

Crime at Convenience Stores:

Assessing an In-Depth Problem-Oriented Policing Initiative

by

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ABSTRACT

Problem-oriented policing (POP) dynamically addresses unique community issues in a way that allows police departments to be cost-effective and efficient. POP draws upon routine activities and rational choice theories, at times incorporating elements of crime prevention through environmental design. A recent systematic review found POP to be hugely popular, but not rigorously assessed or implemented. In 2009, the Glendale, Arizona Police Department and researchers from Arizona State University received funding through the Bureau of Justice Assistance's (BJA) Smart Policing Initiative (SPI) to target crime at convenience stores through a problem-oriented policing approach. The Glendale SPI team devised an approach that mirrored the ideals put forth by Goldstein (1990), and provided a thorough undertaking of the SARA model. A comprehensive response plan was developed with several proposed responses, including: intervention with Circle K leadership, suppression, and prevention at the six highest-activity stores. Despite a thorough POP implementation, the initial descriptive evaluation of the Glendale SPI reported positive effects on crime, but left questions about the intervention's long-term impact on convenience store crime in Glendale, Arizona. The policy and theoretical influence of the initiative warrants a more rigorous evaluation. Supplanting the original assessment, a difference in difference model, negative binomial regression, and relative effect size are calculated to ascertain the SPI's long-term effects on target and comparison stores. Phi and weighted displacement quotient are calculated to determine the existence of displacement of crime or diffusion of benefits. Overall, results indicate support for the project's effectiveness on crime reduction. Further, none of the six intervention stores experienced crime displacement. Five of the six stores, however,

experienced a diffusion of benefits in the surrounding 500-yard area; that is, a crime reduction was observed at the intervention stores *and* in the surrounding areas of five of these stores. Disorder and property crimes at the targeted stores were most affected by the intervention. One of the intervention stores did experience an increase in violent crime, however. Future studies should strengthen the methodological design when evaluating POP projects and seek to flesh out more precisely the crime control effects of unique problem-oriented strategies.

DEDICATION

This dissertation is dedicated to my parents, Charles and Susan Dario. I am forever grateful for your unending love and support, and I am so lucky to have two beautiful souls like you in my life. Thank you both for everything – I love you so much!

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CHAPTER 1: INTRODUCTION

Problem-oriented policing dynamically addresses unique community issues in a way that allows police departments to be cost-effective and efficient. Herman Goldstein put forth the concept of problem-oriented policing (POP) in 1979, which sought to address the “means over ends” syndrome that was plaguing the police. This refers to organizations being so preoccupied with the methods of operation (i.e., internal efficiency) that they lose sight of their purpose. To illustrate this anomic problem, Goldstein (1979) cited an example from a newspaper in the United Kingdom:

Complaints from passengers wishing to use the Bagnall to Greenfields bus service that “the drivers were speeding past the queues of up to 30 people with a smile and a wave of a hand” have been met by a statement pointing out that “it is impossible for the drivers to keep their timetable if they have to stop for passengers.” (p. 236)

By taking on an internally focused, triage approach, the police were acting like the bus drivers; handling incidents as quickly as possible, without solving the underlying problem. POP aims to redirect police attention to problems and not incidents, in turn addressing the causes of crime and disorder and not just symptoms (Goldstein, 1990). POP can be implemented via the SARA process (scanning, analysis, response, and assessment) (Eck & Spelman, 1987), which is a commonly used problem-solving method that implores police to “work smarter, not harder” (Stewart, 1985). The SARA model is built on several problem-oriