-type conceptualizations were found in this network. Several locations were identified as having more than one use. This network was compact relative to others, concentrating along the same roadway where shootings clustered.

The most identifiable examples of space-use facilitating violence included graffiti referencing known groups. This graffiti sometimes referred to violent offenses and their participants. The newly renovated apartment building assumed its role as a useful crime facilitative place when it re-opened. Perhaps to draw less attention to drug market activities and associated disorder, the rear of the building now bore the brunt of illicit behavior rather than the front courtyard, which was preferred prior to renovation. Officers put a great deal of effort into

convincing the property owners to attend to access control issues at the rear doors. The urgency of the situation peaked when a suspect exited one of these doors with a rifle and fired multiple rounds at the driver of a car in the rear lot. This would have resulted in a homicide, but for a few inches difference in bullet trajectory.

PIVOT team members recovered a hidden firearm from behind a dumpster at an adjacent place network spot early in the project. Police frequently received calls for service for crowds and fights in this space. This was not surprising, as several convergent settings made up the central core of this network. A large house burned down very near the site's center during the project. While this house was not relevant to the place network, the fire was demonstrative of what all-too-often occurred in these spaces: high-order blight, public safety risk, and harms of all sorts. Sometimes it was challenging for the investigative team to distinguish between the physical consequences of criminal activity, negligence, and unfortunate circumstance. But in this instance the fire seemed to be the result of negligence, and not an outcome of purposeful criminal activity.

Network Components

Figure 5.27 and Table 5.4 represent Site Four's identified place network and components. Counts of violent crime, arrests, and calls to police are noted for each location for the twenty-four months prior to intervention. But it isn't clear how demonstrative these counts are, given that this network fell into disuse in favor of Site Five's network for a portion of the two years prior to project implementation.

Figure 5.27. Site Four Place Network

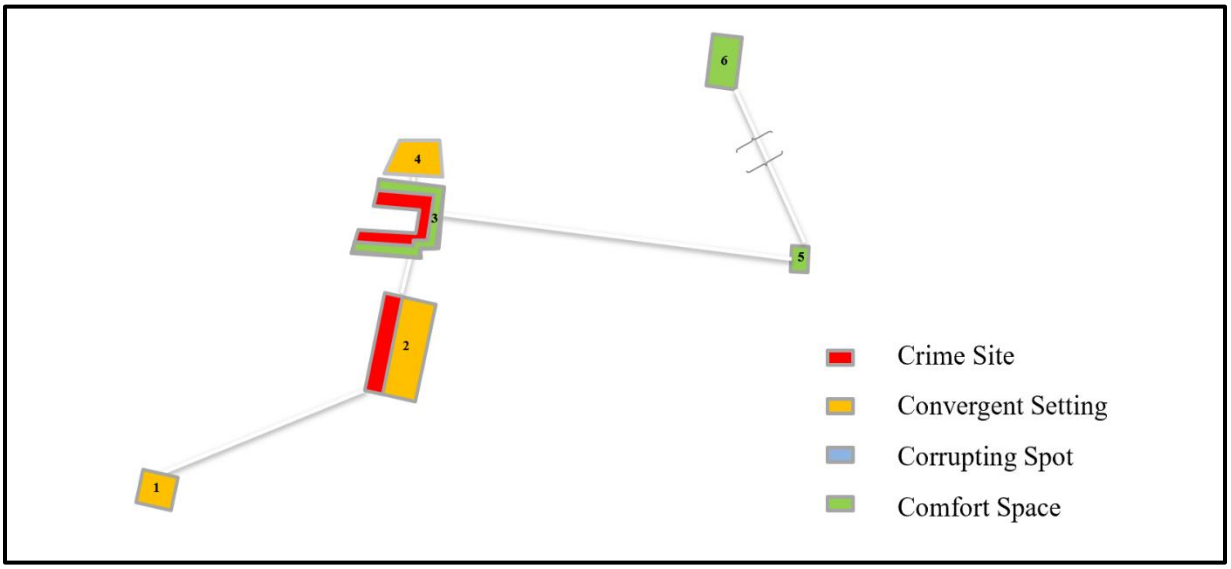


Table 5.4. Site Four Network Components

Site/Place ID	Type	Land Use	Occupied	Violent Crime	Arrests	Police Calls/Weapon Calls
4.1	Convergent setting	Public	Yes	N/C	N/C	N/C
4.2	Crime site/ convergent setting	Commercial	Yes	11	32	950/2
4.3	Crime site/ comfort space (staging and meeting)	Multi-family apt.	Yes	14	21	428/14
4.4	Convergent setting	Commercial	Yes	1	2	40/2
4.5	Comfort space (staging)	Multi-family home	Yes	1	0	11/0
4.6	Comfort space (meeting)	Single family home	Yes	1	0	5/0

Site Five Overview and Observations

Site Five was not identified by CPD in 2015's initial PIVOT suitability analysis. But in 2016, this site's central street segment quickly claimed the City's highest gunshot count. While

gun violence was not entirely new for area residents, this rapid escalation in violence was of great concern. As described previously, the timing of this change aligned with a "natural" network disruption in Site Four, leading investigators to suspect geographic displacement from Site Four to Site Five prior to any project intervention.[26]

A person standing in the center of Site Five might first notice the number of anchoring institutions within eyesight. This is perhaps the greatest uniqueness of this space, as other sites did not have this concentration of institutions so near violent hotspots. And this may be surprising to observers, given that it runs contrary to past assertions regarding the value of neighborhood social organization in reducing crime. Of the ten buildings present on the street segment where shootings were most concentrated, three were anchor institutions. A non-profit youth service center, a church, and an elementary school operated on this block, and these institutions controlled the majority of the segment's land. This raises questions about how a violent place network could successfully operate in the midst of these institutions.

Also unique to this site is that all the identified place network components were operative. None were vacant. There were relatively few abandoned properties in this project area. For these reasons, Sites Three and Five stood in stark contrast to one another in terms of abandonment and presence of socially cohesive institutions. Yet both sites, less than a mile from one another, shared the distinction of disproportionate gunshot victimization.

[26] This reference to "natural" network disruption reflects this author's thinking that disruption of place network components may occur because of a variety of factors that have nothing to do with an intention to disrupt the criminogenic use of space. In this instance, physical rehabilitation of an apartment building led to the building's closure, which had the collateral effect of denying the use of it to support criminal goals. In other instances, one might imagine demolition, change of principle use, or changes in management disconnected from any crime preventive goals, which might collaterally provide crime preventive benefit regardless of that fact that this was not the reason that motivated a change. We might consider these "natural" network disruptions.

Figure 5.28. PIVOT Site Five & Shootings

Site Five's Place Network

The identified place network within this site had the fewest components of any of the sites considered in this paper - five. No corrupting spot was noted within this network, although investigators strongly considered a market just outside the project site as potentially serving this purpose. Ultimately, it was not included in the place network after a substantial investment of time studying the market and its associated activity.

As can be seen below in Figure 5.29 and Table 5.5, this place network is small, when compared to Sites One and Two. This network was also relatively compact. Most network components were on one street segment. Perhaps this reflects the fact that this network did not have the time to develop as fully as others, given that it became a useful alternative after Site Four was disrupted.

Network Components

Components of this network included three multi-family apartment buildings, a public sidewalk, and a portion of school property. But it appeared to investigators that the primary

reason for formation of the place network was the large u-shaped apartment building at the center. Not only was it geographically centered within the network, but it appeared to play a critical facilitating role in offenders' adaptation to this location. Immediately in front of this property, the public sidewalk became a convergent setting as well as its own crime site.

Figure 5.29. Site Five Place Network

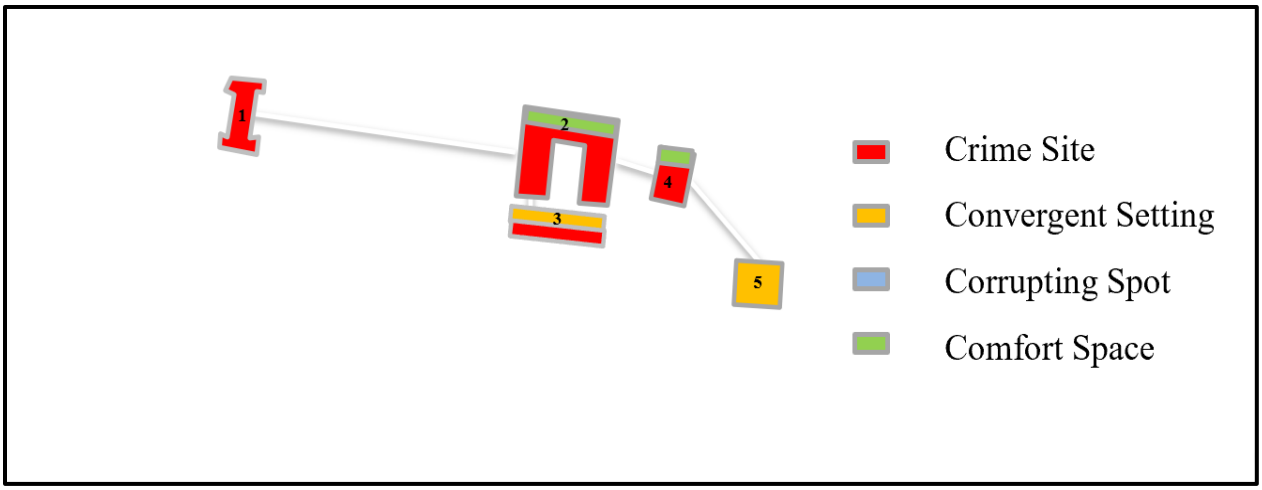


Table 5.5. Site Five Network Components

Site/Place ID	Type	Land Use	Occupied	Violent Crime	Arrests	Police Calls/Weapon Calls
5.1	Crime site	Multi-family apt.	Yes	2	6	105/3
5.2	Crime site/ comfort space	Multi-family apt.	Yes	8	14	305/32
5.3	Crime site/ convergent setting	Public	Yes	N/C	N/C	N/C
5.4	Crime site/ comfort space	Multi-family apt.	Yes	4	6	74/5
5.5	Convergent setting	School	Yes	N/C	N/C	N/C

Describing Cincinnati's PIVOT Sites – A Final Word

Having had the opportunity to thoroughly look at each of these sites, the variation in housing density and population, land use, and physical deterioration between sites, there are

fewer commonalities than I would have expected prior to this project. Working two simultaneous project areas with populations and space-use differences approaching an order of ten, with relatively similar shooting and violent victimization counts challenges associations between population volume and crime.

While it is beyond the scope of this dissertation, these observations also challenge some of the criminological theories of the past, including some neighborhood-level theories. In Avondale, for instance, nearly forty percent of the neighborhood's gunshot victimization (2015-2016) occurred inside these three sites. Yet these make up only about twelve percent of the neighborhood's land mass. These sites experienced more than three times the number of shooting victimizations we would expect if shootings were evenly distributed throughout the neighborhood.

With such physical and social contrast among sites that nevertheless produced similar shooting counts, it would seem that we should focus on features that were present in all of the sites, such as offenders' ability to use places in a criminogenically supportive network, particularly where place management was insufficient or absent.

CHAPTER 6
THE PIVOT INTERVENTION

"And let us not be weary in well doing: for in due season we shall reap, if we faint not."

- *Galatians 6:9-10*[27]

The focus of Chapter Six is the PIVOT intervention and its component parts. I provide an overview of project participants both inside and outside of the police department in this chapter. I also provide detailed explanations of interventions that were applied to disrupt crime place networks. I compare and contrast PIVOT interventions with other widely known and applied policing strategies, such as community policing and engagement, broken windows policing, deterrence applications, and working with property managers.

The CPD Team

The Cincinnati Police Department formed a full-time team of sworn officers and civilian analysts in the spring of 2016, to operationalize the PIVOT strategy. This author, a CPD Lieutenant, was installed as the PIVOT Unit Commander. The PIVOT Unit was originally composed of two squads. The PIVOT Squad was directly supervised by a police sergeant and included between two and four full-time police investigators during the projects described in this dissertation. The Crime Analysis and Problem Solving Squad (CAPS), likewise consisted of between two and four civilian crime analysts during the evaluation period (see Hammer, 2018 for additional details). CAPS mission was not exclusively PIVOT, but included supporting PIVOT through analytics.

[27] Reygan Cunningham used this biblical quote to close her plenary on Oakland's story, as it relates to gun violence (National Network of Safe Neighborhoods 2019 Conference, NY: NY). It seems a fitting reminder of the importance of remaining committed to the merits of violence prevention despite the many challenges.

The City-Wide Team

With recognition that place-based efforts often extend beyond the traditional range of police responses, Cincinnati's city manager directed that a team of stakeholders be formed to work on PIVOT sites. These stakeholders included representatives from nearly all City departments, including Law, Buildings, Economic Development, Department of Transportation and Engineering, and the Cincinnati Recreation Commission. In addition, several non-profit stakeholders were identified and asked to participate on this team, including Keep Cincinnati Beautiful, the Community-Police Partnering Center, and the Hamilton County Port Authority. A few select community stakeholders were also asked to participate in these meetings, such as neighborhood council presidents and particularly engaged residents.

This team of stakeholders met nearly every two weeks to discuss project sites and goals. Facilitated by CPD PIVOT leaders, the team worked through the process of analysis and place network identification, development and implementation of responses, and ongoing assessment, cyclically, until projects were completed. Selected interventions are presented in the paragraphs that follow.

Interventions

One way to organize PIVOT interventions is to sort them by the scale of the unit upon which they are believed to intervene – whether macro or microspatial. Many interventions were highly targeted, intended to disrupt one address - one single component of the place network. But others were aimed at generating a wider-ranging effect, sometimes on the entire PIVOT site or on the neighborhood within which the site was located. The latter will be discussed first,

compared to and contrasted with other, more widely used applications of community engagement and deterrence.

Community Engagement and Deterrence

Raising Awareness

CPD PIVOT personnel engaged community stakeholders in a variety of ways in every site to raise public awareness about shootings and the PIVOT strategy intended to address gun violence. The team engaged groups that were already working in these communities (i.e. Westwood Uniting to Stop the Violence). PIVOT personnel attended community council and other regular public meetings in affected communities, and routinely spoke at those gatherings – describing the problem, explaining the strategy, reporting current conditions, and soliciting public assistance.

The team created door hangers and disseminated them throughout project spaces. A web address was created to serve as a repository for PIVOT information. A PIVOT hotline number was also created to solicit information and community feedback. Surveys were used throughout projects. Surveys were administered in a variety of ways. Some were given by PIVOT partners (i.e. Community-Police Partnering Center). Others were given by community volunteers who walked project sites. Still others were handled by CPD personnel directly, either in-person or online.

Police-community engagement is nothing new. But it sometimes seems that engagement is the goal unto itself. A critic of some police-community engagement strategies might ask, if we built a better relationship but then did nothing else with it, wouldn't our problems remain unsolved?

A distinguishing feature of engagement within this project is that engagement was not the ultimate goal. *Engagement was understood to be a critical step*, necessary to accomplish other goals. By improving communication and public trust, problems could be more properly identified and commonly understood. Legitimacy could be built so that the community would be more likely to permit unorthodox police responses. And all of this ultimately supported the principle goal of reducing shootings in historically violent spaces.

Deterrence

The PIVOT team remained connected to the offender-oriented partner, the Cincinnati Initiative to Reduce Violence (CIRV), throughout project work. One component of CIRV is its Street Outreach Worker program. Sometimes ex-offenders themselves, outreach advocates find and engage potentially active offenders, wherever they might be. PIVOT team leaders asked for street-workers' support in project areas, at convergent settings where active offenders were known to spend their time. This was viewed as potentially impactful in two different ways. In addition to offering services and methods of desistance directly to those thought to be actively engaged in violence, responding directly to hot locations injected pro-social guardians and handlers into these spaces.

At one site, a community leader revived a past neighborhood practice of posting signs throughout the neighborhood that communicated a message of concern regarding drug dealing – and a warning that police would be called to enforce the law. This leader placed signs at the very spaces where drug dealing was a problem (see Figures 6.1 and 6.2). The CPD PIVOT team later added City signage nearby reinforcing the police-community partnership, mirroring the messaging already displayed on community produced signage (Figure 6.3). The intent of this

effort was to deter illicit drug dealing and associated violence – but it was highly spatially focused to directly draw the attention of those engaged in these activities.

Figures 6.1 & 6.2. Community Signs (Near & Far). Photo Credit: Matthew Hammer

Figure 6.3. Collaborative Signs. Photo Credit: Matthew Hammer

Directed patrol strategies were implemented in all sites at various times. These were implemented as a method of triage when areas seemed particularly unstable or violent. The team

continued high-profile directed patrols until other interventions could take hold and stabilize spaces. Once stabilized, resource intensive patrols would be removed.

Each of these interventions were intended to influence the entire PIVOT site. They may be interpreted as an application of deterrence. These applications of deterrence are much more focused than general deterrent efforts which might include citywide messaging regarding the consequences of breaking a state law or municipal code. This method seems better supported by evidence, which suggests that general deterrence efforts are relatively ineffective, but focused efforts may be more impactful. Other interventions were more focused spatially, intended to disrupt the mechanics of a single component within a network of places. A description of site-specific interventions is presented in the following paragraphs. They are considered against the frameworks of broken windows and theory relating to property management.

Broken Windows

Broken windows theorists argued that attending to small things, such as issues of blight, disorder, and disrepair would reduce larger problems like drug dealing and shooting victimization. "It argued that, just as a broken window left untended was a sign that nobody cares and leads to more and severe property damage, so disorderly conditions and behaviors left untended send a signal that nobody cares and results in citizen fear of crime, serious crime, and the 'downward spiral of urban decay'" (Kelling & Bratton, 1998; 1219; see also Wilson & Kelling, 1982). And in descriptions of PIVOT, broken windows theorists may find resonating narratives. There are fundamental differences between PIVOT's application and traditional broken windows policing, however. While broken windows theorists focused on neighborhood conditions and the potential for poor conditions to be perceived as criminally permissive, PIVOT's application is highly focused on the places where violence *is* occurring, and generally

on places *where offenders have acted upon* existing opportunities rather than where we think they might.

PIVOT interventions have included convincing, cajoling, or compelling property owners to attend to issues of blight, such as trimming overgrown foliage, cutting tall grass, removing unsightly trash, and painting over gang graffiti. But the circumstances under which each are identified for intervention is fundamentally different than traditional broken windows policing, which would encourage all owners to better attend to the physical order of spaces under their control.

Two problems exist with the traditional broken windows approach. First, it invites collateral consequence. Lacking focus and addressing blight and low-level criminal activity anywhere it exists may cause large areas to be blanketed with punitive low-level violations. This could invite frustration, anger, and resentment from the community. This could be particularly true in areas where serious and violent crime thrives, and where residents may feel that the government is not properly attending to the most harmful issues. Instead it may be perceived as focusing on people whose problems are an expression of resource limitations rather than criminal propensity. This point aligns with Haberman et al.'s recent finding that "perceptions of crime do not link to satisfaction with police, but perceptions of procedural justice do. . . In short, reducing crime and thereby improving citizens' perceptions of crime do not appear to be enough to improve citizens' satisfaction with police; rather, police departments likely need to implement hot spots policing tactics that are mindful of treating citizens fairly . . ." (2016; 542).

Second is the matter of resource-need dissonance within local government. Rarely are there enough resources to systematically address all blight in a way that would impact higher-level problems. If visualizing community problems as a triangle, where blight and disorder

occupy the low half, and violence and shootings the upper tip, a bottom-up approach would require far more resources than the alternative. By attempting to address all blight in neighborhoods, local governments have embarked on an endeavor they are far from being able to achieve. Because of this, little noticeable impact what-so-ever seems the most likely result.

Within PIVOT, the team is asked to prioritize blight much differently than would be suggested by "broken windows". By carefully studying physical features supportive of violence, the tall grass that becomes an intervention point is the overgrown parcel where weapons are being hidden. The building code features that are prioritized for correction are those contributing directly to violent behaviors and risky activities that lead to violence, such as unsecured doors and structures that are known to be used by violent offenders. While PIVOT supports the notion that general levels of community blight might be improved, and the team supports neighborhood cleanups and beautification efforts, there is not an expectation that this generalized effort will produce any short-term shooting reduction. PIVOT investigators do not highly prioritize the systematic identification and removal of all blight. Instead they seek direct connections between the two in as highly focused and specific a way as they are able.

While Kelling and Bratton theorized that the link between "broken windows" and serious crime was a five step process where disorder led to fear, which led to withdrawal, increased predatory behavior, increased crime, and ultimately a "spiral of decline" (1998; 1219), the PIVOT approach recognizes the direct connection between *some blight* and criminogenic opportunities a place provides. When it is directly connected, it is prioritized for intervention.

This distinction can easily be lost, and it is a critically important one. Particularly when working in areas suffering from extensive physical degradation (as has been expressed in all of the PIVOT sites to-date), it is this author's opinion that the difference between success and

failure of these projects lies in understanding how critically important it is to properly prioritize problems.

In the most physically degraded PIVOT project sites (recall these are only a few blocks), city resources may become overwhelmed once the volume of dilapidation, blight, and health hazards is fully understood. The cost of repairing all blighted and hazardous properties in a single site could easily exceed a million dollars. When considering the scope of these problems in many urban areas, it is easy to see how quickly governmental resources might be expended if they are not used efficiently. Problem-based prioritization is critical. Mission-creep must be avoided.

Place Management

It should be no surprise, given opportunity theory and the recent development of a theory of place management, that place managers would play an important role in place network disruption. Madensen defines place management as ". . . a set of four interrelated processes: (1) physical space organization, (2) regulation of conduct, (3) access control, and (4) resource acquisition" (2007; 3). Organized within this framework, I discuss several project interventions in the next few pages.

Some have recently argued that the place manager's role in influencing criminal events has been sometimes understated, and other times completely neglected. A newer line of thinking suggests that informal social controls, collective efficacy, and guardianship may all be influenced by the decisions place managers make. "Ownership provides property rights. Because of these property rights, owners have power over the behaviors of place users. The management function includes, but is far from limited to, guardianship. Much of what we perceive as guardianship

stems from intentional actions of owners" (Eck and Herold, 2018; 269). Eck and Herold claim that there are four types of place managers whose decision-making ranges from reactive to proactive in influencing crime events. Eck and Herold consider these managers to be reactors, enablers, promoters, or suppressors (2018; 281). The line of thinking that claims place managers have great power over the production and expression of crime events resonates with PIVOT strategy interventions. Some PIVOT efforts could be characterized as attempts to transform reactive managers into crime suppressors.

Physical Space Organization

In one project site, the team worked with the Department of Buildings and Inspections to compel a store owner to re-organize his parking lot which was the site of drug trafficking and other illicit activity. He was ordered to move his dumpster from a street-front position where it provided cover for drug dealing and public gaming, to a fenced-in location adjacent to his building, as code required. The same owner was cited for allowing a private vendor to operate on his parking lot against regulation. He was encouraged to properly remove a partially demolished structure that remained on the edge of his lot, and to resurface and properly stripe the lot. These efforts better organized the space, communicated intended use, and reduced criminogenic benefits.

Regulation of Conduct

The same place manager was also challenged to regulate conduct occurring on his lot and in his business. He posted signs limiting the amount of time parking was permitted on his lot and indicated that parking was for his customers only. He enforced this by monitoring the lot via CCTV, leaving notes on cars in violation, and warning that vehicles would be towed if

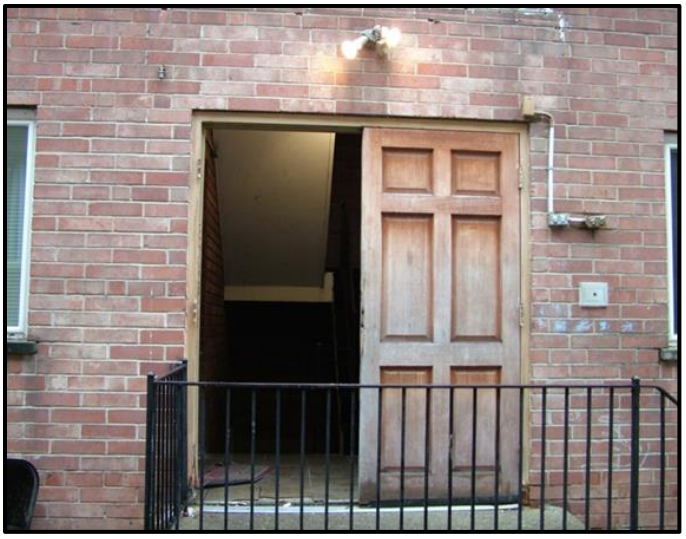
necessary. These efforts were intended to regulate conduct in this space, to reduce non-customer drug trafficking and associated violence in his lot.

Access Control

Offenders need access to places in order to take advantage of the opportunities they provide. Not surprisingly, it was obvious at place network locations that access control features had often been defeated. Broken common-door locks were frequently found. These were noted in nearly every multi-family place network property in all five sites. Door handles were entirely missing in some cases. In one instance, the door itself was gone.

Figures 6.4 & 6.5 Missing Door Locks (1 & 2). Photo Credit: Matthew Hammer

Figure 6.6. Missing Door. Photo Credit: CPD PIVOT Team



One might easily see why it is important to restrict access to residents and their visitors in a multifamily building. Yet within these project sites, this problem was pervasive and persistent. Managers were generally reluctant to do more than complain to PIVOT investigators that even if they did replace broken mechanisms, the locks would surely just be broken again. During the time in which these conversations were ongoing with one place manager, an individual ran in and out of a broken common hallway door of one of the properties with a rifle, firing rounds into an occupied vehicle in the building's rear lot, before disappearing back into the building with his rifle. The driver narrowly escaped with her life. While the relevance of access control in some instances might be contested, it seems clear that uncontrolled spaces present greater risk of violent victimization than those that are properly controlled.

The building without a front door had gang-related markings scrawled throughout its basement laundry room, including anti-police graffiti. Territorial declarations via graffiti were observed throughout PIVOT project spaces. In some instances, locations of particular significance were specifically marked. Where common areas were not access controlled, it was

not uncommon to find graffiti along walls inside hallways. While the PIVOT team regularly challenged managers to take access control seriously, it was rarely improved, and only after nauseating levels of persistence.

Resource Acquisition

Resource acquisition is an important place management feature, but perhaps the hardest for police to influence. While a business' ability to address at least two of the other three features is incumbent upon the resources available to do so, the divide between government and private enterprise makes governmental intervention in owners' resource acquisition plans problematic. One instance where resource acquisition may have been influenced, was when the PIVOT team worked with a business owner to discourage actions supportive of drug market activity.

The business owner seemed to believe that if he didn't have drug dealers as customers, he would have no customers at all. But as he engaged in actions discouraging illicit behavior, loitering and disorder went down, and he reported that his sales correspondingly went up. This additional revenue was potentially available for enterprise re-investment, thereby improving his ability to control access and organize the surrounding physical space at his business.

Table 6.1 summarizes the array of interventions that were discussed in this chapter and includes the scale at which each intervention was believed to produce an effect, the types of crime places interventions were launched against, the frameworks that were applied, a summary of the intervention, and the sites where these strategies were used. These are specific examples of the interventions that were applied to provide an outline of the mechanics, rather than providing a comprehensive list of all activities.

Table 6.1. Intervention Array

Scale	Type	Operational Framework	ORCA Frame	Intervention Type	Sites Applied
Sitewide	Various	Community Engagement		Raising public awareness (speaking about problems at public meetings, distributing information, etc.)	All
Sitewide	Various	Community Engagement		Survey implementation	All
Sitewide	Various	Deterrence		Street outreach at problem sites	All
Sitewide	Various	Deterrence		Preventive signage placed at key locations throughout site	Site 1
Sitewide	Crime Sites	Deterrence		Uniformed, high-profile directed patrols	All
Address/Point	Crime Site/ Convergent Setting	Place Management	Organizing Space	Reorganizing space (e.g. move dumpster, stripe lot, cut grass, remove brush, restrict parking) Comply with code against outside vending on property Finish demolition of partially demolished outbuilding	Site 1
Address/Point	Crime Site/ Convergent Setting	Place Management	Regulating Conduct	Limit time on lot/business for customers only	Site 1
Address/Point	Crime Site	Place Management	Regulating Conduct	Add lighting/Repair lighting	Site 1/Sites 3-5
Address/Point	Comfort Spaces	Place Management	Regulating Conduct	Improve lease agreements/house rules	All
Address/Point	All	Place Management	Regulating Conduct	Placement of CCTV/signage	All
Address/Point	Comfort Spaces	Place Management	Access Control	Repair/replace common hallway locks	All
Address/Point	Crime Site/ Convergent Setting	Place Management	Resource Acquisition	Encouraging business practices that improve customer safety	All

CHAPTER 7
PIVOT'S IMPACT

In the previous chapter I provided a detailed explanation of the PIVOT intervention. In this chapter I focus on the impact of the strategy. The evaluative challenges first presented in Chapter Three include project sites' small geographies, dependent variables' relative infrequency, and the overall exploratory nature of this work. To address these challenges, I use paired sample t-tests, ARIMA modeling, and techniques designed to handle non-normally distributed data to perform multivariate tests of PIVOT's impact at each project site.

CPD Internal Reports

The Cincinnati Police Department used three major evaluative components to internally measure PIVOT project impacts. First, the department counted shootings before and after the project. Second, CPD used a violence score (see Christenson, 2017). This metric included shootings, gun crimes, and gun-related calls for service, weighted by recency and severity. Finally, CPD measured intervals between shootings within project sites.

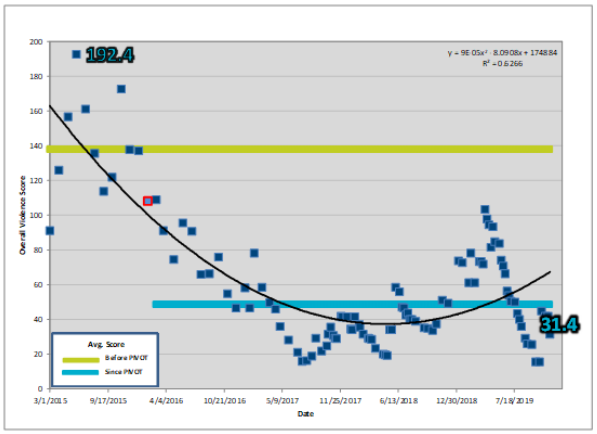
CPD reported positive outcomes across all five sites for each of the three evaluative frames. The Department reported shooting declines after PIVOT intervention and increases in intervals between shootings. Violence scores generally declined at each of the five sites (Cincinnati Police Department, 2019). CPD violence score and shooting interval charts are presented below.

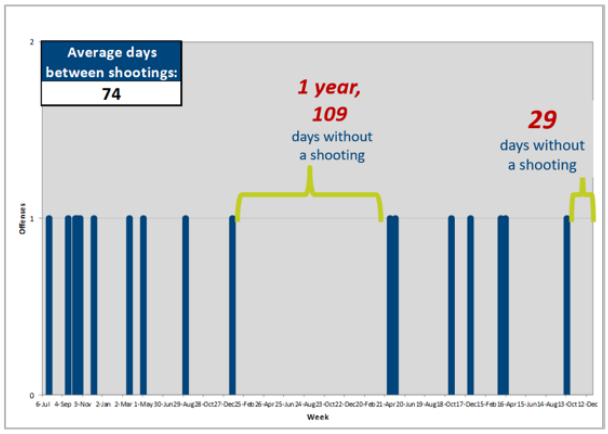
CPD Internal Information

Violence score charts and shooting interval charts were created by CPD analysts. These reports, in conjunction with routine verbal reporting on shooting counts in project

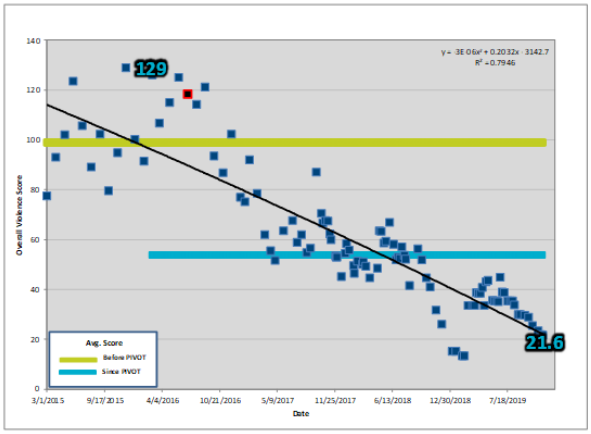
neighborhoods, were the primary metrics reported by police to the multidisciplinary PIVOT team. Most commonly, the CPD PIVOT team reported this information at the All-City Department PIVOT meetings, held every two weeks. These charts included pre-project data and were continually presented even after projects were completed. These CPD charts for the first five sites, updated through November 17, 2019, are presented below in Figures 7.1-7.10.

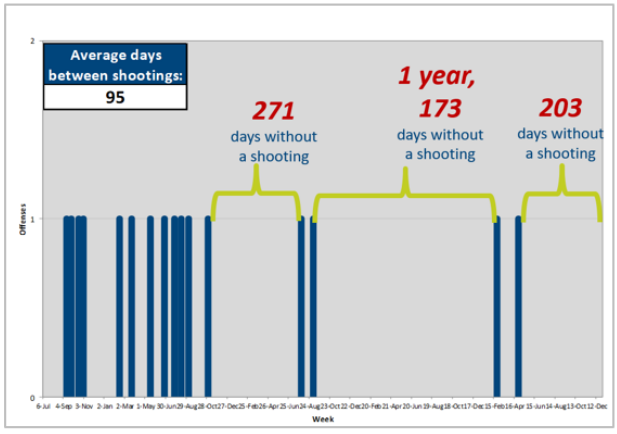
Figures 7.1 & 7.2. CPD Site One (Violence Score & Shooting Intervals)



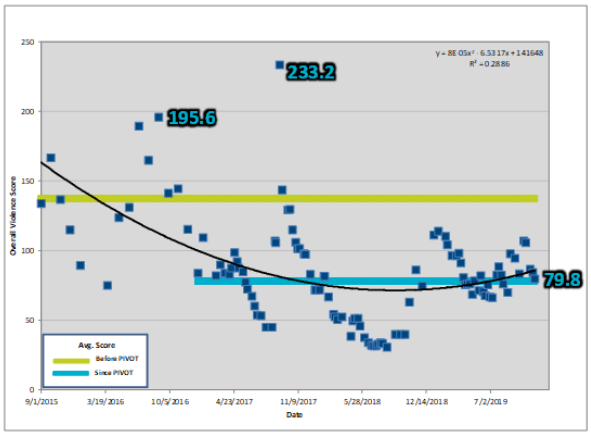


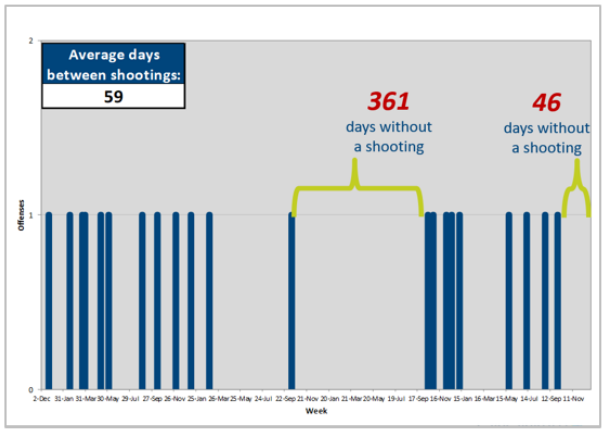
Figures 7.3 & 7.4. CPD Site Two (Violence Score & Shooting Intervals)



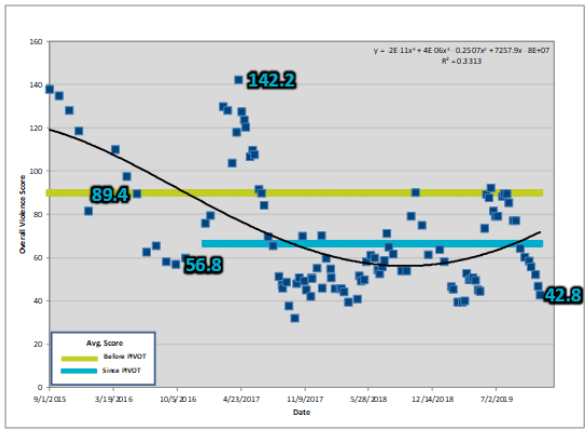


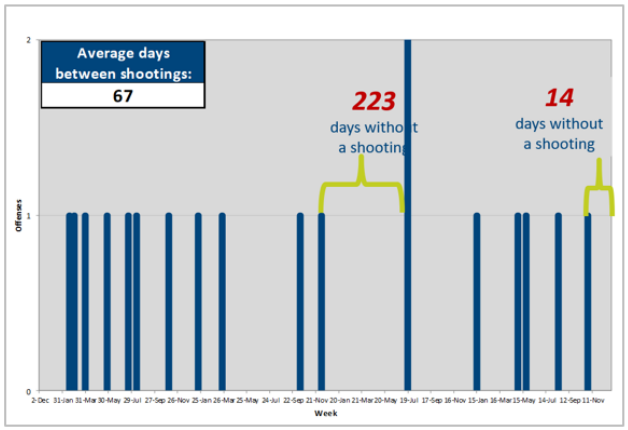
Figures 7.5 & 7.6. CPD Site Three (Violence Score & Shooting Intervals)



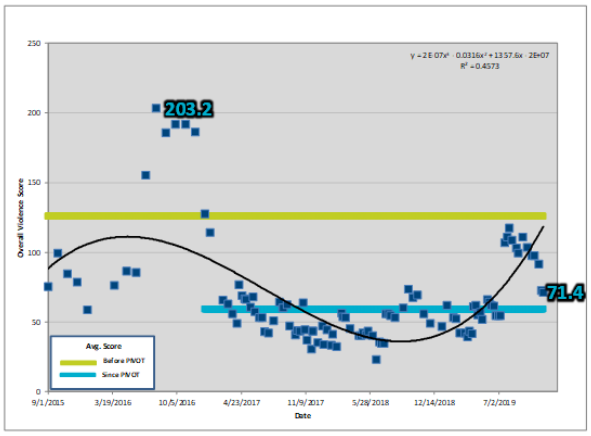


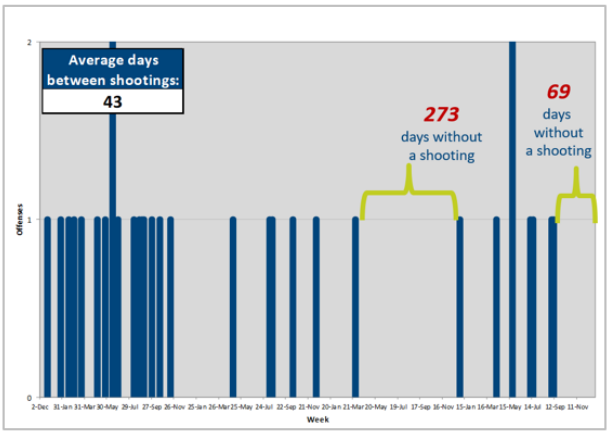
Figures 7.7. & 7.8. CPD Site Four (Violence Score & Shooting Intervals)





Figures 7.9. & 7.10. CPD Site Five (Violence Score & Shooting Intervals)





The Purpose of CPD Analytics

CPD's analysis was not created to perform a full evaluation of the strategy. Rather, it was used for internal monitoring of the outcomes the team hoped to influence, and to report the current status of shootings, shooting intervals, and the composite picture of gun-related reports to police and project partners, regarding project areas. These process measures may be of some use in understanding the impact of the strategy, but they do not replace a full evaluative framework.

Limitation of these Reports

The metrics used by CPD serve an important purpose to the strategic operations team. But they are less informative to outside audiences interested in understanding the impact of the PIVOT strategy. External evaluation generally includes data collection and organization that allows for statistical testing, so that readers might rely on more than visual assessments of charts, to aid them in determining if declines are significant beyond random fluctuations.

Those who complete rigorous program evaluations also consider the possible influence of other factors, either controlling for the influence of these other factors within statistical models, or by otherwise exploring their potential impact on variation in the dependent variable. This is important so that we might avoid drawing spurious conclusions.

In the following paragraphs, I present the results of my evaluation of the PIVOT strategy, following the process I previously outlined in Chapter 3's methods section. While the data that are evaluated are generally the same as those used by CPD, the evaluative methods I used included rigorous statistical tests and control variables. In instances where it was inappropriate to include potential confounders within my statistical models, I addressed their potential influence with separate analysis. As such, the evaluation in this dissertation more fully informs

those outside of the project team who are interested in understanding the effect of the PIVOT strategy.

Descriptive Statistics

The following models use three outcome variables: gunshot victim counts, violent crime counts, and weapon related calls for service recorded within each PIVOT site (those highly violent areas selected for intervention that encompass approximately one-twentieth of a square mile), summed monthly. My principle independent variable is a binary measurement of the PIVOT intervention (off = 0, on = 1). I also use two independent variables as controls in the multivariate models: building permit counts, and monthly average temperature. Descriptive statistics for the five non-binary variables are listed in Table 7.1 below. The dataset used to create these descriptive statistics included all monthly measurements for each of the five sites during the five-year period from January 2014 through December 2018. Sixty measurements were made for each site for the purpose of this descriptive table (N=300). The intent of this descriptive analysis is to gain insight into the population characteristics of data from which this sample is drawn.

Table 7.1. Descriptive Statistics Continuous Variables

Variables	Mean	Std. Dev.	Min	Max
Shooting Victims	0.36	0.74	0	6
Violent Crimes	1.19	1.28	0	6
Weapon Calls	4.08	3.19	0	22
Temperature	55.18	16.53	23	78
Building Permits	0.99	1.49	0	13

Pre-Post Descriptive Analysis

During the times Sites One and Two were evaluated, city shooting victims increased slightly. In comparison, the two PIVOT sites experienced substantial shooting declines. During the times Sites Three, Four, and Five were evaluated, city shooting victims declined modestly. Shootings in PIVOT Sites Three, Four, and Five declined far more. This data is displayed below in Table 7.2. Similar patterns are present in violent crimes and weapon calls, although site reductions are less pronounced and city weapon calls appear stable (see Tables 7.3 & 7.4).

Table 7.2. Shooting Victim Counts

	Time 1			Time 2			
	Site 1	Site 2	City*	Site 3	Site 4	Site 5	City*
24 Months Pre	26	8	817	14	9	12	838
24 Months Post	2	7	820	6	3	1	730
Count Change	-24	-1	3	-8	-6	-11	-108
Percent Change	-92.31	-12.5	0.37	-57.14	-66.67	-91.67	-12.89

Table 7.3. Violent Crime Counts

	Time 1			Time 2			
	Site 1	Site 2	City*	Site 3	Site 4	Site 5	City*
24 Months Pre	33	29	5,109	44	45	29	5,139
24 Months Post	18	19	5,129	27	35	14	4,617
Count Change	-15	-10	20	-17	-10	-15	-522
Percent Change	-45.45	-34.48	0.39	-38.64	-22.22	-51.72	-10.16

Table 7.4. Weapon Calls

	Time 1			Time 2			
	Site 1	Site 2	City*	Site 3	Site 4	Site 5	City*
24 Months Pre	88	68	15,438	152	117	111	15,304
24 Months Post	59	68	15,660	101	93	83	15,165
Count Change	-29	N/A	222	-51	-24	-28	-139
Percent Change	-32.95	0	1.44	-33.55	-20.51	-25.23	-0.91

*Note: For shootings, City Time 1 represents all reported events citywide for 24 months pre and post PIVOT, excluding PIVOT Sites One and Two. City Time 2 represents all events citywide for 24 months pre and post PIVOT, excluding Sites One through Five.

Time Plots

Time plots help visualize trends. While it can be difficult to find the signal for the noise when studying low count data, several techniques have been previously applied to help accomplish this goal. One such technique is the use of a moving-average to smooth data depictions. After exploring several possibilities, I found the most useful visualization to be monthly count data, averaged over twelve-months. This method is helpful for two reasons. First, it serves to smooth low-count occurrence graphs in order to better understand if trends exist. Second, twelve-month averaging removes the potentially confounding seasonal influence that might otherwise interfere with the interpretability of chart trends. I chose to visualize five years of data for these graphs. Because of this, the reader will note differences in the placement of the vertical line, which denotes PIVOT intervention, as project start dates were staggered. The gray line with markers depicts shooting victim counts, monthly. The heavy black line represents the same data, twelve-month averaged (and therefore lagged in the chart until eleven prior data points could be included in the calculation).

These charts reveal noticeable differences in shooting victimization trends, as would be expected given the declines that were reported in pre-post shooting comparisons, in Table 7.2. While sites Three and Four generally showed stable and high shooting victimization prior to PIVOT, Sites One, Two and Five showed that shootings were increasing prior to PIVOT intervention.

Some similarities are also noted across Figures 7.11 through 7.15. In each instance shootings declined following the PIVOT intervention. In each instance this appears to generally align with the intervention date, accounting for data lag due to twelve-month averaging. And in each instance shooting measurements descended to zero for multiple monthly time periods after PIVOT intervention. This is an important note, as there is only one instance where twelve-month averaged values were zero in pre-project time periods (reference Figure 7.12, Site Two, the three oldest pre-project measurements). Site Two's decline appears least pronounced and most lagged, which is not surprising, given this site had the smallest shooting reduction overall.

Figure 7.11. Shooting Victims Site One (smoothed)

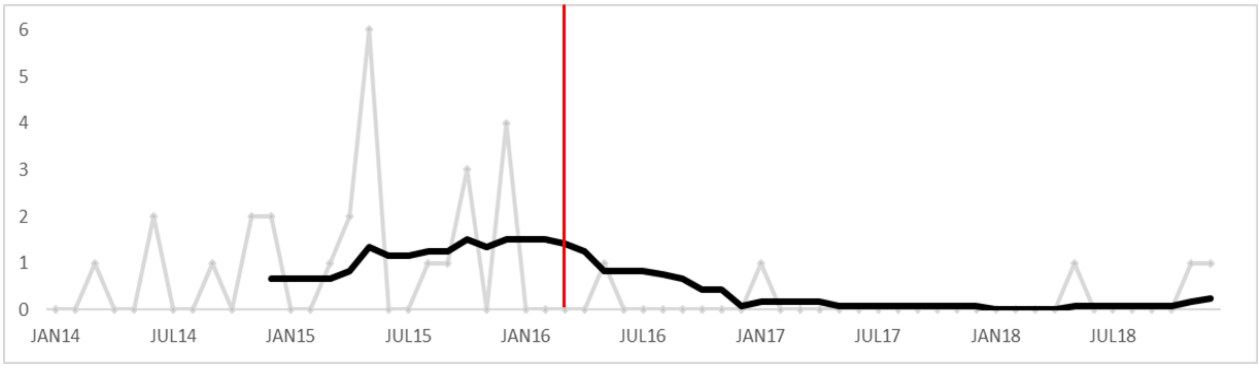


Figure 7.12. Shooting Victims Site Two (smoothed)

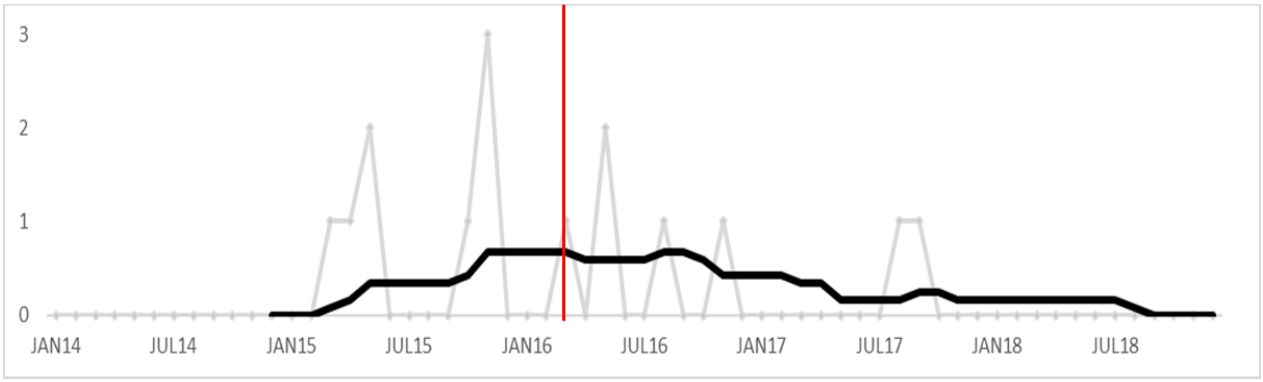


Figure 7.13. Shooting Victims Site Three (smoothed)

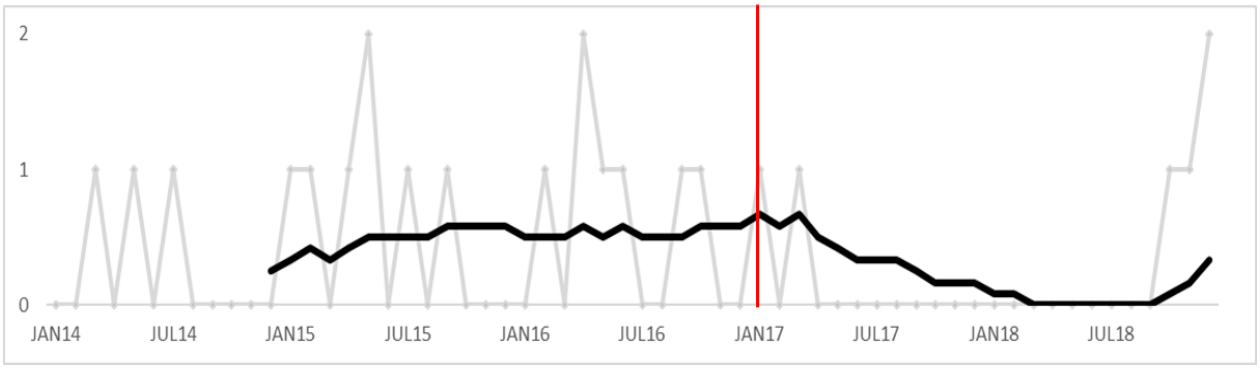


Figure 7.14. Shooting Victims Site Four (smoothed)

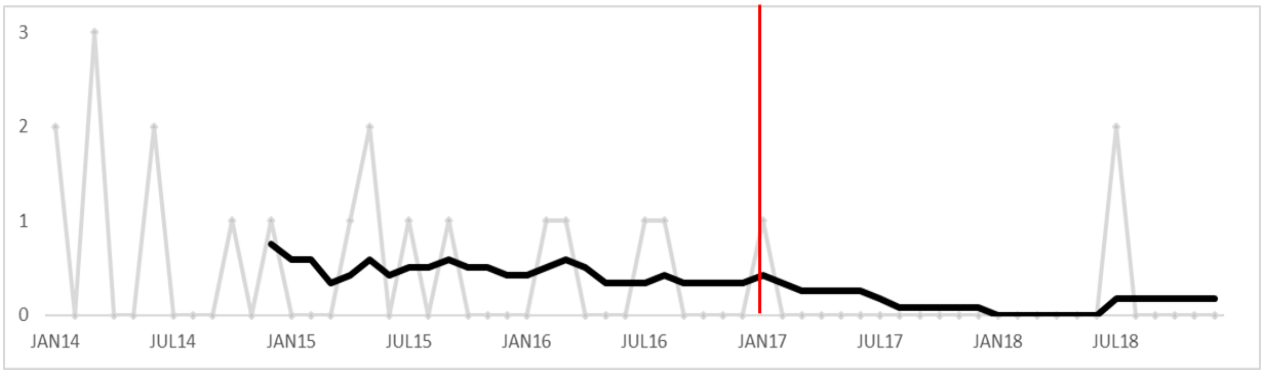
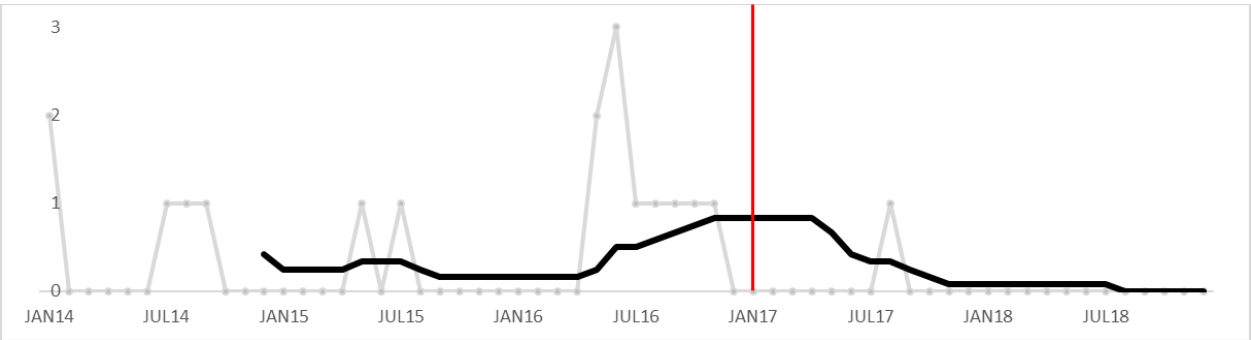


Figure 7.15. Shooting Victims Site Five (smoothed)



I prepared similar charts for the other dependent variables, violent crime, and weapon related calls for service. These charts appear in Appendix A and B. In most instances, declines are noted during post intervention periods for both alternative data sets. In some instances, declines appear less pronounced than those observed in shooting victimization figures. Site Five's violent crime visualization appears relatively balanced in pre and post time periods. More obvious declines are observed in the shooting data visualizations, above. Weapon-related call figures appear stable in Sites Two and Three.

These descriptive data suggest PIVOT may have had a positive impact. Though the impact varied by site, descriptive data indicates PIVOT was useful in all sites. But these data do not address the theoretical possibility that declines may have been because of chance. To address this concern, I used paired sample t-testing.

Paired Samples T-Tests

The first statistical test I performed was paired sample t-testing. This is appropriate, given that the dependent variable values represent repeated measurements of the same site under different conditions. I performed this test for each intervention site, comparing twenty-four monthly measurements prior to the intervention to the same number of monthly measurements

after the intervention began. The purpose of this test was to determine whether a statistically significant difference was identified between the mean values in the paired samples (pre/post). Table 7.5 below shows the results of the five paired sample t-tests, modeling shooting data.

Table 7.5. Shooting T-Test Summary

	Mean Pre	Mean Post	t-value	df	Significance
Site 1	1.08	0.08	3.36	23	0.003***
Site 2	0.33	0.29	0	23	1
Site 3	0.58	0.25	1.908	23	0.069*
Site 4	0.38	0.13	2.032	23	0.054*
Site 5	0.5	0.04	2.871	23	0.009***

T-tests were also performed for each of the five sites using violent crime and weapon related calls for service, reported in Tables 7.6 and 7.7. In all instances, these variables were transformed using the natural log (plus a constant of one), to normalize sample distribution, and reduce the right skew observed in the untransformed variables. This log transformation appeared generally to improve the variables' distribution, as mean values tended to lie nearer the center of the range after the transformation was completed.

Table 7.6. Violent Crime T-Test Summary

	Mean Pre	Mean Post	t-value	df	Significance
Site 1	1.38	0.75	1.473	23	0.154
Site 2	1.21	0.79	1.404	23	0.174
Site 3	1.83	1.13	0.963	23	0.345
Site 4	1.88	1.46	1.374	23	0.183
Site 5	1.21	0.58	1.991	23	.058*

Table 7.7. Weapon Calls T-Test Summary

	Mean Pre	Mean Post	t-value	df	Significance
Site 1	3.67	2.46	1.715	23	0.1*
Site 2	2.83	2.83	0.455	23	0.653
Site 3	6.33	4.21	3.078	23	0.005***
Site 4	4.88	3.88	1.803	23	0.085*
Site 5	4.63	3.46	1.114	23	0.277

*Notes: For Tables 7.5, 7.6, & 7.7, means reported are untransformed, true mean values. These values are reported for interpretability, while t and p values are the results of two-tailed testing of log transformed variables.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 7.5 above displays declines in mean shooting values across all five PIVOT sites in post intervention time periods. Paired sample tests reveal that four of the five sites achieved significance at $p < 0.1$ or better, using two-tailed tests. Sites Three and Four were significant at $p < 0.1$, and Sites One and Five were significant at $p < 0.01$. Site two was the only site that did not achieve statistical significance, presenting a small decline in pre and post mean shooting values. Values for t ranged from 1.908 to 3.36, for the four significant outcomes. The same test was performed using untransformed values. This produced no appreciable difference in the results.

The same tests were conducted using all reported violent crimes as the variable of interest. These models generated fewer significant results. They are displayed in Table 7.6 above. Again, pre and post mean values for the variable of interest reveal reductions in each of the five sites tested. Paired sample t-testing found that the decline in one of these sites was statistically significant, at $p < 0.1$. The remaining p values may be worth noting, however, as three of them produced two-tailed p values of less than 0.19. Were these results interpreted as a one-tailed hypothesis test, which may be reasonable given universal declines, four of the five

models would be reported as significant at 0.1 ($p < 0.077$*, 0.087*, 0.173, 0.092*, 0.029**, respectively).

Table 7.7 displays t-tests of the third dependent variable of interest, weapon-related calls for service. Four of five PIVOT sites produced mean value reductions in pre and post comparison, and the fifth mean value, at Site Two, was even. Three of the five paired sample t-tests achieved statistically significant reductions in weapon-related calls. These findings were significant at $p < 0.1$ for Sites One and Four, and significant at $p < 0.01$ at Site Three. Sites Two and Five were not found to be significant for this variable.

Considering all fifteen t-tests, three specific observations are noted. First, *there are no instances where mean values increased from pre to post intervention periods*. This would be an unusual observation if we were monitoring random variation. In fourteen of fifteen tests, mean values declined. Weapon-related calls at Site Two produced stable mean values in pre and post time periods. The second notable observation is that Site Two is the only site where two of the three tests were not found to be statistically significant. All four remaining sites produced significant reductions for two of the three variables of interest. Third, shooting data produced the strongest statistically significant results. Having found support for the effect of PIVOT in paired-sample tests I progressed to multivariate modeling.

ARIMA Time Series Modeling

Standard multivariate models, such as OLS, depend on several assumptions for the results to be accepted with confidence. One such assumption is that the observations making up the data are independent of one another (Fox, 2008). When sample data includes repeated measures of the same space, there is risk of violating this assumption and compromising the

interpretability of the results. Time series modeling overcomes this concern by seeking evidence of autocorrelation and accounting for variable's dependence upon themselves within the statistical model.

There are a variety of approaches to time series analysis, including descriptive techniques and processes, data plots, and various methods by which trends and patterns are identified (see Chatfield, 1975). While seeking to identify the main properties of a series, traditional time series approaches are "mainly concerned with decomposing a series into a trend, a seasonal variation, and other 'irregular' fluctuations" (Chatfield, 1975; 12).

ARIMA modeling is one form of time series modeling intended to appropriately handle each of these considerations. "The introduction of correlation as a phenomenon that may be generated by various kinds of difference equations leads to using the stationary autoregressive (AR) and autoregressive moving average (ARMA) models. The modeling of nonstationarity in terms of ordinary and seasonal differencing operators leads to the autoregressive integrated moving average (ARIMA) model popularized in the landmark work by Box and Jenkins (1970)" (Shumway, 1988).

I conducted ARIMA time series modeling by using the Expert modeler feature available in SPSS version 26. Accompanying literature provided by IBM, the SPSS software developer, describes the Expert modeler feature. "The Time Series Modeler procedure estimates exponential smoothing, univariate Autoregressive Integrated Moving Average (ARIMA), and multivariate ARIMA (or transfer function models) models for time series, and produces forecasts. The procedure includes an Expert Modeler that automatically identifies and estimates the best fitting ARIMA or exponential smoothing model for one or more dependent variable

series, thus eliminating the need to identify an appropriate model through trial and error" (IBM Corporation, 2011).

I executed the Expert Modeler function using data from each of the five PIVOT sites, independent of one another. In each instance, model output produced a recommended ARIMA sequence. Considering models using transformed variables for shootings and building permits (natural log plus the constant "1"), three of the five models generated output with one or more significant predictors, when including the independent variables: PIVOT intervention, building permits, and mean temperature. In each of these instances, Expert Modeler identified ARIMA (0,0,0) as the best fit. This 0,0,0 model fit suggests uncorrelated error terms, making it unnecessary to separately account for autoregressive or moving average correlations within the model.

I visually inspected ACF and PACF residual plots, as both are used to interpret whether ARIMA models are properly fitted based on selected autoregressive and moving average parameters and to determine if the proper differencing has been applied. ACF (autocorrelation function) values represent coefficient values of correlations with lagged values. These values are calculated at each time period. ACF plots reflect autocorrelation values, benchmarked against confidence intervals, to allow the reviewer of ACF plots an opportunity to see whether there are ACF values outlying confidence intervals at each time period, or ACF patterning which could reflect untreated autocorrelations. Partial auto-correlation functions (PACF) is a similar process which provides values based on the correlation of residuals after removing the effect explained by past lags. My PACF plots were also benchmarked against confidence intervals (see IBM, 2011; see also Shumway, 1988).

I ran a custom ARIMA model for each site, as a check against the Expert Modeler SPSS function, and as all independent variables specified in the model are explicitly included in custom model output. Expert modeler includes only those variables found to have a statistically significant relationship with the dependent variable in model output. These custom model outputs produced for each of the five sites are listed in Tables 7.8 – 7.12, below. Sites Two and Four did not produce significant model predictors among the included independent variables when using SPSS expert modeler. A simple seasonal model was identified as the best fit by SPSS Expert Modeler for Site Two and a Winter's additive model was recommended for Site Four. I approximated these models using custom ARIMA (1,0,1) (0,1,1) for Site Two and ARIMA (0,1,13) (0,1,0) for Site Four. The building permit and PIVOT variables in Site Two did achieve significance when I ran these customized models.

Table 7.8. Site One Shootings (transformed)

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.479	0.134	-3.581	0.001***
Temperature	0	0.004	0.107	0.915
Building Permits	-0.165	0.175	-0.947	0.349
Model Statistics				
Constant	0.559	0.254	2.198	0.033**
Stationary R-squared	0.237			

Table 7.9. Site Two Shootings (transformed)

ARIMA (1,0,1)(0,1,1)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.441	0.168	-2.622	0.014**
Temperature	0.002	0.003	0.544	0.591
Building Permits	0.363	0.171	2.119	0.043**
Model Statistics				
Constant	0.127	0.202	0.629	0.534
Stationary R-squared	0.477			

Table 7.10. Site Three Shootings (transformed)

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.229	0.106	-2.15	0.037**
Temperature	-0.003	0.003	-0.937	0.354
Building Permits	0.118	0.096	1.233	0.224
Model Statistics				
Constant	0.487	0.203	2.401	0.021**
Stationary R-squared	0.129			

Table 7.11. Site Four Shootings (transformed)

ARIMA (0,1,13)(0,1,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.037	0.162	-0.23	0.821
Temperature	0.006	0.007	0.827	0.419
Building Permits	0.265	0.284	0.932	0.364
Model Statistics				
Constant	-0.613	0.617	-0.994	0.333
Stationary R-squared	0.56			

Table 7.12. Site Five Shootings (transformed)

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.269	0.082	-3.261	0.002***
Temperature	0.007	0.003	2.603	0.013**
Building Permits	0.152	0.088	1.731	0.090*
Model Statistics				
Constant	-0.133	0.155	-0.857	0.396
Stationary R-squared	0.365			

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Close inspection of tables 7.8 and 7.10 reveal that for Sites One and Three, the PIVOT intervention was the only significant variable included in these models. For Site One, the PIVOT variable was significant at $p < 0.01$. At Site Three, PIVOT was significant at $p < 0.05$. All three independent variables were significantly correlated at Site Five. PIVOT correlated the most significantly at $p < 0.01$. Mean temperature correlated at $p < 0.05$ and building permits were significant at $p < 0.10$.

As previously stated, using the transformed variables specified above, Expert ARIMA modeling did not produce any significant predictors for Sites Two or Four. Custom models approximating the Expert Modeler generated two significant predictors, the PIVOT intervention and building permits, for Site Two. There were no other differences noted.

In order to explore whether the observed results were impacted by the variable transformations that were employed, I also modeled each site using untransformed variables. Modeling of Sites One and Five produced results consistent with the transformed models. The PIVOT intervention variable was again significant in both models at $p < 0.01$. Temperature and

building permit variables were again significant in Site Five, although the significance of building permits improved from $p < 0.10$ to $p < 0.01$ using untransformed data.

Larger differences were noted in Sites Three and Four. Using untransformed variables, Expert ARIMA modeling produced a simple seasonal output for Site Three, and the PIVOT intervention was not found to be significantly predictive. In fact, no independent variables were determined to be predictive in Site Three's untransformed model. With respect to Site Four, the Winter's additive model was found to be most appropriate by SPSS Expert Modeler when using transformed variables, and no significant predictors were found. Conversely, using untransformed variables, an ARIMA (0,0,5) model was produced. PIVOT was the only significantly predictive variable in this model, at $p < 0.01$. Tables of each of these untransformed models which contain at least one significant predictor is included in Appendix C for the purpose of comparison.

I followed the same process as with shooting victims, instead using violent crime and then weapon-related calls for service as the dependent variable modeled, using the Expert ARIMA modeling function, for each of the five PIVOT sites. I first used transformed, then untransformed variables in my models. In all, modeling of violent crime and weapon-related calls for each of the five sites produced twenty additional ARIMA models. The vast majority (seventeen) of these models did not produce any statistically significant independent variables. The three models that did produce statistically significant results using violent crime and weapon calls were each associated with Site Five.

For Site Five, both violent crime models (using transformed and untransformed variables, respectively) revealed statistically significant variables. Tables 7.13 and 7.14 below, display these results. Variable transformation impacted the outcome for building permits, altering the

interpretation of the variable's significance. It also impacted interpretation of the PIVOT intervention. Although the change in significance was slight, it moved from p = .099 (significant at .10), to p =.115 in the untransformed model, rendering it insignificant by a negligible amount. The variable measuring temperature was stable and statistically significant in both models.

Table 7.13. Site Five Violent Crime (transformed)

ARIMA (0,0,0)(0,0,0)				
Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.256	0.152	-1.685	0.099*
Temperature	0.008	0.005	1.701	0.096*
Building Permits	0.193	0.162	1.192	0.24
Model Statistics				
Constant	0.067	0.285	0.234	0.816
Stationary R-squared:	0.174			

Table 7.14. Site Five Violent Crime (untransformed)

ARIMA (0,0,0)(0,0,0)				
Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.544	0.339	-1.608	0.115
Temperature	0.019	0.011	1.709	0.095*
Building Permits	0.387	0.168	2.304	0.026**
Model Statistics				
Constant	-0.092	0.633	-0.146	0.885
Stationary R-squared	0.256			

Modeling weapon-related calls for service at Site Five, the untransformed model produced one statistically significant variable, temperature. This is shown in Table 7.15. The transformed model did not produce any statistically significant variables.

Table 7.15. Site Five Weapon-Related Calls (untransformed)

ARIMA (0,0,0)(0,0,0)				
Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-1.157	1.058	-1.093	0.28
Temperature	0.082	0.034	2.401	0.021**
Building Permits	0.047	0.524	0.09	0.928
Model Statistics				
Constant	0.012	1.978	0.006	0.995
Stationary R-squared	0.150			

Rather than relying solely on ARIMA models in evaluation, some scholars have preferred to use this as a method to check whether measurements are independent of one another, or if they are subject to autoregressive processes that might confound more traditional techniques of regression (for examples, see Braga, 2008, also Madero-Hernandez et al., 2017). Madero-Hernandez et al. explain this rationale by stating "[i]n addition to Poisson regression models, we estimated ARIMA models to take into account the possibility that the error terms for different time points are serially correlated. Serially correlated errors violate a fundamental assumption of ordinary least squares regression models and may result in inflated standard errors and large z values, thereby overstating the significance of observed effects. ARIMA explicitly models serial correlation as a time series process and accounts for trend, seasonality, and random error effects that may confound the effects of the intervention (McDowall, McCleary, Meidinger, & Hay, 1980)" (2017; 775). By choosing to evaluate both by using ARIMA and another appropriate regressive technique, the reader may be informed as to the potential for serial correlation in addition to the influence of other control variables which might be included in the model.

In this instance, ARIMA models of the primary dependent variable, shootings, has provided support for the notion that autoregressive processes do not appear to be present in most

models related to the dependent variable shootings. Therefore, other regressive modeling techniques may be applied. Given the non-normal, right skewed distribution recognized in this data, Poisson and negative binomial regressive techniques appear most appropriate.

An argument could be presented to proceed with Poisson and negative binomial regressive modeling of violent crimes and weapon-related calls. I explored Durbin Watson test values for each site and found that in eight of ten instances, these values fell between 1.75 and 2.3, which have generally been accepted as within reasonable range of the central value of "2" to proceed under the assumption that error terms correlation is not so significant as to forfeit the interpretive value of regressive modeling. In one instance each, for violent crime and weapon calls, Durbin Watson values were near 1.35, signaling potential positive autocorrelation, yet still above the value of "1" which may be considered the threshold below which researchers should be extraordinarily concerned with the interpretability of model results. That said, ARIMA modeling is more precise in the methodology by which patterned correlations are sought, across multiple lags.

Because ARIMA models for violent crime and weapon-related call data were found to behave differently than when using shootings as the dependent variable, I chose not to proceed with Poisson and/or Negative Binomial modeling of these variables. Excepting the three models produced in Tables 7.13 – 7.15 above, these models did not produce statistically significant independent variables, and the vast majority produced a simple seasonal model from SPSS Expert Modeler, signaling seasonal autocorrelation. Given both of these factors, it appeared not to be productive to proceed with regressive models of this sample data, as I could not be assured that the findings for these variables would not be confounded by the autoregressive processes that ARIMA models suggested were present.

Poisson and Negative Binomial Regressive Models

Poisson regressive models are most appropriate when dealing with right-skewed variables, rather than those normally distributed that meet the assumptions of OLS regression. These models may be applied where there is reason to believe that findings will not be confounded by uncontrolled autocorrelation (which is a rationale for the assumption of independent observations). In this case, having completed ARIMA modeling and finding little evidence of autocorrelation within the shooting outcome variable, Poisson regressive models seemed appropriate. Evidence favoring a Poisson distribution may be found when a variable's mean and variance are the same. Negative Binomial models more generally, rather than the Poisson sub-type, can be used to handle distributions with variances greater than the mean.

I ran Poisson, traditional negative binomial, and custom negative binomial regression models for each of the five sites. Traditional and custom negative binomial regressive models differ in that the traditional model uses a fixed parameter of "1", whereas custom models estimate and apply parameter values as a result of the data included in the model. I used the same data as in ARIMA models for these tests. After running each, I compared the AIC and BIC values for each of the three models (Poisson, negative binomial and custom negative binomial). These AIC and BIC values provide indications of each model's "fit" to the distribution against which it has been modeled. For each site I selected the model which signaled the best fit, by producing the lowest AIC and BIC values, for use in this dissertation.

Model results are reported below in Tables 7.16 – 7.20. In two instances, negative binomial modeling was found to be more appropriate. Poisson regressive models were a better fit in the other three instances. In all cases, observed AIC and BIC differences were relatively small between models for the same sites. Custom negative binomial modeling did not improve

model fit in any of the five sites. Some caution is warranted in the interpretation of regressive models for Sites Two and Five, as ARIMA Expert modeler signaled that there may be confounding factors not controlled for within these regressive models. Regardless, I have included them below for the reader's consideration, and for the purpose of presenting the output of this technique systematically across all five sites.

Table 7.16. Site One Negative Binomial Shootings Model

Negative Binomial Regression (1)						
Pearson Chi-Square Goodness of fit: 36.352 44df .826 value/df					95% Confidence Interval (IRR)	
Variable	Incident rate ratio	Coefficient	Standard error	Significance	Lower	Upper
PIVOT Intervention	0.073	-2.623	0.801	0.001***	0.015	0.349
Temperature	1.009	0.009	0.019	0.651	0.972	1.047
Building Permits	0.514	-0.665	0.509	0.191	0.19	1.395
Intercept	0.867	-0.142	1.058	0.893	-2.217	1.932
Log likelihood: -40.746						

Table 7.17. Site Two Negative Binomial Shootings Model

Negative Binomial Regression (1)						
Pearson Chi-Square Goodness of fit: 46.337 44df 1.053 value/df					95% Confidence Interval (IRR)	
Variable	Incident rate ratio	Coefficient	Standard error	Significance	Lower	Upper
PIVOT Intervention	0.971	-0.03	0.621	0.962	0.287	3.279
Temperature	1.01	0.01	0.021	0.647	0.969	1.052
Building Permits	1.692	0.526	0.359	0.142	0.838	3.418
Intercept	0.13	-2.043	1.244	0.101	0.011	1.485
Log likelihood: -33.222						

Table 7.18. Site Three Negative Binomial Shootings Model

Poisson						
Pearson Chi-Square Goodness of fit: 42.296 44df .961 value/df					95% Confidence Interval (IRR)	
Variable	Incident rate ratio	Coefficient	Standard error	Significance	Lower	Upper
PIVOT Intervention	0.413	-0.883	0.493	0.073*	0.157	1.086
Temperature	0.989	-0.011	0.013	0.427	0.964	1.016
Building Permits	1.149	0.139	0.189	0.462	0.794	1.663
Intercept	0.896	-0.11	0.77	0.886	0.198	4.049
Log likelihood: -37.407						

Table 7.19. Site Four Negative Binomial Shootings Model

Poisson						
Pearson Chi-Square Goodness of fit: 50.499 44df 1.148 value/df					95% Confidence Interval (IRR)	
Variable	Incident rate ratio	Coefficient	Standard error	Significance	Lower	Upper
PIVOT Intervention	0.309	-1.174	0.695	0.091*	0.079	1.206
Temperature	1.038	0.037	0.021	0.078*	0.996	1.082
Building Permits	1.079	0.076	0.155	0.624	0.796	1.462
Intercept	0.034	-3.368	1.486	0.023*	0.002	0.634
Log likelihood: -26.661						

Table 7.20. Site Five Negative Binomial Shootings Model

Poisson						
Pearson Chi-Square Goodness of fit: 26.801 44df .609 value/df					95% Confidence Interval (IRR)	
Variable	Incident rate ratio	Coefficient	Standard error	Significance	Lower	Upper
PIVOT Intervention	0.097	-2.331	1.049	0.026**	0.012	0.76
Temperature	1.066	0.064	0.029	0.028**	1.007	1.128
Building Permits	1.277	0.245	0.149	0.1*	0.954	1.71
Intercept	0.007	-5.032	1.978	0.011*	0	0.315
Log likelihood: -20.548						

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Summary of Statistical Tests

I have summarized the three statistical tests employed for the dependent variable shootings, for the purpose of coalescing these findings in Table 7.21. I have included all three independent variables in these tables. *The most prominent observations are that the PIVOT intervention was statistically significant across all three testing methods for Sites One, Three, and Five. Two of three methods produced statistically significant effects for PIVOT at Site Four. And there was no backfire effect in any PIVOT project site.* The remaining variables included in these models were most often not statistically significant. Following this table summarizing the results of these tests, I have provided an evaluation of potential displacement and diffusion impacts at each of the five PIVOT project sites.

Table 7.21. Summary of Shooting Model Findings

Site	Variable	t-test	ARIMA	Poisson/Neg. Binomial
One	PIVOT	**0.003*** **	**0.001*** **	**0.001*** **
	Building	n.t.	0.349	0.191
	Temperature	n.t.	0.915	0.651
Two	PIVOT	1	**0.014** **	0.962
	Building	n.t.	0.043**	0.142
	Temperature	n.t.	0.591	0.647
Three	PIVOT	**0.069***	**0.037** **	**0.073***
	Building	n.t.	0.224	0.462
	Temperature	n.t.	0.354	0.427
Four	PIVOT	**0.054***	0.821	**0.091***
	Building	n.t.	0.364	0.624
	Temperature	n.t.	0.419	0.078*
Five	PIVOT	**0.009*** **	**0.002*** **	**0.026** **
	Building	n.t.	0.090*	0.1*
	Temperature	n.t.	0.013**	0.028**

Note: The letters "n.t." represent instance where variables were not tested. PIVOT t-test reflects a test of the dependent variable, shootings, pre and post PIVOT time periods.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

CHAPTER 8
DISPLACEMENT/DIFFUSION OF BENEFITS

Any crime prevention strategy focused on opportunity reduction is subject to the mainstream criticism that it will not be effective because crime will not actually be reduced, rather displaced. While an impressive body of research has demonstrated that displacement is not as frequent or severe as one might fear (see Guerette & Bowers, 2009; Hesseling, 1995; Eck, 1993), the risk of its truth in any single circumstance remains a possibility, nonetheless.

In fact, research has shown that diffusion of benefits is at least as likely as displacement (Guerette & Bowers, 2009). Diffusion of benefits occurs when there are positive changes in crime beyond the intervention itself (i.e. crime goes down beyond a project site). Diffusion of benefits are measured as a part of the same process as displacement, simply representing changes in opposing directions.

Six potential forms of displacement have been recognized by scholars: spatial, temporal, target, method, perpetrator and crime type (see Reppetto, 1976; Barr & Pease, 1990; Gabor, 1990; and Eck, 1993). This research focuses primarily on shootings in PIVOT sites, observed over time, and so the following examples reflect how displacement might be expressed in this instance.

If shooting locations changed but did not reduce, then spatial displacement could have occurred. Temporal displacement within PIVOT sites would have occurred if there were changes in the time of day in which these events were expressed. Changes in victim characteristics would suggest target displacement. An example of changes in methods might be that drive-by shootings ceased but were replaced by instances where victims were lured to a location and shot. Crime-type displacement might occur if shootings ceased, but kidnappings

took their place. Finally, previously active perpetrators might desist only to be replaced by new offenders.

It may not take six different measurements to evaluate displacement under certain circumstances. A decline in the total number of shootings in the project area might suggest that temporal, target, method, and perpetrator displacement were largely irrelevant (at least insofar as researchers are interested in crime reduction). If shootings also went down in a larger area that buffered the project site, this would suggest that spatial displacement did not occur, at least within the buffer area. Only crime type displacement might remain for consideration, if the previous two statements were true.

I measured shooting counts over time within PIVOT sites and in buffer areas surrounding these sites. I evaluated non-shooting violent crimes in search of change in crime type. If certain forms of displacement were suggested by this analysis, the findings were explored in greater detail within the discussion section of this paper.

Spatial

Spatial displacement means a crime that would have happened in one place "moves" and instead occurs elsewhere. This is a common concern for crime prevention skeptics and the public at-large, particularly those who are oriented toward an offender deterministic view. While spatial displacement is rarely proven, researchers have generally interpreted increases in nearby crime as evidence favoring a displacement effect, even though these changes may also be the result of independent processes and unrelated to crime reductions in other locations.

I use Bowers and Johnson's (2003) approach in this study. One exception to this is that I do not use the *weighted displacement quotient* (WDQ) these researchers identified. This is

because the WDQ formula they present includes control area values, and no such values are available for this research.[28] Excluding this point, their theoretical positioning related to displacement is sound, and adapted in the following pages.

To evaluate the prospect of spatial displacement as the result of PIVOT, I created two catchment areas around PIVOT sites. Each buffer extended 1000' beyond the previous spatial layer (i.e. the primary catchment extended 1000' beyond the site and the secondary catchment extended 1000' further). In the instance of Sites One and Two, the sites were geographically distant enough that there was no intersection between buffer features once they were built. In the instance of Sites Three, Four, and Five, their proximity to one another meant that catchments would have intersected and overlapped if each was created independently.[29] Given that these sites were intervened upon on the same timeline, I chose to handle this issue by merging the catchment layers into a single feature at each level. I grouped my evaluation of potential displacement across all three spatially proximal sites.[30] Figures 8.1 and 8.2 below show the project areas, and the primary and secondary catchment zones.

The size of these buffer zones seems consistent with what we know of offenders' preference to remain in familiar areas (see Eck, 1993 for a presentation of *familiarity decay*), and therefore the reasonable inference that if spatial displacement occurs, it is likely to occur

[28] Bowers and Johnson (2003) recommend two approaches to define a control area. Their first recommendation is to use a secondary buffer as control. This appears inappropriate to this author as it is not clear how one might differentiate between an impact that radiates far enough to disrupt the control area and a true control, where crime event processes are unaffected by the original treatment. For this reason, although a secondary buffer is used in my model, it is not adapted as a control. Bowers and Johnson's second approach is to find a geographically distant area to assign as a control. In doing so, the first problem is avoided, but the second (which they elude to) is that entirely independent crime event processes may be taking place which are unlike the first area, making it unsuitable to include in the study of the first.

[29] Weisburd and Green (1995b) call this "displacement contamination".

[30] There are other ways to handle this situation, such as counting events of interest within areas of spatial overlap, then dividing by spatial proportion and assigning values to each site. In this instance this step is unnecessary. It is far more straightforward to group the project sites for this purpose and explore displacement outside of all three sites.

relatively near in space. This position is restated in Bowers and Johnson's work. "Thus, we might predict that for geographical displacement, there is likely to be a displacement gradient. In other words, displacement is most likely to occur within close proximity to a treatment area (where familiarity is highest) and it will decrease as the distance from the treatment area increases . . . Following this rationale, it seems reasonable to suggest that should displacement occur as a result of crime prevention activity, properties that surround an intervention area would be an offender's most likely replacement targets" (2003, 279).

Although Bowers and Johnson consider the use of secondary spatial buffers as controls, they also recognize the value of understanding relative spatial change by using multiple concentric rings. I have taken this approach here. "For instance, a number of concentric buffer zones may be defined, which would provide the opportunity to see if any displacement/diffusion of benefit observed *decayed* across successive buffer zones, as may be predicted by Eck's (1993) familiarity decay model. The observation of such an effect would serve to increase confidence in the assumption that the change in the geographical distribution of crime was actually attributable to the scheme" (2003; 281).

Figure 8.1. Catchment Zones Sites One & Two

Figure 8.2. Catchment Zones Sites Three - Five

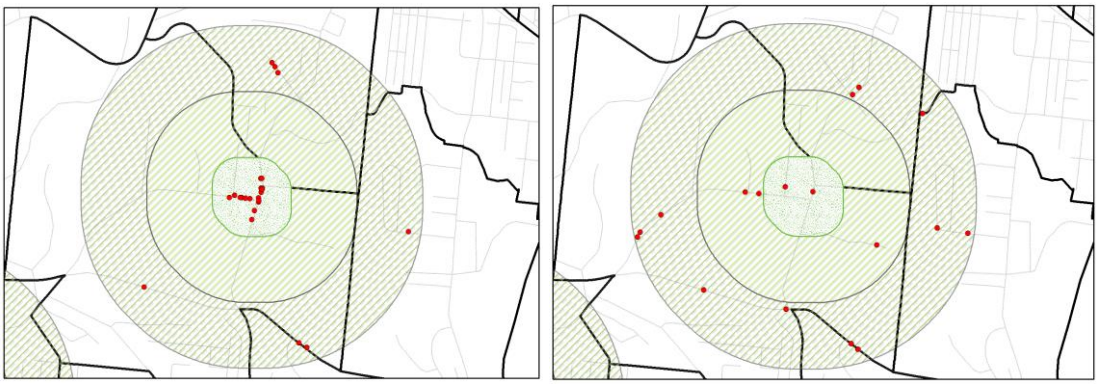
The tables following this paragraph summarize the results for gunshot victimization, as recorded by the Cincinnati Police Department for twenty-four months prior to project implementation within project sites, and within each respective catchment layer, and summarized

to include the "full extent", or the site and both catchment layers summed. These counts are compared against the twenty-four months following PIVOT's launch. The final table in the series summarizes all five sites to provide a global evaluation of spatial displacement. Following this series of tables are visualizations of the same pre and post time periods for gunshot victimization.

Table 8.1. Site One Spatial Displacement

	Site 1	Site 1 1000'	Site 1 2000'	Full Extent
24 Months Pre	26	0	8	34
24 Months Post	2	3	15	20
Count Change	-24	3	7	-14
Percent Change	-92.31	Not Calc.	87.50	-41.18

Figures 8.3 & 8.4. Site One Shooting Victimization (Pre & Post)

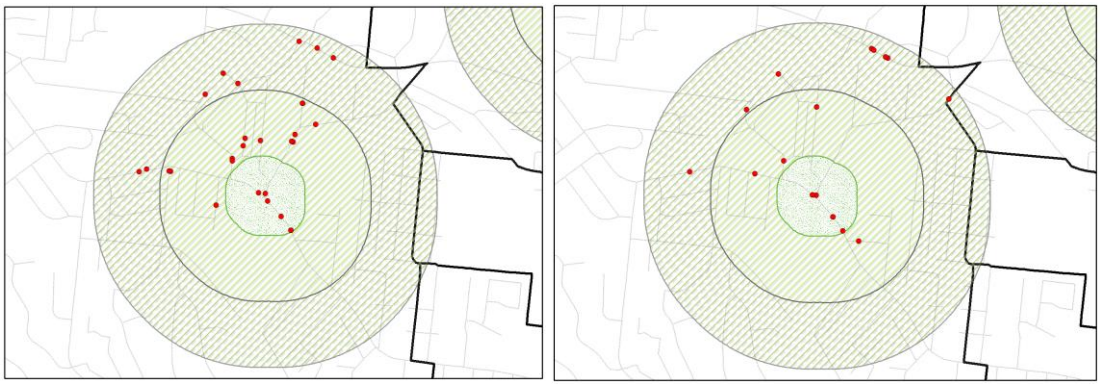


Pre-post shooting reductions are clear both in tabular and visual depictions above. Dramatic reductions are noted in the site (-92%, -24). A small increase is observed in the first catchment area (+3), and a larger increase is noted in the second catchment area (+7). Considering the full extent (the site and both catchment areas combined), a 41% reduction is noted between pre and post time periods (-14 shooting victims). Site Two is reviewed in the same manner as Site One.

Table 8.2. Site Two Spatial Displacement

	Site 2	Site 2 1000'	Site 2 2000'	Full Extent
24 Months Pre	8	16	8	32
24 Months Post	7	4	9	20
Count Change	-1	-12	1	-12
Percent Change	-12.5	-75	12.5	-37.5

Figures 8.5 & 8.6. Site Two Shooting Victimization (Pre & Post)



Spatial differences were evident in terms of shooting change in Site Two as compared to Site One. Shooting reduction at this site was minimal during the evaluative time frame (-1). But the first catchment area showed dramatic reductions (-75%, -12), and the second catchment area revealed a slight increase (+1). While the impact on Site Two was small, it appears to have generated a considerable diffusion of benefit to the first catchment area. Combined, these areas demonstrated remarkably similar percentage and count reductions when compared with the first site at the full extent (-38% vs. -41%, or -12 vs. -14). Table 8.3 and Figures 8.7 and 8.8, summarizing Sites Three, Four, and Five in the same manner, are below.

Table 8.3. Sites Three-Five Spatial Displacement

	Sites 3-5	Sites 3-5 1000'	Sites 3-5 2000'	Full Extent
24 Months Pre	35	36	18	89
24 Months Post	10	24	15	49
Count Change	-25	-12	-3	-40
Percent Change	-71.43	-33.33	-16.67	-44.94

Figures 8.7 & 8.8. Sites Three - Five Shooting Victimization (Pre & Post)

A review of Sites Three through Five reveals dramatic declines in shooting victimization within sites (-71%, -25). Reductions are also observed in the first and second catchment areas. These reductions dissipate as the distance from project sites increases (i.e. first catchment area: -33%, -12, second catchment area: -17%, -3).

Finally, to provide a summative perspective, I combined all pre and post shooting counts across sites and respective catchments. The method reveals dramatic reductions at the sites (-72%, -50), important but lesser reductions within the first catchment (-40%, -21), and a slight increase in the second catchment (+15%, +5). Table 8.4 combines all sites and catchments. This summarization produced a nearly forty-three percent reduction in gunshot victimization in these spaces (-66). Excepting Site One, the reduction in shooting victim counts was greater at the full

extent than at the project sites alone. This suggests there was not a negative impact as a result of displacement, but rather a diffusive benefit.

Table 8.4. All Sites Combined Spatial Displacement

	Sites 1-5	Sites 1-5 1000'	Sites 1-5 2000'	Full Extent
24 Months Pre	69	52	34	155
24 Months Post	19	31	39	89
Count Change	-50	-21	5	-66
Percent Change	-72.46	-40.38	14.71	-42.58

Temporal

While it is clear why spatial displacement would be an important concern for evaluation of this project, there are two reasons why temporal displacement is less of a concern. First, the intervention is not temporally rooted. It is intended to systematically change the environment regardless of the hour or day. If the intervention was for instance, a directed patrol strategy during peak event times, the risk of temporal displacement might be great. But in this case, place network disruption is not variable by hour or day. If successfully implemented, a location is disrupted twenty-four hours a day, seven days a week.

The second reason why temporal displacement is of less concern is a pragmatic insight. Shifting the time of fewer shootings still results in fewer shootings for the area. Any temporal changes that occurred would not serve to qualify the observed reduction, nor would it provide much insight into specific causal mechanics within the intervention that may have created temporal changes. Regardless, temporal variation is displayed in Tables 8.5 – 8.7 for descriptive purposes, and to evaluate any evidence of temporal displacement. Because the intervention is not temporally rooted, temporal diffusion of benefit is not applicable.

Table 8.5. Temporal Change Site One

	7A-3P	3P-11P	11P-7A	Total
24 Months Pre	9	13	4	26
24 Months Post	0	2	0	2
Count Change	-9	-11	-4	-24
Percent Change	-100.00	-84.62	-100.00	-92.31

Table 8.6. Temporal Change Site Two

	7A-3P	3P-11P	11P-7A	Total
24 Months Pre	0	7	1	8
24 Months Post	0	3	4	7
Count Change	0	-4	3	-1
Percent Change	N/C	-57.14	300.00	-12.50

Table 8.7. Temporal Change Sites Three-Five

	7A-3P	3P-11P	11P-7A	Total
24 Months Pre	7	19	9	35
24 Months Post	1	5	4	10
Count Change	-6	-14	-5	-25
Percent Change	-85.71	-73.68	-55.56	-71.43

These temporal change tables consistently show reductions consistent with overall proportion and volume, across all time periods and all sites. The single exception in this analysis is the overnight time period in Site Two, which increased noticeably in the post-intervention time period (from one to four gunshot victims). A close inspection of these events qualifies this observation, as shootings tended to gather near the breakpoint (11P), meaning there was not a dramatic temporal shift in shootings. Otherwise, reductions were nearly universal across times and sites.

Target

Target displacement occurs when offenders select different targets than they would have otherwise. In the instance of crime preventive measures, one target might be sufficiently protected to prevent the victimization of that individual or place, but instead of desisting, an offender selects a new target for victimization.

The data gathered for this research does not allow for a deep exploration of targeted individuals, as information about victims was not collected. Speaking generally, the PIVOT team did not identify noticeable changes in victim characteristics that would suggest target displacement occurred during these interventions. Shooting offenses were often perpetrated against those engaged in risky activities both before and after project intervention. Occasionally, passers-by would be shot as the result of unwittingly entering into an area where bullets were flying.

As with temporal displacement, target displacement has somewhat less relevance. Offenses reduced. If there was a change in offender target selection, it appears not to have resulted in the same number of successful shooting victimizations, and it was not anecdotally noticed. This intervention was aimed broadly at all targets in project spaces. Measurement of diffusion of benefits to targets outside of the intervention is not applicable.

Method

Method displacement occurs when offenders shift the means by which they complete a criminal act. The act is still completed. A hypothetical example related to shootings might be that instead of engaging in drive-by shootings, offenders might move to “set-up” shootings,

luring a victim to a quiet spot, rather than shooting someone on a crowded (or heavily patrolled street).

Shooting victimizations across all five CPD sites seemed to most often be the result of disputes arising from risky activities (i.e. drug trafficking), retaliatory acts, and "set-up" robberies. These events were not coded based on this classification. However, there did not appear to be obvious changes in method. Even where shooting reductions were pronounced, when shootings still occurred, the methods by which they were perpetrated did not tend to surprise investigators, and they seemed to fall into one of these three categories.

Perpetrator

Information about perpetrators was not collected for this research. But no obvious changes were noted as it relates to shooting perpetrators. I suspect that target, method, and perpetrator displacement often inter-relate, and it is likely that changes within one of these categories increases the likelihood of change in the other two. No clear signals were identified by investigators suggesting displacement in any of these three categories.

Crime Type

Aside from spatial displacement, changes in crime type may be of greatest research interest, given the effort to reduce shootings. Particularly where shooting reductions are noted, it is important to ask the question: Did offenders continue to offend at the same rate, choosing rather to commit different crimes that would not be classified as shootings?

While it is possible that offenders might shift to any type of offense, it is most plausible and most interesting to know if the shift is to other violent crimes. Past researchers have speculated that if a violent offender continues to offend at the same rate, but moves to non-

violent crimes, we might consider ourselves to be in a better situation than the one in which we were previously, and might therefore consider this displacement to be benign. Regardless, the first step is to discover whether there is evidence of crime-type displacement.

For this research, I reviewed total violent crimes (homicides, rapes, robberies, and aggravated assaults combined – categorized according to FBI/UCR definitions) in search of evidence that crime type displacement occurred. As this category is broader, but inclusive of shooting offenses, I flagged violent crimes where a shooting occurred, and removed these crimes for the purpose of this displacement analysis. I searched for changes among the remaining offenses. If non-shooting violent crimes went up, it is possible (although not determinative) that crime type displacement occurred. If they went down, this may point toward diffusion of benefit by crime type, beyond gunshot victimization. These results are presented in Table 8.8.

Table 8.8. Non-Shooting Violent Crime Pre/Post Intervention

	Site 1	Site 2	Site 3	Site 4	Site 5	All Sites
24 Months Pre	10	23	31	36	19	119
24 Months Post	16	13	16	26	11	82
Count Change	6	-10	-15	-10	-8	-37
Percent Change	60.00	-43.48	-48.39	-27.78	-42.11	-31.09

Site One was the only site to record an increase in non-shooting violent crime between pre and post intervention periods (+6). All other sites experienced decreases in non-shooting violent crimes. Adding all pre and post periods together, non-shooting violent crimes reduced by more than thirty percent in the PIVOT intervention sites. This suggests that crime type displacement (summed) did not occur, pointing rather toward crime type diffusion of benefits.

Overall, the evidence suggests that a diffusion of benefits occurred in most project sites, both geographically and by crime type. Regarding temporal, target, method, and perpetrator constructs, displacement was not observed, and diffusion of benefits was not applicable because of the intervention framework. The strategy appears not to have generated collateral harms elsewhere. Instead, it appears that benefits diffused beyond the intervention. These results are summarized in Table 8.9 below.

Table 8.9. Displacement/Diffusion Summary

Sites	Spatial	Temporal	Target	Method	Perpetrator	Crime Type
1	Displacement (Partial)	No Displacement	No Displacement*	No Displacement*	No Displacement*	Displacement (Partial)
2	Diffusion	No Displacement	No Displacement*	No Displacement*	No Displacement*	Diffusion
3	Diffusion	No Displacement	No Displacement*	No Displacement*	No Displacement*	Diffusion
4	Diffusion	No Displacement	No Displacement*	No Displacement*	No Displacement*	Diffusion
5	Diffusion	No Displacement	No Displacement*	No Displacement*	No Displacement*	Diffusion

*No quantitative assessment possible. Findings based on qualitative assessments by PIVOT investigative team.

CHAPTER 9
DISCUSSION

This evaluation of PIVOT supports the assertion that place network disruption effectively reduces shootings. Evidence favoring PIVOT's reduction of violent crime and weapon related calls for service is consistent, but weaker. Pre-post comparisons of shootings, violent crime, and weapon-related calls revealed near universal declines across each metric, at each of the five project sites. Two sites had reductions of shooting victimization of more than ninety percent, in the two years following PIVOT intervention. Fifty fewer gunshot victims were recorded in PIVOT sites after PIVOT was launched (69 vs. 19; see Table 8.4, page 173).

Paired samples t-tests revealed statistically significant declines in shooting victimization at four of five intervention sites. This method also revealed statistically significant declines in violent crime at one of five sites, and significant declines in weapon-related calls at three of five sites during the evaluation period.

ARIMA models considering violent crime and weapon-related calls did not produce statistically significant outcomes for any included variable, save two for violent crime, and one for weapon calls. PIVOT was found to have a statistically significant, but weak effect in only one of these violent crime models. But ARIMA models, after controlling for factors of economic development, temperature and seasons, autocorrelation and lags, continued to produce statistically significant results for the PIVOT intervention on shootings in three of the five intervention sites.

Poisson and Negative Binomial Regressive models, evaluating the dependent variable shootings, produced statistically significant outcomes for the PIVOT intervention variable in four

of the five PIVOT sites. These models also controlled for the influence of economic development and temperature.

Evaluation of potential spatial displacement further supported the notion that PIVOT was effective. First, this evaluation suggested that the intervention created benefits beyond the original site. Fifty fewer gunshot victims were recorded in PIVOT project sites during the two year period after project launch, compared to the two years before. Twenty-one fewer shooting victims were recorded in a 1000' buffer around intervention sites after PIVOT. In the next 1000' buffer, a small increase was observed (+5, 39 vs. 34). Considering the intervention sites and the 2000 feet beyond, 66 fewer gunshot victims were recorded during the two years after PIVOT began (89 vs. 155; see Table 8.4, page 173). Analysis of the spatial change in shootings at and near PIVOT intervention sites revealed that declines were greatest at intervention sites, and shooting reductions generally became progressively less pronounced further from the site. We would expect to see this pattern if the intervention itself was causing the change, rather than when making spurious associations.

Site Specific Evaluative Strength

This evaluation provides the strongest evidence of PIVOT's effect at Sites One and Five. Shooting reductions exceeded ninety percent at these two sites. Paired sample tests of shooting counts produced significant findings for both, at $p < 0.01$. ARIMA modeling of the same dependent variable also produced significant results for both, at $p < 0.01$. Poisson and Negative Binomial Regression modeling produced statistically significant results for both sites as well ($p < 0.01$ and $p < 0.05$, respectively).

There is moderately strong evidence supporting PIVOT's effect at Sites Three and Four. Shootings reduced by fifty-seven percent and sixty-six percent, respectively. Both were found significant at $p < 0.1$ using paired sample t-testing. Site Three produced a statistically significant result for the PIVOT intervention using natural log transformed variables in ARIMA modeling, at $p < 0.05$. Site Four did not produce this same result using transformed variables, although it did so using untransformed variables. Poisson regressive models produced significant results at Sites Three and Four, at $p < 0.1$.

Site Two stands out as the only of five intervention sites without statistically significant support based on the evaluative methods applied in this dissertation (save one). It is possible that PIVOT had no effect at this site. Shootings declined slightly during the evaluative period (-1), and weapon-related calls showed no change. Yet close inspection of Figures 8.5 & 8.6, and associated Table 8.2 (page 171), show dramatic declines in gunshot victimization in the 1000 feet surrounding the intervention site (-75%, from 16 to 4).

This is particularly interesting as the place network for this site included five locations outside of the evaluated project boundary. Four of these places were inside the 1000' buffer that experienced substantial shooting declines after PIVOT. Considering the importance of standardized evaluation and the hazards of picking and choosing evidence that might support a desirable narrative, I have chosen to retain original PIVOT, as the unit of analysis for statistical testing applied in this dissertation. Yet substantial declines in shooting victimization in the first buffer area was too interesting to entirely ignore, particularly given that the identified place network that was intervened upon extended into this buffer area.

PIVOT may have had an important effect at Site Two, as expressed by substantial reductions in this buffer area. The negligible change found in the site evaluation may be because the original project boundary was drawn too tightly and failed to capture the full place network.

Close inspection of shooting data also suggests a lagged effect may have occurred at this site. Shooting victimizations continued after March 2016's project launch in March (1), May (2), August (1), and November (1), before there was a nine-month period without shootings. Two shootings occurred in August and September of 2017, and then 538 days passed without a shooting. While the data analyzed for this paper does not extend beyond 2018, CPD reports that only two shootings have occurred in the last 745 days (as of January 1, 2020). For 2018 and 2019, this site averaged one shooting per year, whereas pre-project averages were seventy-five percent higher.

The Weaker Case for Violent Crime and Weapon Calls

Paired sample t-tests and pre-post comparisons provide some evidence favoring PIVOT's influence on violent crime and weapon-related call variables. ARIMA modeling proved less supportive of PIVOT's effect on these indicators, compared to shooting data. Given the lack of statistical significance using ARIMA output, it did not appear productive to proceed with Poisson or negative binomial regression with these alternative dependent variables.

The strength of effect may be smaller in these data sets because these indicators are more heterogeneous. Violent crime includes events such as egregious domestic abuses, sex crimes, and store robberies. These are less theoretically connected to the idea of criminal place networks that PIVOT is designed to address. Given the small number of events and their normal fluctuation, the addition of non-PIVOT events clouded the findings.

This argument makes sense for the violent crime indicator. It makes less sense for weapon-related calls. PIVOT team members believe that many of the weapon-related calls to which CPD responded, involved the same individuals engaged in shooting offenses. If we take their suspicions seriously, then a different explanation for why this variable is weakly connected to PIVOT is warranted.

Weapon calls may be subject to low and variable reporting rates. That is, many weapon offenses go unreported. In a given month, reporting rates may fluctuate considerably. If a substantial percentage of shots fired are not reported to police, which has been estimated to be as high as eighty percent, random variation in reporting levels could confound our ability to confidently measure weapon activity levels, and compromise our ability to determine covariance (Ratcliffe et al., 2019; Knight, 2020). Using the measurement system that is in place, weapon-related calls were found to have reduced by between twenty and thirty percent at four of five sites. Again, given the small number of events in these evaluations, only the strongest effects are likely to be identified as statistically significant, and these documented reductions are smaller than shooting count reductions.

Alternative Explanations

This evaluation has uncovered evidence that favors PIVOT as an effective shooting reduction strategy. The designs I used were pre-post (paired t-test), time series (ARIMA) and negative binomial regression. There are possible rival explanations to the conclusion that PIVOT reduced shootings.

In the paragraphs that follow, I will explore possible alternative explanations to this conclusion. The four specific alternatives that will be considered are: economic development,

the influence of temperature, traditional law enforcement (arrests), and other policing interventions (gunshot detection and focused deterrence). The first two alternative explanations were included in multivariate modeling. The remaining two were not.

Temperature

Temperature and seasons are commonly said to influence crime counts. Plenty of examples may be found to support this inside and outside of scholarship. Particularly in midwestern locations, such as Cincinnati, where temperatures are dramatically different throughout the seasons, the "summer crime spike" is a comfortable assertion, as is the "cooling of crime through winter months". But examples contrary to this assumption may be found. One such dramatic example occurred during the planning phase prior to PIVOT's launch, when a quadruple shooting occurred in what would become the first PIVOT site, during a cold December evening. Given wide ranging assumptions about the influence of temperature on crime, it seemed important to control for such a feature in multivariate testing, and to attempt to determine if an intervention such as PIVOT breaks beyond whatever effect temperature and seasons might have on shootings and violence. The evaluative period, two full years before and after intervention, is the first attempt to control for any such seasonal influence. Accounting for recorded temperatures of each measurement period is the second attempt to control for the influence of temperature, as it captured any variations that may have occurred beyond normally expected seasonal changes.

ARIMA, Poisson, and negative binomial regressive models each included the temperature variable. These models found temperature to not be significant for Sites One, Two, and Three. At Site Four, temperature was not significant for ARIMA modeling, but was significant in negative binomial regression ($p < 0.1$). At Site Five, temperature was found to be

statistically significant in both ARIMA and negative binomial regressive models ($p < 0.05$). In each of the three instances where temperature was a significant predictor of shootings, PIVOT was also found to be statistically significant.

These findings suggest that temperature does not routinely correlate with gunshot victimization. And while statistically significant correlations were found at two of the project sites, PIVOT remained a significant predictor of shooting declines in each of the three instances where temperature was also a significant predictor. Based on the tests performed in this paper, temperature appears not to be a confounding alternative explanation.

Economic Development

A common perspective outside of the field of crime prevention is that economic development, rather than policing, changes crime rates in neighborhoods. There must certainly be some truth to the assertion that large-scale economic development impacts criminal activity, as it does most of the rest of patterned human behavior. Two critical points must not be overlooked, however. First, if we assume that economic development can and does reduce crime, should we assume that this is the only method by which crime can be reduced? Using large-scale economic development to reduce crime is expensive and time consuming, and in many places it is impractical. Second, even if resources were routinely available to take this approach, there are times where this approach is not wanted.

For these reasons, even if economic development can effectively reduce crime events, we should seek alternatives that may not require such expense, and which will not create such wholesale change. It is a goal of the PIVOT strategy that healthy economic enhancement is a downstream byproduct of reduced victimization in these areas. But economic development is

not the means by which this strategy claims to reduce crime. And while descriptions of PIVOT interventions included examples of demolition and spatial re-organization, these occurred at discrete locations, rather than *en masse*.

Building permit issuance was included in ARIMA, Poisson, and Negative Binomial regression models, to operationalize the economic development concept and to control for this possible alternative explanation. This variable was found to be significant in only two of five shooting models. It was found to be significant on only one ARIMA violent crime model ($p < .05$). It was not significant in any ARIMA analysis of weapon-related calls. Two significant findings were at the same site, Site Five. And all three significant findings were opposite the direction that would be expected if we theorize that development produces public safety. Model output revealed that building permit issuance significantly and *positively* correlated with shootings. Increased building permit issuance *associated with increased shootings*. There appears not to be strong evidence that economic development, rather than PIVOT, produced the observed shooting declines across the PIVOT sites.

Traditional Law Enforcement (Arrest)

PIVOT has been thoroughly described. Arrests are one component of PIVOT, as offenders and the places they use are entangled. It would not be likely that the PIVOT investigative team ignored offenders committing criminal acts during their patrols and investigations. The PIVOT team regularly detected offenses, and arrested offenders as a part of their project work. Other operational policing groups also worked in these areas, detecting offenses and arresting offenders as a part of their regular duties. While the PIVOT team was relatively small in Cincinnati (between two and four officers during these projects' timeframes), to the extent that they spent additional time in these spaces, one might argue that increased

detection and apprehension could explain the shooting declines observed in these spaces. This alternative explanation could render the place network perspective and claims of place interventions' effect irrelevant. This explanation would suggest that something more akin to zero-tolerance law enforcement created the observed effect. Because PIVOT is a complex strategy, disentangling its component parts, such as arrests, is not entirely possible. Arrests were not included as a control variable within statistical models, given the entangled relationship between PIVOT and arrest. But a reader might seek reassurances that arrest alone did not create the observed outcome.

I analyzed arrest data in each PIVOT site. I summed arrests for the two-years prior to PIVOT intervention and compared this to the two years after PIVOT was launched.[31] If the alternative explanation has merit, I would expect to find consistent increases in the number of arrests post-PIVOT. Two figures are presented below. The first displays felony arrests and the second represents misdemeanor arrests (Figures 9.1 & 9.3).

While there is variation in the arrest activity across sites, this data undermines the hypothesis that arrests are the principle mechanism reducing violence at PIVOT sites. First, overall, arrest activity did not go up after PIVOT was launched as would be expected if criminal enforcement were the driving mechanism. For all sites (summed), felony charges declined by ten percent in the post-PIVOT time period. Misdemeanor arrests also declined slightly.

Close inspection of these tables reveals relative consistency in arrest activity in Sites Two, Three, and Five (single digit changes in either direction for both felony and misdemeanor arrest). Site One demonstrated dramatic arrest reductions (61% fewer felony arrests and 35%

[31] The data used represent charge counts, meaning that if an individual was charged with multiple offenses during a single event, each is counted.

fewer misdemeanor arrests). Site Four was the only site that presented appreciable arrest increases (+19, +33% for felonies and +63, +39% for misdemeanors). Significance tests (Tables 9.2 & 9.4) further reinforce the position that arrest activity did not significantly increase. Three of ten tests proved significant in arrest comparisons, and two of three were the result of significant declines in arrest activity. The lone exception was misdemeanor arrests at Site Four, which increased by about 2.5 misdemeanor charges, monthly ($p < 0.1$). As a result, this data does not support the alternative explanation that criminal law enforcement created the observed shooting decline. Arrests declined and so did shootings.

Table 9.1. Felony Arrests Pre/Post

	Site 1	Site 2	Site 3	Site 4	Site 5	All Sites
24 Months Pre	105	55	80	57	43	340
24 Months Post	41	58	80	76	50	305
Count Change	-64	3	0	19	7	-35
Percent Change	-60.95	5.45	0.00	33.33	16.28	-10.29

Table 9.2. Felony Arrest T-Test

	Mean Pre	Mean Post	t-value	df	Significance
Site 1	4.38	1.71	2.654	23	0.014**
Site 2	2.29	2.42	-0.179	23	0.86
Site 3	3.33	3.33	0	23	1
Site 4	2.38	3.17	-1.009	23	0.324
Site 5	1.79	2.08	-0.44	23	0.664

Table 9.3. Misdemeanor Arrests

	Site 1	Site 2	Site 3	Site 4	Site 5	All Sites
24 Months Pre	289	202	196	162	85	934
24 Months Post	189	207	198	225	91	910
Count Change	-100	5	2	63	6	-24
Percent Change	-34.60	2.48	1.02	38.89	7.06	-2.57

Table 9.4. Misdemeanor Arrest T-Test

	Mean Pre	Mean Post	t-value	df	Significance
Site 1	12.04	7.88	2.661	23	0.014**
Site 2	8.417	8.625	-0.124	23	0.902
Site 3	8.17	8.25	-0.057	23	0.955
Site 4	6.75	9.38	-1.983	23	0.059*
Site 5	3.54	3.79	-0.329	23	0.745

Other Police Interventions

The Cincinnati Police Department engaged several violence reduction strategies during the time in which this PIVOT evaluation was completed. These included the Cincinnati Initiative to Reduce Violence (CIRV) and the implementation of gunshot detection technology.

The early pages of this paper introduced CIRV, Cincinnati's offender oriented focused deterrence strategy, which was launched in 2007 and has been operational since. PIVOT planners envisioned CIRV and PIVOT as companion strategies. Yet for evaluative purposes it is important to consider whether the results found in this paper might be because of CIRV, rather than PIVOT.

There are two reasons why this does not appear to be the case. First, CIRV has been operational since 2007. As such, there seems not to be a connection between the intervention points identified in this paper and the CIRV strategy. Second, the CIRV strategy has been adopted citywide, and it has been evaluated at this level (i.e. Engel et al., 2013). Shootings citywide did not follow the same trajectory as within PIVOT sites. Shooting victim counts were relatively stable in the first PIVOT evaluative period, and they declined by approximately thirteen percent in the second. Shootings in PIVOT sites declined by approximately seventy-two percent (averaged).

My analysis cannot determine whether CIRV continues to have an impact on violence. To some extent, the strategies have been interwoven in Cincinnati to a degree that does not allow precise separation. These results do suggest that the addition of PIVOT to Cincinnati's violence reduction efforts has produced a benefit over and above what CIRV had previously provided.

The City of Cincinnati also paid to install gunshot detection equipment in a portion of the city during this evaluative timeframe. As this is the case, it is important to consider if the gunshot detection program, rather than PIVOT, provides a plausible alternative explanation for observed declines in shooting victimization in PIVOT sites. Two key pieces of information suggest that it did not.

First, this gunshot detection program was first launched in only one area of Cincinnati, several miles from the two original project sites.[32] For the duration of this analysis of the first two sites, no gunshot detection program was activated in those sites. Given this, there is no reason to believe that Sites One or Two were impacted either positively or negatively, by the installation of gunshot detection technology in a neighborhood that was several miles away from where PIVOT was originally implemented.

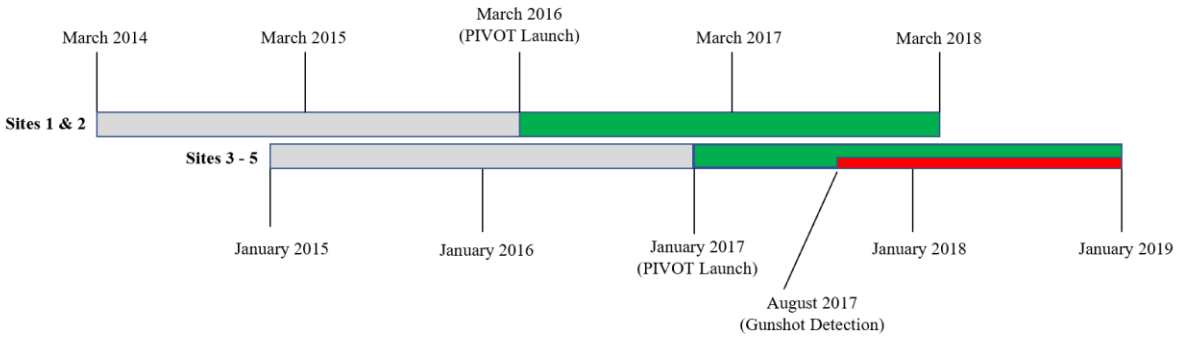
Disentangling these interventions at the other three sites is more complex. Sites Three, Four, and Five were situated within the same neighborhood that received the gunshot detection treatment, and the gunshot detection project was launched closer in time to the PIVOT intervention.[33] This creates more significant challenges for those interested in disentangling

[32] Cincinnati did not report the exact footprint of the gunshot detection program, but did publicly report the neighborhood where this project was launched and the general size of the footprint, approximately three square miles of the 77 square mile city, first launched in August of 2017. This public information is what I have relied for this paper's purpose.

[33] PIVOT was implemented in these sites in January, 2017. The gunshot detection program was implemented in August, 2017.

these two strategies' relative impact at these three sites. Figure 9.1 is presented below to illuminate project and intervention timelines in relation to one another.

Figure 9.1. Intervention Timelines



Two pieces of evidence suggest that PIVOT's impact extended beyond any effect of the gunshot detection program. First, inspection of twelve-month averaged shooting counts for all three of these sites demonstrate a downward trend that aligns relatively closely with PIVOT's implementation and pre-dates the launch of the gunshot detection program. Second, the analysis of spatial shooting reductions aligns closely with PIVOT sites rather than the larger footprint of the gunshot detection technology. Shooting reductions in PIVOT sites were pronounced. Reductions were also observed in the first 1000' buffer area, but to a lesser degree, and again declined, but to a progressively lesser degree in the 2000' buffer zone (see Table 9.5 & Figures 9.2 & 9.3 below). This is powerful evidence supportive of the assertion that something unique occurred within the boundaries of PIVOT sites that was different than what happened in the neighborhood at-large, and that this effect radiated outward as it diffused. The restated table and figures below demonstrate the centralized reductions observed in PIVOT sites and their outward diffusion. Figures 9.4 - 9.6 are restated smoothed shooting counts for the same three sites, with a

red vertical line indicating PIVOT launch and a blue vertical line marking the launch of gunshot detection technology.

Table 9.5. Sites Three-Five Spatial Displacement

	Sites 3-5	Sites 3-5 1000'	Sites 3-5 2000'	Full Extent
24 Months Pre	35	36	18	89
24 Months Post	10	24	15	49
Count Change	-25	-12	-3	-40
Percent Change	-71.43	-33.33	-16.67	-44.94

Figures 9.2 & 9.3. Sites Three - Five Shooting Victimization (Pre & Post)

Figure 9.4. Shooting Victims Site Three (smoothed)

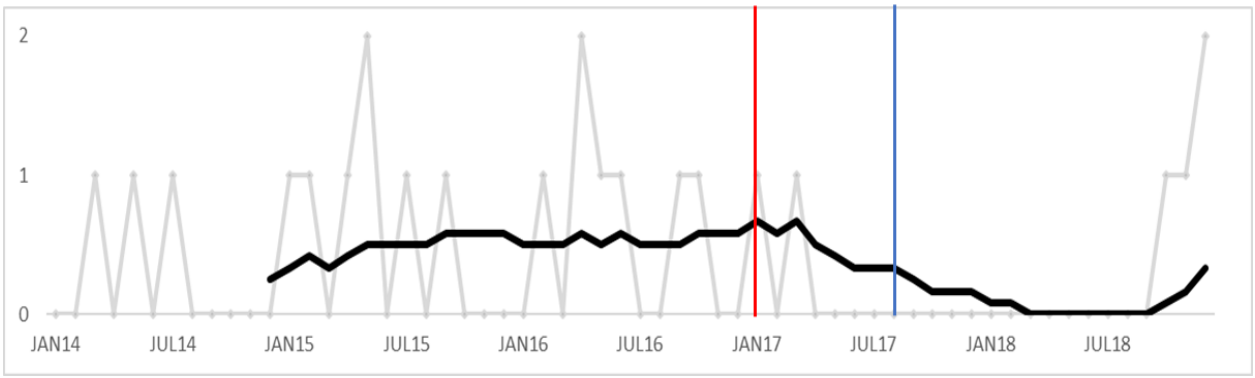


Figure 9.5. Shooting Victims Site Four (smoothed)

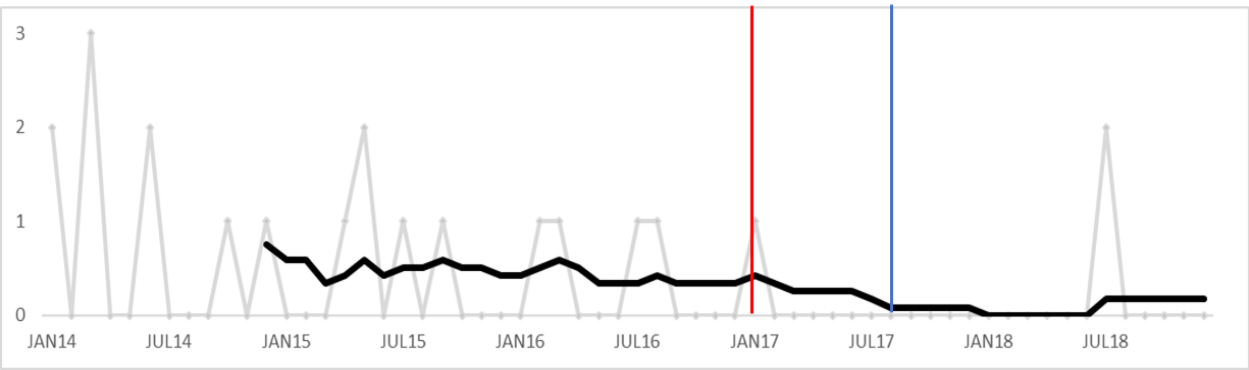
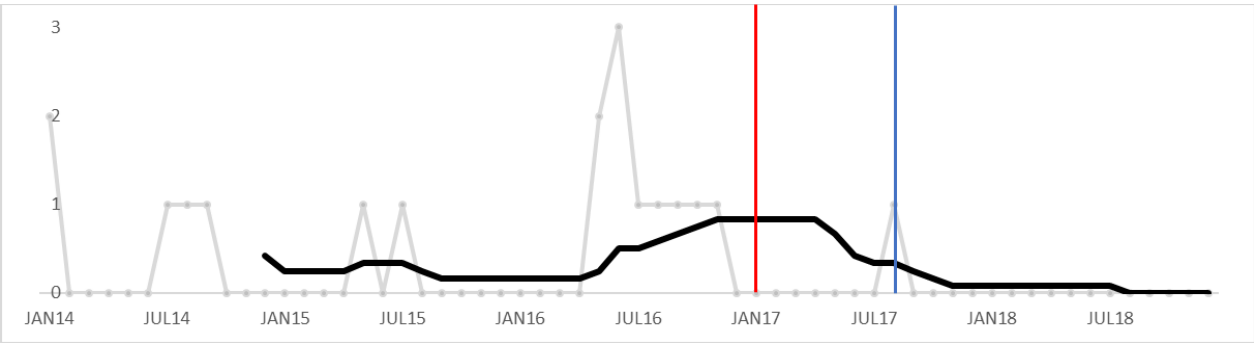


Figure 9.6. Shooting Victims Site Five (smoothed)



*Red line denotes PIVOT start. Blue line denotes gunshot detection start.

This evaluation of PIVOT supports the assertion that place network disruption is effective at reducing shootings. Having eliminated several rival explanations, including the effects of climate and economic development, traditional law enforcement, Cincinnati's ongoing CIRV initiative, and newly implemented gunshot detection technology, I proceed to a discussion of why PIVOT works in Chapter 10.

CHAPTER 10
WHY DOES PIVOT WORK?

"There is no such thing as a coincidence"

- *Gibbs Rule 39, N.C.I.S.*

In this chapter, I discuss the mechanisms that appear to drive PIVOT. I blend observations and findings from previous chapters, drawing from past research and practice to highlight the features of this strategy. The ideas presented in this chapter are not comprehensive. Instead, I have highlighted some of the key features that are most important to the successful implementation of a place network disruption strategy. Table 10.1 summarizes these features. Each is explored in detail in the paragraphs that follow.

Table 10.1. Important PIVOT Features

Operative Feature	Value
Careful network identification	Resource efficiency
Network, rather than single place disruption	Reduces offenders' ability to adapt/adjust
Wide ranging partnerships & buy-in	Improves the array of intervention tools
Timely analytic feedback	Allows for adaptive responses

Careful Network Identification

After a site has been selected for PIVOT, the process of identifying the operative place network begins. This would be unnecessary but for the critical need for resource efficiency. There are hundreds of places within a single intervention site. While most outsiders aren't likely to know the resource limitations of local government, insiders should be very aware of this

reality. If local government attempted to intervene (ala "broken windows") comprehensively, across hundreds of locations within a single site, the treatment would most likely dilute to a negligible level. This approach would probably produce a level of treatment indistinguishable from non-treatment. Given that *the theoretical underpinnings of opportunity theory require that offenders perceive that changes have taken place* within their criminal opportunity structure, the intervention must be noticed in order to produce an effect.

Further, the place network assertion is that locations have irregular value in perpetuating criminal activity. Some places are helpful to those interested in crime. Other nearby places are not. Focusing on the places that have the greatest criminogenic value provides the best opportunity for return on investment in an environment of limited resource. Cincinnati's PIVOT Site Two illustrates this point.

Working in a neighborhood larger than some small cities, the PIVOT team focused on one high-density intersection within the neighborhood of 30,000 residents. During this project's early months, two investigators and a supervisor were assigned to PIVOT. These officers divided their time between Sites One and Two. Officers had to carefully identify network components from among dozens of apartment buildings, commercial strips, and smaller structures, if there would be any hope of a noticeable treatment impact. By relying on careful place network identification, hundreds of possible intervention sites were reduced to fourteen. This is akin to delivering medicine to a localized site on the body, rather than relying on an oral dose that diffuses through healthy and non-healthy tissue alike.

Government gains legitimacy by prioritizing the greatest harms. It avoids disenfranchising those with few resources who are not generating problems for their near neighbors. Not every broken window is more than just that. Some are. The fourteen places the

PIVOT team identified in Site Two provided more than enough work for the small team to manage, more than enough evidence supporting the need for government intervention, and little reason for the public to push back on our prioritization of work at these places. Not only did the team consider careful place network identification to be important, it also appeared that when efforts were coordinated across multiple nearby places, the overall outcomes were more impactful.

The Impact of Network Disruption

Scholars have identified four types of places believed to compose criminogenic place networks so far. In Cincinnati projects, place networks were found to average nine separate components. This suggests duplicative purpose among some networks. If one were to imagine a strong criminal gang, you might expect to see people with duplicative skill sets in the gang. There might be several people who act as lookouts or drivers. More than one person might be capable of laundering money. One might expect to find multiple "shooters" among the group. In fact, in any strong system, criminal or not, we would expect to see redundancies develop as a natural function of system preservation. Large retailers generally have multiple production facilities, several warehouses, and more than one transportation route. If they do not, they risk service interruptions that impact the bottom line.

We should think of crime place networks the same way. Those who profit from crime are motivated to create resilient systems that support their bottom line. But accepting this, we should expect that intervening upon a single component of a place network could have little effect on the overall operation. We should expect that where violence is highly concentrated and systematic, a strong infrastructure exists to support it. In Cincinnati, as many as eight places were identified as comfort spaces in a single network. Four separate crime sites were recorded in

a different project area. Table 10.2 below, identifies the distribution of places – by type – at each site. Where places were identified by more than one type, they are counted in both categories. Comfort spaces were identified most frequently, followed by crime sites. Corrupting spots were relatively rare.

Table 10.2. Crime Places by Type

Site	Crime Sites	Comfort Spaces	Convergent Settings	Corrupting Spots
1	4	6	1	1
2	2	8	3	1
3	3	7	2	0
4	2	3	3	0
5	3	2	2	0
Total	14	26	11	2

Cincinnati PIVOT team investigators, while working Site One, began to intervene upon a row of four adjoining properties that were fronted by a public sidewalk. While these spaces were discrete in their ownership, their proximity to each other created the opportunity to quite literally sidestep a single intervention. And that is exactly what they did, using nearby space toward similar benefit. It was not until network, rather than place, disruption was achieved that the team observed an impact on crime.

Sites Four and Five were unique for the PIVOT team. As previously described, these sites were treated together largely because they represented entire alternative networks available to the same group of offenders. I would expect that this situation is rare. In Cincinnati, this is the only instance where an alternative network appeared to be available to a group.

The Importance of Broad-Based Partnership

As is certainly clear by now, the style of policing applied within the PIVOT strategy, built upon the foundation of environmental criminology, is not limited to traditional law

enforcement methods. Given this, the strategy's style requires a broadening of the array of tools available to police to generate crime reduction and preventive effect. It is by extending and strengthening these relationships that non-enforcement tools become more readily available.

Only a few places are directly controlled by law enforcement (i.e. police stations, courts, and jails). In public settings, although police frequently enforce laws there, the spaces are not *managed* by police. Rather, other divisions of local government organize and manage these spaces. These governmental divisions (i.e. traffic engineering, public services, recreation) are influenced to a greater or lesser degree by the communities they represent as a result of a variety of factors. Most places are privately owned and managed, with little or no governmental involvement. Once we realize the significant percentage of places that are privately managed, the relevance of place management theory in crime control and prevention is activated. This realization likewise emphasizes the importance of partnership development. Developing strong partnerships strengthens police' ability to influence the decisions that are made about public and private places.

Community Stakeholders

In most every community, there are individuals who care about the neighborhood in which they live. They have an expectation that as residents, they have a role in determining the construction of their neighborhood. Some residents have been granted extended power by their peers to "informally govern" on behalf of small collectivities.

Cincinnati is a city of neighborhoods. Socially, individuals routinely organize and define themselves by the neighborhood in which they live. Community councils have been established as neighborhood "governments". These collectives are recognized by the City as a body that speaks for their community. While this specific form of collectivity may not be present in other

jurisdictions - the premise - that social collectives form who desire to communicate their wishes to government, to be at the table, and to sometimes participate in government decision making, is widespread.

Sir Robert Peel twice served as the Prime Minister of England. As the British Home Secretary, he founded the London Metropolitan Police. Peel created *Nine Principles of Policing* to inform the basic mission of the police. His second principle stated: "The ability of the police to perform their duties is dependent upon public approval of police actions" (Williams, 2003; 100). This idea is a cornerstone of democratic policing.

Particularly when police are engaged in actions that are outside of the expected norm, it is critical to build relationships with public figures, to communicate problems and potential solutions, and to work toward collective decision making whenever possible. It is the public that grants police the authority to act.

As an example of the importance of this point, I draw the reader's attention back to Site Two. Investigators identified two bus stops that were contributing to cyclical violence by providing superficial legitimacy for the presence of drug dealers, allowing them to rebuff both business owners and police who objected to loitering, disorder, and drug trafficking. The PIVOT team felt that the bus stops should be closed or moved to disrupt the criminogenic benefit they were providing offenders.

Without engaging the community, relaying all the information that led the team to this conclusion, and understanding the transportation concerns of residents, the team would not have generated enough public support for the closure of these stops. By building a relationship, communicating concerns, offering alternatives that mitigated collateral consequences, and

engaging the public (including surveying those most likely to ride the bus), police were able to win public approval for this police action. In another instance, public support was sought to add parking restrictions. In yet another, the team solicited the approval of neighborhood leaders to demolish a vacant building. These are just a few of the many instances in which the support of the public was necessary in order to disrupt place network components.

When the police and the community stand together, there are few obstacles. During the first PIVOT project, the team and East Westwood leaders built a strong partnership. Leaders in East Westwood had spent years mentoring the community's most at-risk youth. Against a violent drug operation whose participants were more than willing to complain about police scrutiny, this partnership helped to demonstrate the legitimacy of police efforts.

At one point, the City commissioned a filmmaker to create a documentary about PIVOT. While the filmmaker was interviewing community leaders, one of them pulled me into the camera frame in an unscripted moment and said ". . . the reason we're being revolutionary now is because we're solving the problems in this community within a year, because we're doing it together. Because I love you, I'm telling you I appreciate what you guys are doing!" He proclaimed: "I can't believe that my entire police force is out to get me . . . [T]he decision he makes is that I'm going to make every citizen safe." (Black, Isaac, & Wesson, 2017; 4:50).

He spoke those words *into a microphone* for all to hear, during a time when the national narrative about police was as negative as it had been in the 1960's. He spoke these words at a time when a steady stream of news reports suggested that the police and community were opposed to one another. Imagine the impact of this public proclamation of partnership with the police, by credible neighborhood leaders.

When community leaders encouraged their residents to place signs in their windows that stated: "We call police because we care", I was taken with the message. Again, it represented unity between police and the community, and it empowered the police to act. It seemed surreal to me – as my experiences had previously been that in areas where violence was entrenched, the community-police relationship was rocky, to say the least. The PIVOT intervention included close coordination with City economic development professionals, and communication with local community development corporations as well.

Law

Police throughout the U.S. regularly work with lawyers who prosecute criminal defendants. To a lesser extent, governments use attorneys to aid in preventing crime. Yet if place management and place network theories have merit, government attorneys are critical partners in the prevention and mitigation of crime.[34]

While arresting offenders and assisting in the prosecution of criminals is well within the direct purview of police, the police have less direct authority in dealing with property owners whose mismanagement allows criminal activity to persist. This highlights, in part, that the lion share of police activities have historically been focused on criminal, rather than civil law. "A whole host of legal issues [that] go beyond the expertise and training of the average police officer … are realistic obstacles in many cases. How are you going to navigate probate [for example]? There are a whole host of [legal] topics that attorneys are trained in, that police are not." (M. Manning, personal communication, December, 2019).

[34] There are statutory provisions that allow non-government entities to pursue civil actions that governments might pursue, bur from practical standpoint, non-governmental pursuit of these remedies seems rare.

Herman Goldstein, recognized as the father of problem-oriented policing, developed a hierarchy by which those engaged in problem-oriented policing might "shift ownership" back to those responsible for the problem. He recognized that intervening upon a place, as with intervening upon a person, is not necessarily a cooperative endeavor. Goldstein considered the two highest order interventions to be legislation mandating prevention and engaging a civil action. These items are important, as those engaged in the business of public safety must recognize that cooperation is not the only avenue by which public safety should be improved.

Conflict is sometimes necessary. Goldstein rightly treated this type of work hierarchically, identifying informal, expedient, and non-coercive routes as those that are preferred. But to believe that problem places are always so, due to accident or ignorance, is to ignore the reality that some places are problems because of the purposeful acts of others who profit directly from the environment as it is. These owners or managers have a vested interest in preserving the problem, because they are profiting in some way from it. Beyond these instances, we suspect that police get some cooperation because some owners understand that police may choose to pursue coercive avenues. As Egon Bittner stated, "police work can, with a very few exceptions, accomplish something *for* somebody only by proceeding *against* someone else" (1970; 16). Conflict should be expected in some instances, as problem solution is not always perceived as being in the best interest of the individual in control of the place.

There is not much legislation specific to the prevention of crime, as compared with fire and building municipal codes. But fire and building codes do overlap with the goals of crime prevention in some instances, and that can be leveraged. Cincinnati's PIVOT team considered civil actions, such as public nuisance lawsuits, within the array of responses to disrupt the negative use of place network components.

In Cincinnati, the Law Department was instrumental in disrupting some of the most persistent place network components. Cincinnati's Law Department includes city solicitors dedicating their full-time attention to issues affecting residents' quality of life. Negligent, reckless, or purposeful mismanagement of places can certainly harm residents' quality of life. These attorneys worked closely with CPD officers to mitigate the harm created to the community as a result of nuisance conditions. City attorneys routinely worked with PIVOT team members to address place network components contributing to violence. Assistant City Solicitor Mark Manning offered this when asked about the effectiveness of public nuisance actions: "Even when you do criminal enforcement, you achieve minimal compliance. The tools that exist under civil remedies . . . allow you to just go in and fix the problem yourself, and just cut out the middle-man, which is oftentimes the most effective response" (personal communication, December 2019).

The principles communicated within Ohio's public nuisance law show that the state legislature recognizes property owners have a responsibility not to acquiesce to criminal conduct on their property. Ohio's public nuisance law states, in part: "Any person, who uses, occupies, establishes, or conducts a nuisance, or aids or abets in the use, occupancy, establishment, or conduct of a nuisance; the owner, agent, or lessee of an interest in any such nuisance; any person who is employed in that nuisance by that owner, agent, or lessee; and any person who is in control of that nuisance is guilty of maintaining a nuisance . . ." (37 Ohio Rev. Code, 1999). Nuisance activities in Ohio include prostitution, criminal activity at liquor permit premises, use of property by criminal gangs, and some drug law violations.

This statute allows for a civil action to be brought against an owner of property upon which nuisance activities have occurred. Remedies range from injunctive relief (court declaring

a property a public nuisance), orders to abate nuisance activity, forfeiture of a liquor license, or a one-year closure of the property for use by all people, including the property owner.

Public nuisance decisions rendered by Ohio courts demonstrate that the judiciary recognizes the role places play in persistent criminal activity, and the government's responsibility to intervene upon these places to preserve public safety. In State ex rel. Miller v. Anthony, the Ohio Supreme Court offered: "All property owners are obligated to use their property in a manner that will not injure the community at large . . . The legislature may exercise its police power by authorizing the proper authorities to grant injunctions in order to prevent certain persons from allowing their property to pose a continuing detriment to public safety" (Ohio Sup. Ct., Feb. 8, 1995).

While considering the merits of another nuisance case heard by the Ohio Supreme Court, the state's high court asserted: "injunctions which authorize a governmental agent to sue to enjoin activities deemed harmful by the General Assembly are not designed primarily to do justice to the parties *but to prevent harm to the general public*" (Ohio Sup. Ct., Dec. 9, 1998, emphasis added). In the same decision, the state's high court addressed the constitutionality of this state law: "[p]rivate property rights may be limited through the state's exercise of its police power when restrictions are necessary for the public welfare . . . Before the police power can be exercised to limit an owner's control of private property, it must appear that the interests of the general public require its exercise and the means of restriction must not be unduly oppressive upon individuals" (Ohio Sup. Ct., Dec. 9, 1998). In both decisions, the court recognized the relationship between an owner's operation of a place and potential public welfare implications.

In addition to Ohio's Public Nuisance statute, the City of Cincinnati enacted a Chronic Nuisance local municipal code that addresses properties with elevated levels of certain nuisance

activities such as assaults, noise, drug, and weapon activity (see 761 Cincinnati Mun. Code, 2006). Once qualified as a chronic nuisance, the City's process includes providing notice to the owner that they must submit an abatement plan subject to review. Failure to submit an acceptable abatement plan exposes property owners to fines and ultimately, criminal remedies, if nuisance activities persist and legitimate abatement efforts are not attempted.

Both state and local statutes have proven valuable toward the disruption of crime place networks. Generally treated as an incremental process, the PIVOT team attempted to work with property owners when conditions on private property signaled a need for abatement. But these accountability mechanisms provided by the local and state legislators (and the system of solicitors willing to pursue them) are necessary, as cooperative soliloquies do not always succeed.

In this author's experience, law enforcement often solicits private owners' cooperation in addressing matters. Sometimes this works. But both law enforcement and owners alike, all too often act as if there is no method of accomplishing change if owners do not willingly act. And so, where cooperation is found, progress is made. This is most likely to happen at the least problematic places within a criminogenic place network. The most entrenched network components may require civil action to disrupt the use of these properties to further violence.

Buildings and Inspections

Because people interact with their environments in highly specific ways, those motivated to engage in violence take advantage of certain characteristics of places to facilitate these activities. Buildings and inspections departments are a natural partner when focusing on disrupting the criminogenic value of places, as these departments regulate the construction and condition of structures.

Although Cincinnati's building code focuses directly on risk factors related to fire, structural integrity, and health, it seems that when owners fail to attend to these basic necessities, they also create conditions that are suitable for crime. Offenders routinely seek places to hide contraband. Well maintained structures provide fewer opportunities to hide guns and drugs. Buildings with gaps in siding, missing bricks in exterior walls, and large holes in common-area drywall create suitable spaces to secrete contraband, while also breaching fire separation and risking water intrusion. Owners who fail to properly maintain structures also communicate their lack of interest in the proper, lawful operation of the place. This message is received by those who occupy the space. It communicates permissiveness on the part of the owner or place manager.

In Cincinnati, it is the Department of Buildings and Inspections who generally determine the livability of property, and whether the conditions at properties create substantial risk of harm to residents and guests. The PIVOT team worked closely with this department to evaluate physical risks, to offer input as to additional problems that some building code violations might create in terms of crime, and to identify potential hazards for the Buildings and Inspections department to evaluate. In many instances, evaluating police and building department records together, provided a more complete picture of owners' acquiescence to their legal obligation to protect against activity that harms the community.

Examples of intersecting building and police concerns at place network locations include a vacant school with a collapsing roof that showed signs of trespass (see Figures 5.16 & 5.17, page 110) and behind which street robberies were taking place, a burned out three-family house where drug dealers gathered on the porch and a homicide occurred in the driveway, and an apartment building without functioning common hallway locks or hallway illumination of any

sort (either natural or artificial), within which shooting victims retreated and outside of which robberies took place. These are just a few instances where building conditions and crime intersected. In Cincinnati, the Department of Buildings and Inspections was a fantastic partner for police in the effort to disrupt the negative use of criminogenic places.

Departments of Government as Public Place Managers

Although private property is heavily represented in Cincinnati's five place networks, public spaces such as sidewalks and street segments were also identified. While it might seem to those outside police departments, that the police have broad authority to exert change in public places, this is not actually the case. Police sometimes exert *temporary* control of public spaces to serve specific emergency needs, such as preserving a crime scene or guarding against temporary hazards, like downed power lines. But police generally have very little direct influence over the long-term organization and operation of public spaces. Rather, they are left to attend to the consequences of how they are organized and managed.

The place managers of these public spaces are local traffic engineers and public service employees, as they have the responsibility for construction and maintenance of our roads and sidewalks. When seeking parking restrictions on Cincinnati roadways, police solicited traffic engineers to approve this change. Traffic engineers were also called upon to facilitate street lighting improvements, in coordination with the local utility provider. The PIVOT team added signage to several public spaces via the Department of Public Services. Other place management activities, including debris and brush removal were also coordinated with these departments.

An array of other governmental departments are managers of some public spaces. The number of these departments is probably proportional to the size of the jurisdiction. In

Cincinnati, in addition to the Departments of Traffic and Engineering and Public Services, the PIVOT team also worked with the local recreation department and the parks department (two separate entities) to facilitate changes at places they controlled. Understanding that even public spaces have place managers with the ability to make changes, is important when public spaces are a part of criminogenic place networks.

One might think that it would be far easier for police to generate change in public spaces. This is not always true. Within the bureaucracy of government, it can be challenging to create change. There can be a sense that public spaces should, by their nature, be lightly managed. Budgets are often already committed to new projects, and finances are difficult to alter within government, and so there are financial barriers to proposed changes. Also, the responsibility for the management of these places falls on departments, rather than upon individuals, which leaves room for confusion as to who is ultimately responsible for acting. Nevertheless, within the PIVOT strategy in Cincinnati, representatives of many of these departments worked diligently to create the changes necessary to produce a safer community. It just wasn't always easy, either for the police who recommended the change, or for the department representatives attempting to act within a bureaucracy.

Economic Development and Private Partners

Although the police are asked to broaden their array of tools to prevent crime, there are limits to what they can accomplish before having ventured outside of even a liberal interpretation of their responsibilities. If we seek guidance from Peel on the responsibility of the police, we find that this range is broad, but not unlimited. "The basic mission for which the police exist is to prevent crime and disorder" (Peel's first principle, Williams, 2003; 100).

Traditional law enforcement is naturally subtractive. Prohibiting unlawful conduct, restricting the movement of some. Arresting others. Even within PIVOT, most of the direct product of police action is subtractive. It is the removal of things. Restricting parking. Closing a bus stop or shuttering a business.

Subtractive processes, while important, do not engender public support the way additive processes do. The items of additive value that the police do provide tend to be intangibles and of low visibility – officers' time and attention. It is generally the responsibility of other governmental entities to produce high visibility outputs considered by the public to be additive, such as improvements to parks, addition of recreation areas, or rehabilitation of community centers. And it is critically important that the police partner with these entities for two reasons. First, that the police may help prioritize the places and times in which strategic investment takes place. Second, that the public may witness that the police value and support additive change, even if they do not directly deliver it themselves.

The ability of the police to help prioritize positive place change and the timing of these changes should not be overlooked. Within these projects, the PIVOT police team developed detailed information about criminogenic place networks, the character of violence, and the strategic value of specific places in the prevention of future crime. They were able to share this information with economic developers in a productive way. In Cincinnati, PIVOT was linked with an existing program facilitated by the City's Department of Community and Economic Development (DCED), called the Neighborhood Enhancement Program (NEP). One example of this close coordination was during planning stages for the redevelopment of a local park. Timing was such that the team was able to first witness sustained improvements in violence and shootings and demolish a dilapidated house, before a playground, walking trail, and seating area

was added to the recreation space for the public to enjoy. Ethel Cogen, NEP Program Manager for the City of Cincinnati worked tirelessly to produce a public benefit to NEP and PIVOT partnerships. "While PIVOT is removing the bad, NEP is working with the community to stage the good, so there's a seamless transition" (E. Cogen, personal communication, December, 2019).

Police officers from the PIVOT team joined with neighborhood volunteers and other city employees to help spread mulch and make recreation area improvements a reality. In this instance, the police were able to participate directly in an additive community program, and the public was able to see this. From the city's perspective, "We are doing this *with* the community, not *for* the community. [The value of] this is long term sustainability, because the community is engaged from the beginning. They have a stake in it. I think about that old cliché, that if you give someone a fish, they eat for a day, if you teach them to fish, they eat forever" (E. Cogen, personal communication, December, 2019). Community engagement during programming phases provides a higher probability that successes will sustain. "If they don't do it with you, they can't pick up the ball and run with it [after government programming ends]" (E. Cogen, personal communication, December, 2019).

Positive place change is important for several reasons. It encourages active place management nearby. It communicates to those interested in violence that someone cares about nearby space. And it provides an opportunity for others to sense that the community is no longer entrenched in disinvestment. "It's important to celebrate success. Those celebrations add intrinsic value. They have a positive ripple effect for a long time" (E. Cogen, personal communication, December, 2019).

Non-Profit Partners

Other partners joined Cincinnati's PIVOT effort, providing a variety of benefits. The Hamilton County Land Reutilization Organization, a local land bank, collaborated with PIVOT. Keep Cincinnati Beautiful (KCB) worked with the team to organize neighborhood cleanup and beautification efforts in project spaces. They also painted vacant building facades and boarded up windows when they could get an owner's consent, to reduce the appearance of abandonment, to eliminate opportunities for stashing contraband, and to improve the appearance of place management.

Churches and faith groups participated in these projects. The Community Police Partnering Center conducted outreach, sought to train residents on problem solving methodologies, and performed citizen surveys to further the team's mission. Where alignment could be achieved, even in public messaging regarding community trajectory goals and results, the project undoubtedly benefitted.

Timely Analytic Feedback

Sir Robert Peel's final principle guiding police was: "The test of police efficiency is the absence of crime and disorder, not the evidence of police action in dealing with it" (Williams, 2003; 100). This requires a system of measuring crime and disorder that allows us to know whether it is present or absent.

A decade ago, I worked on a problem-solving project focused on a small area on Cincinnati's east side, where gun violence was frequent. I was a sergeant, supervising one of CPD's violent crime squads at the time. While working on that project, I became frustrated that I couldn't tell whether the interventions we had set in place were having an effect. I couldn't tell, in a timely manner, whether crime and disorder had abated. I only knew what actions we

had taken to try to deal with the problem. If one shooting happened, did that mean that the strategic interventions we had set in place were worthless? I needed timely and accurate information that I did not have, to help me understand what was going on. Because gun violence in small spaces (even those disproportionately impacted) is relatively infrequent, and because I had not identified any systems (other than shooting reports) that informed me whether gun crime was slowing, I was blind to the impact of our project while it was underway. It was not until long after we had completed the project that I was able to see that it had successfully reduced shootings.

This has not been a problem for researchers, largely because researchers tend to operate on different timelines than practitioners. Researchers have generally contented themselves with allowing time to pass until data has sufficiently accumulated, and they can be reasonably sure that the datasets will support standard statistical methods for evaluation. This is understandable. But among practitioners, there is a demand to push toward more timely evaluation so that practitioners might alter their decision making *during* an intervention, so they might refine programming more quickly. This is especially true when projects intend to save lives and reduce catastrophic harms. These practitioners have neither the patience nor the luxury of waiting several years to determine if what they are doing is helpful.

This is why when PIVOT began, CPD developed a violence score, a weighted metric summarizing multiple sources of information that measure the problem of gun violence in PIVOT areas. This score provided a more dynamic sense of the levels of violence in project areas. This score is updated every two-weeks. Decision makers used this, along with other indicators, to assess whether project areas were improving. The PIVOT team also used analytic reports that detailed all activity in the past three days, daily. And as highlighted previously, the

team used qualitative observations and intelligence gathering to further inform their sense of progress in PIVOT areas, in addition to quantitative measurement systems.

The PIVOT team found that measuring days between shootings provided a more discerning indicator of violence levels, as the team could compare intervals between shootings for evidence of changing dynamic, rather than simply considering the scenario to be binary, success or failure. As often observed in the practice of medicine and sometimes observed in other scientifically oriented efforts to tackle persistent problems, evidence of incremental improvement can be a helpful indicator. We should not simply content ourselves with awaiting total success and abandoning programming that falls short of complete problem resolution.

Timely analytics have been critical to the success of these projects. They have allowed those managing resources to prioritize next steps, to re-allocate resources as necessary, and to reconsider the effectiveness of interventions that have been launched. The systems that operate in these places can be dynamic. Disrupting them requires the ability to see levels of crime and disorder in real time. I believe that timely analytic feedback has been one important reason why PIVOT has successfully reduced shootings.

CHAPTER 11
CONCLUSION

On a mild fall afternoon in 2017, officers from the Cincinnati Police Department moved in to make an arrest of a person concealing a handgun in his pocket, amidst a violent open-air drug market in a Cincinnati neighborhood. This area had suffered high concentrations of gunshot victimization in the past. But why?

The subject fled and was apprehended. This was not unusual. He would most certainly be replaced by another person stepping into his role if he was successfully prosecuted *and* incarcerated, or if he desisted. Whether the current offender persisted in his activities, or if his role was filled by another, the community would be no better off, as the harmful activities would almost certainly persist. Unless the systems of opportunities, risks, and rewards were changed, this arrest would have a negligible effect on nearby crime.

In this area, the PIVOT team marshalled a massive effort, first to identify the network of places believed to be providing a criminogenic benefit, then to intervene upon the network. The team and partners demolished a deteriorating apartment building and an old school whose roof had partially collapsed. They installed fencing, cordoned off alcoves, removed graffiti and painted a building face. A mural was created that projected a renewed pride in this space. The team hung signs announcing the presence of neighborhood public safety cameras. High-profile patrols were conducted. PIVOT investigators repeatedly met with property owners to discuss management practices, design features, and ongoing concerns. In some instances, the City litigated against owners who acquiesced to nuisance activities and failed to abate threats to public safety. And the team studied criminal activity and calls to police to see if this work was having an effect. After years of recalcitrant violence, the area began to stabilize.

Why Places?

The field of crime prevention has evolved to the point that opportunity theories have entered crime preventive practice, and place dynamics are (sometimes) considered by practitioners to be relevant for criminal events. In Cincinnati, Ohio, a PIVOT team has for several years piloted a strategy to disrupt crime places at some of the most systematically violent hotspots, hoping to create safer spaces in areas where violence has persisted. Cincinnati's PIVOT team is new, but the ideas leading toward its implementation are not.

Park and Burgess' sociological work in the 1920's highlighted spatial patterning in human activities. Decades later, In Hawley's *Human Ecology,* he asserted "[e]very form of life must act selectively with reference to environment; it is constantly making distinctions, seizing upon that which is appropriate to its needs and rejecting or avoiding that which is not" (1950; 3). This statement might be considered an organizing thesis upon which the field of crime prevention's opportunity theories are built.

Crime prevention's interest in places is undoubtedly spurred on by the spatial clustering of crime events that has been observed repeatedly across places, crime types, and measurement systems (Sherman, 1989; Eck et al, 2007; Wilcox & Eck, 2011; Weisburd, 2015; Blair et al, 2017; Haberman & Radcliff, 2015; Haberman et al., 2017). Cohen and Felson's routine activities theory (1979), the rational choice perspective (Simon, 1987; Clark & Cornish, 1986; Cornish & Clark, 1986), crime pattern theory (Brantingham & Brantingham, 1993 a/b), and ideas of situational crime prevention (Cornish & Clarke, 2003), all advance the role of places in the expression of crime events. The theory of place management also highlights the role places play in crime events (Madensen, 2007). Rather than viewing offending as a deterministic proposition,

these opportunity theories acknowledge that human-environment interactions are highly relevant in the interest of crime prevention.

Crime relevant places do not all serve the same purpose in the expression of offending. Crime sites, convergent settings (Felson, 2003), comfort spaces (Hammer, 2011), and corrupting spots (Eck et al., 2011) facilitate the criminal event in different ways. Given the divergent roles these places play, we should consider whether they are organized into networks.

PIVOT Sites

Cincinnati's first five PIVOT projects served as the basis for study in this dissertation. The PIVOT team identified a network of crime relevant places in each of these sites, then worked to disrupt their usefulness to offenders. It is hoped that Chapter 5's detailed exploration of the contextual features within which these networks were found, and the examination of the networks themselves, helped readers understand the practical application of thinking about crime place networks. Cincinnati's five project sites provided an important opportunity to see the expression of this approach in a handful of settings. If there had only been one network to study, we would have been much more limited in what we might have learned. Studying five different place networks gives the reader an opportunity to learn more about the commonalities of these crime place networks. It also provides an opportunity to gain confidence in the evaluation of place network disruption strategies.

Methods and Results

I gathered crime, call, and arrest data to test the effect of PIVOT on shootings, violent crime, and weapon calls in PIVOT sites, my unit of analysis. I counted how often each of these occurred in each site, each month. In addition to using a variety of descriptive methods and

visualizations, I performed t-tests, ARIMA (time-series) modeling, and negative binomial regression, controlling for temperature and economic development when models allowed. I uncovered evidence favoring PIVOT as an effective method for reducing shootings, violent crime, and weapon calls, although most violent crime and weapon call models failed to produce statistically significant results. In fourteen of fifteen instances, shootings, violent crime, and weapon calls declined after PIVOT. The fifteenth, weapon calls at Site Two, was even. The strongest statistical evidence favoring PIVOT was found during evaluation of the dependent variable, shootings.

Evidence supporting PIVOT's effect on shootings was found at each of the five sites. *PIVOT was significant at Sites One and Five across all three statistical methods. Five of these six results were significant at greater than $p < 0.01$. The sixth was significant at $p < 0.05$. Shootings at these sites declined by more than ninety percent in pre-post comparisons. Evidence supporting PIVOT was found in five of six statistical models for Sites Three and Four, at $p < 0.10$. Shootings declined at these sites by more than fifty percent.* Site Two was the only site without strong findings on the dependent variable, shootings. Yet close inspection of Site Two revealed a seventy-five percent reduction in shootings within the first catchment zone (1000' beyond the PIVOT site), and evidence suggesting a time-lagged impact. CPD reports only two shootings have occurred here in the last 745 days, approximately seventy-five percent fewer than pre-PIVOT. Much of this reduction lagged beyond the post period used in this dissertation, and so it was not considered in evaluative models.

There is little evidence to suggest that PIVOT created crime displacement. After reviewing potential spatial, temporal, target, method, perpetrator and crime type displacement at each site, evidence suggesting displacement only appeared at one project location. At Site One,

spatial and crime type displacement appeared possible. But even if we were to assign the full value of both potential forms of displacement to the program (a particularly harsh treatment of potential displacement), an appreciable reduction would remain. This aligns with past evaluations of displacement and diffusion of benefit, that suggest even when potential displacement is observed, it rarely appears at the same levels previously found elsewhere.

Far more evidence favoring a diffusion of crime preventive benefits was located. While shootings in all PIVOT sites declined by about seventy-two percent (-50), they also declined in the 2000' beyond PIVOT sites, by approximately nineteen percent (-16). Non-shooting violent crimes also declined in PIVOT sites, by approximately thirty-one percent (-37), disposing of crime type displacement concerns, and instead signaling a crime type diffusion of benefits.

I explored potential rival explanations for my findings. Temperature and seasonality were controlled for within statistical models. PIVOT was significant beyond any temperature correlations. Temperature was significant in only two of the ten shooting models, at one site, and PIVOT was also statistically significant in these models. Economic development, through building permit applications, was also controlled for within statistical models. This variable was found to be significant in two of ten shooting models, but opposite the expected direction. At one site, where PIVOT was also statistically significant, increased building permits positively correlated with increased shootings.

I considered other rival explanations not suitable as statistical controls. I disposed of traditional enforcement activities (arrest) as a proper explanation for these observations. I also disposed of Cincinnati's focused deterrence program (CIRV) and a newly implemented gunshot detection technology as reasonable explanations for the reductions here credited to PIVOT. This is not to say that these other programs are ineffective. I cannot tell based on this evaluation

whether they are or are not, but they do not reasonably explain the effects observed in PIVOT sites during this evaluation.

There is a growing body of evidence supporting an assertion that crime place networks exist, and that place network intervention can effectively reduce crime. This dissertation is another contribution to literature that emphasizes crime's concentration, the value of focusing on places, and the development of place approaches that consider networks.

Threats, Limitations, and Future Directions

No research is without limitations. In this case, the methods employed here are quasi-experimental, and so we cannot claim to know with as much certainty as with randomized controlled trials, that the relationship between crime reductions and PIVOT is causative. Sites were selected non-randomly, by those charged with reducing violence in the city, and this research was conducted after these projects were completed. For reasons previously stated I did not believe that control sites could be located to pair with confidence that they would provide informative analysis.

Threats to Internal Validity

Given the research methods I applied in this dissertation, I make the following remarks regarding potential threats to the internal validity of these findings. Temporal order appears to be adequately handled, given the various time series visualizations, pre-post, and statistical analyses that associate the PIVOT intervention temporally with shooting declines. All five sites intervened upon were studied, and so there was no attrition with which to be concerned. There were no changes in the methods by which these variables were measured, so instrumentation threats are also of no concern. I see no reason to be worried about testing effects, given that this

study was retrospective, and that it was focused on a spatial unit rather than an individual who might be apt to behave differently in a testing environment.

It is possible that selection bias threatens the internal validity of these findings. Perhaps shootings and violence at these locations would have declined regardless of the PIVOT intervention. This would be a more plausible threat if the evaluation had covered one, rather than five, project sites. While a randomized experiment might have given us more confidence that there was not selection bias, this was not an option in this instance. We may gather some assurances that my findings were not compromised by selection effect given that the entire population of intervention sites in Cincinnati during the time period was studied (five), and that findings generally replicated across all project sites. Given this, selection threat is minimized.

It is possible that I failed to account for external events that aligned with the time periods in this study (a history effect). Two factors make this unlikely. First, I located and studied potential rival explanations including arrest activity, Cincinnati's focused deterrence initiative, and the implementation of gunshot detection technology. None appeared to adequately explain the shooting declines in PIVOT sites. Second, PIVOT projects benefitted from having proceeded on two separate timelines – the first two sites launched in the spring of 2016 and the next three began in January of 2017. Given that I explored and dispensed with the most likely historical events that could alternatively explain my findings, and that the five PIVOT projects operated on two different timelines, the likelihood that a history effect compromised the internal validity of these findings seems low.

Maturation and regression effects are possible. While there tends to be more reason to be concerned with how maturation might confound measurements regarding people than aggregations of place, it is possible, although unlikely, that maturation occurred in PIVOT sites.

It is unlikely because PIVOT sites were selected due to longstanding violence as a pre-condition for selection into the project. To assume that maturation explains this dissertation's findings is to suggest that practitioners intervened at a time when an independent and natural process was creating the conditions which would lead to fewer shootings and violence in places which had shown stability in violence prior to the intervention, and that this naturally occurring process proceeded along the same two different timelines as PIVOT interventions once projects were launched. A similarly unlikely argument would be articulated for regression effect, if one were to associate regression with the findings, rather than PIVOT.

I cannot completely discount regression effects on my findings. But the threat of regression effect assumes that project sites were selected at the height of randomly variable harms, and that the timing of this variation was aligned with project implementation and study periods such that statistically significant results were artificially produced. These assumptions are contrary to much of the evidence presented in this paper, and the timing seems unlikely. Evidence of pre-project shooting spikes only appears in Sites Two and Five (in smoothed shooting timelines), and it only appears in Site Five when evaluating all violent crime. Again, if this were an evaluation of a single project site, regression effect concerns would be greater. But it is far less likely that this anomaly would be reproduced in evaluations of five different sites. Further, to accept the theoretical argument of regression effect is to reject, at least in part, arguments associated with crime's general concentration and stability. While some regression effect cannot be discounted, it seems unlikely that it compromised these findings in a meaningful way.

External Validity

Given all of the above, the internal validity of these findings appears relatively strong for a study that did not benefit from randomized control trials. But there is no link between the strength of internal validity and the generalizability of findings. All five projects that were evaluated in this paper took place within one city. It is unknown the degree to which the success of this intervention might generalize beyond Cincinnati or other similarly situated midwestern cities. While the fact that PIVOT replicated across various Cincinnati sites is important, we can only speculate as to how well place network disruption might work in Pittsburgh, New Orleans, San Diego, or Las Vegas.

Future Directions

Every research project concludes leaving avenues unexplored. For this dissertation I had a limited roadmap to guide my decisions regarding statistical methods, and I was limited by the post-hoc nature of my research project. Future researchers might find themselves in a different situation, where they might have the ability to influence project implementation to favor stronger research design. Future researchers who take advantage of opportunities for stronger evaluation designs could improve the empirical strength of place network intervention findings.

Beyond the works that generated a conceptual foundation for convergent settings, comfort spaces, and corrupting spots, there is very little research aimed at refining our understanding of what these types of places are, how they work, and how we might find them. There are tremendous opportunities to clarify these conceptualizations, and perhaps to find new types of places that are a part of crime place networks.

Most importantly though, I encourage others to replicate place network interventions where shootings and violence concentrate and persist. There are far too many places in the United States and around the world in need of strategies that effectively reduce violence. We could learn a great deal from place network disruption replications in other jurisdictions where conditions are different, even if program evaluations are not the strongest. While strong research design is preferred, replications are also informative, and the program appears promising.

Last Words

Shootings and violent crimes are some of the most significant problems that citizens expect local governments to address. For a variety of reasons, it has been unclear whether governments are up to this task. In some cities, violence, nonfatal shootings, and murders persist at extraordinary levels, despite persistent public outcry for solutions.

For the past twenty years, Cincinnati has grappled with the problem of gun violence, with disproportionate levels of shootings and violent crime. If this was not the case, Cincinnati would probably not have been the location where place network intervention was piloted. I have served as the PIVOT unit commander for the Cincinnati Police Department since the program's operational launch in the spring of 2016 until early 2020 and have researched the impact of the strategy for as long. I believe there is much we can learn from this approach to violence reduction. Not only does it suggest a promising result, but the means by which the result is delivered provides hope that violence reductions might be achieved while making fewer arrests and at reasonable expense.

Given everything presented in this dissertation, it is my view that place network intervention effectively reduces shootings and violence in areas where it disproportionately concentrates. I encourage others to replicate place network interventions, with careful attention

to process implementation, and toward the operative mechanisms that have been highlighted in the preceding pages. ***We can have safer cities***, but it takes innovation, extraordinary effort, an understanding of the features that support persistent violence, and an assembly of the proper tools to disrupt this infrastructure. The effort is worthwhile, the understanding is achievable, and citizens suffering persistent violence near their homes deserve to see crime place networks disrupted and violence reduced.

Appendix A: Violent Crime Rolling Twelve-Month Charts
(Vertical Line Marks Intervention Point)

Figure A.1. Site One Violent Crime (smoothed)

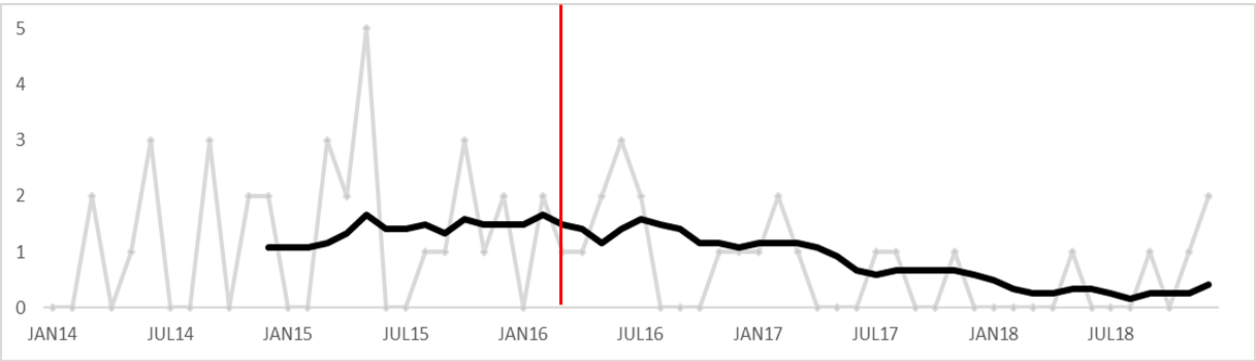


Figure A.2. Site Two Violent Crime (smoothed)

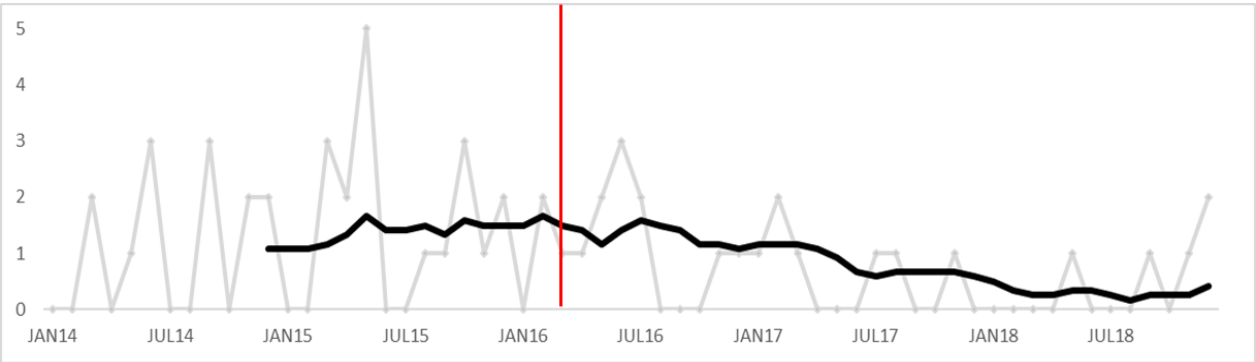


Figure A.3. Site Three Violent Crime (smoothed)

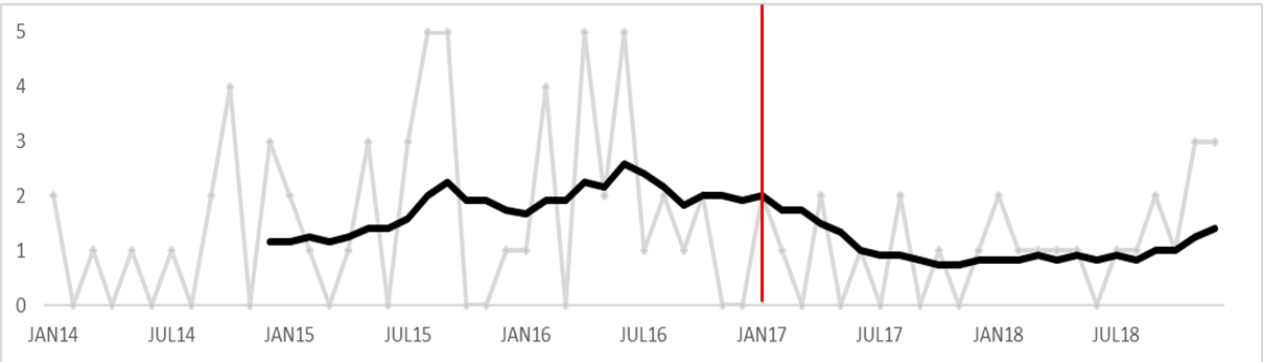


Figure A.4. Site Four Violent Crime (smoothed)

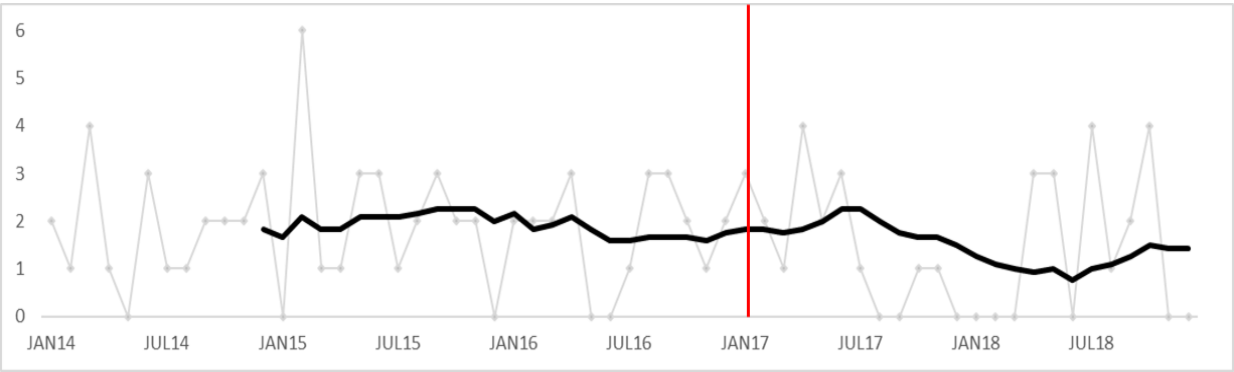
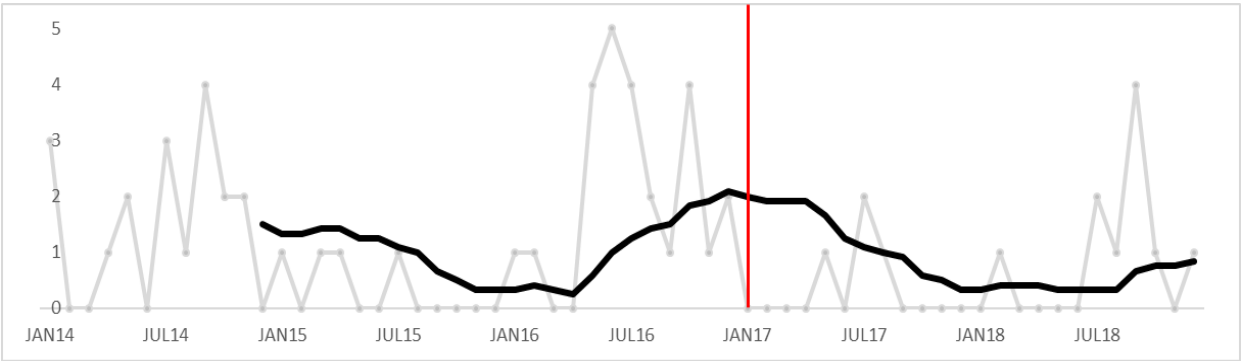


Figure A.5. Site Five Violent Crime (smoothed)



Appendix B: Weapon Calls Rolling Twelve-Month Charts
(Vertical Line Marks Intervention Point)

Figure B.1. Site One Weapon Calls (smoothed)

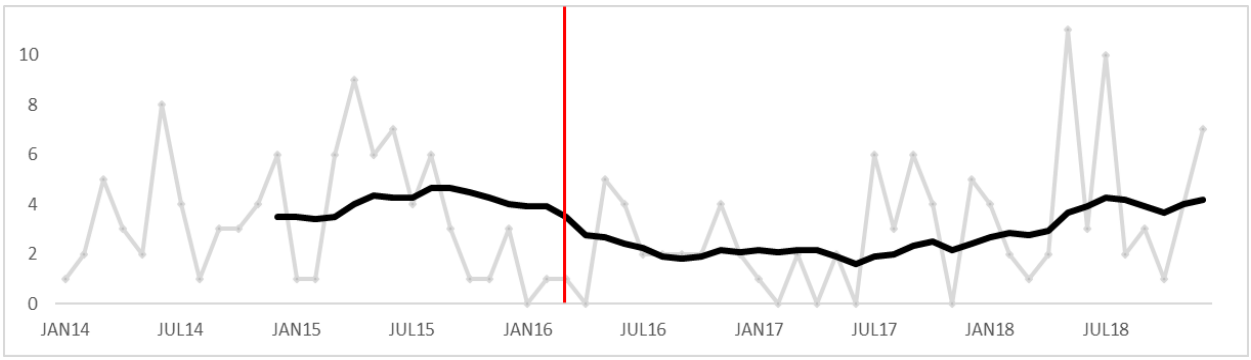


Figure B.2. Site Two Weapon Calls (smoothed)

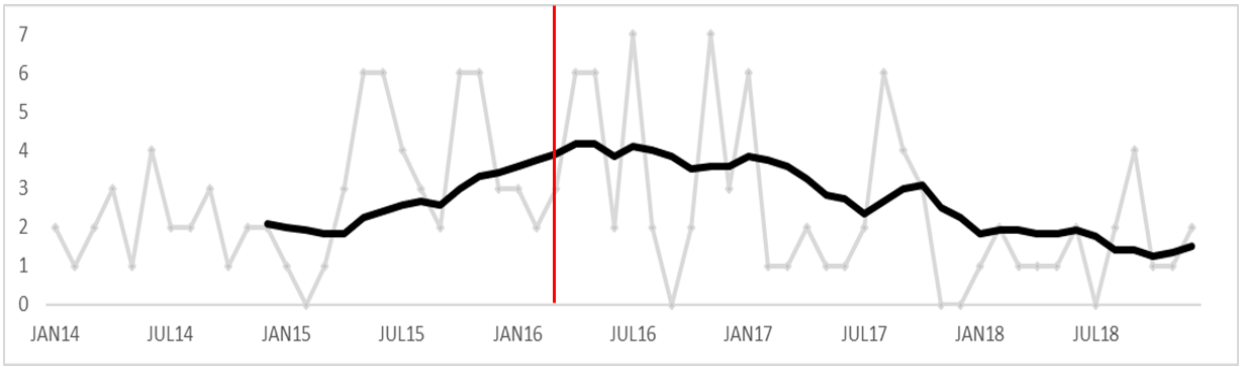


Figure B.3. Site Three Weapon Calls (smoothed)

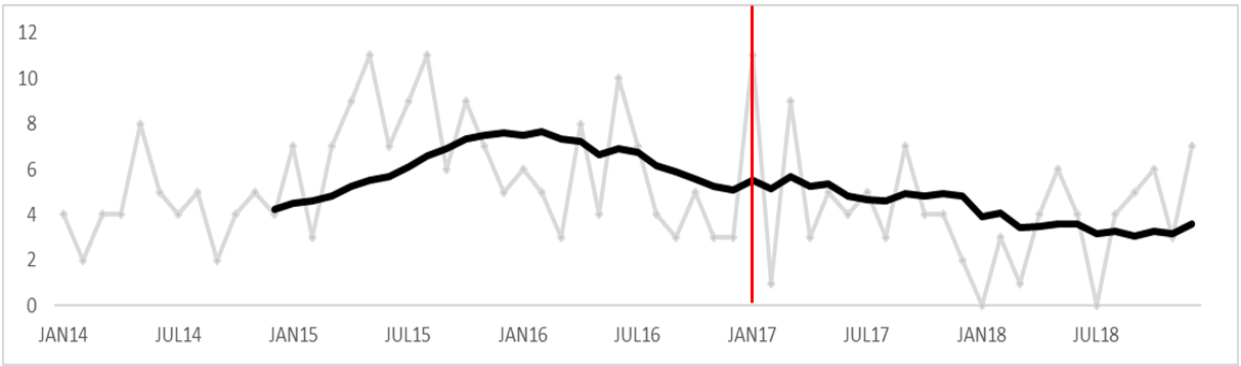


Figure B.4. Site Four Weapon Calls (smoothed)

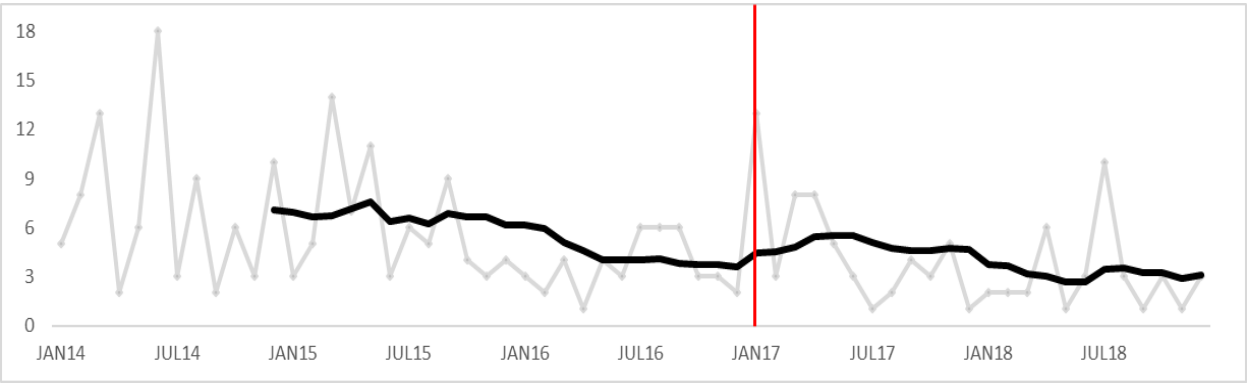
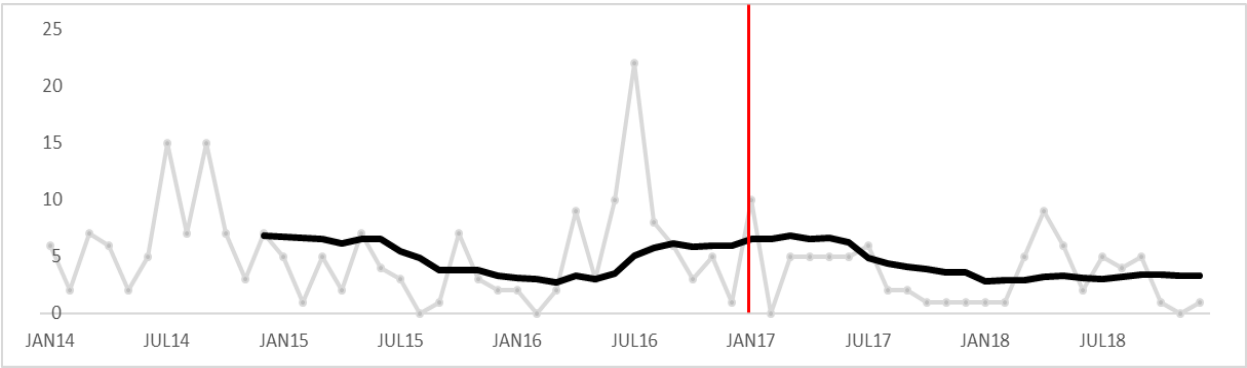


Figure B.5. Site Five Weapon Calls (smoothed)



Appendix C: ARIMA Models (Shootings, Untransformed)

Table C.1. Site One

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-1.005	0.321	-3.128	0.003***
Temperature	0.003	0.01	0.251	0.803
Building Permits	-0.269	0.262	-1.025	0.311
Model Statistics				
Constant	1.068	0.612	1.744	0.088*
Stationary R-sqaured	0.198			

Table C.2. Site Two

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.037	0.189	0.19	0.85
Temperature	0.003	0.006	0.453	0.653
Building Permits	0.235	0.134	1.75	.087*
Model Statistics				
Constant	0.067	0.354	0.19	0.85
Stationary R-squared	0.074			

Table C.3. Site Three

ARIMA (1,0,1)(0,1,1)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.075	0.318	-0.237	0.814
Temperature	-0.008	0.007	-1.204	0.238
Building Permits	0.018	0.098	0.185	0.854
Model Statistics				
Constant	0.363	0.43	0.843	0.406
Stantionary R-squared	0.17			

Table C.4. Site Four

ARIMA (0,0,5)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.354	0.094	-3.757	0.001***
Temperature	0.008	0.005	1.51	0.139
Building Permits	0.02	0.033	0.59	0.559
Model Statistics				
Constant	-0.097	0.318	-0.304	0.763
Stationary R-squared	0.237			

Table C.5. Site Five

ARIMA (0,0,0)(0,0,0)

Variable	Estimate	Standard Error	t-value	Significance
PIVOT Intervention	-0.415	0.141	-2.933	0.005***
Temperature	0.01	0.005	2.12	0.04**
Building Permits	0.209	0.07	2.98	0.005***
Model Statistics				
Constant	-0.18	0.264	-0.68	0.5
Stationary R-squared	0.402			

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

APPENDIX D. INSTITUTIONAL REVIEW BOARD

Institutional Review Board - Federalwide Assurance #00003152

University of Cincinnati

Date: 9/4/2018

From: UC IRB

To: Principal Investigator: Matthew Hammer

Re: Study ID: 2018-5638
Study Title: Crime and Place - Cincinnati 2018

The Institutional Review Board (IRB) acknowledges receipt of the above referenced proposal. It was determined that this proposal does not meet the regulatory criteria for research involving human subjects (see below): No human subjects – analysis of publicly available data relating to concentration of crime a places within Cincinnati. Ongoing IRB oversight is not required.

Please note the following requirements:

Statement regarding International conference on Harmonization and Good clinical Practices. The Institutional Review Board is duly constituted (fulfilling FDA requirements for diversity), has written procedures for initial and continuing review of clinical trials: prepares written minutes of convened meetings and retains records pertaining to the review and approval process; all in compliance with requirements defined in 21 CFR Parts 50, 56 and 312 Code of Federal Regulations. This institution is in compliance with the ICH GCP as adopted by FDA/DHHS.

Thank you for your cooperation during the review process.

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45 CRF § 46.102(d): Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

45 CRF § 46.102(f): Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains:

1. data through intervention or interaction with the individual, or
2. identifiable private information.

Intervention includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes.

Interaction includes communication or interpersonal contact between investigator and subject.

Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

FDA regulations apply whenever an individual is or becomes a participant in research, either as a recipient of a FDA-regulated product or as a control, and as directed by a research protocol and not by medical practice. FDA-regulated activities involve individuals, specimens, or data, as patients or healthy controls, in any of the following:

a. any use of a drug or biologic, other than the use of an approved drug or biologic in the course of medical practice
b. any use of a device (medical or other devices, approved or investigational) to test the safety or effectiveness of the device
c. any use of dietary supplements to cure, treat, or prevent a disease or bear a nutrient content claim or other health claim
d. the collection of data or other results from individuals that will be submitted to, or held for inspection by, the FDA as part of an application for a research or marketing permit (including foods, infant formulas, food and color additives, drugs for human use, medical devices for human use, biological products for human use, and electronic products.)
e. activities where specimens (of any type) from individuals, regardless of whether specimens are identifiable, are used to test the safety or effectiveness of any device (medical or other devices, approved or investigational) and the information is being submitted to, or held for inspection by, the FDA.

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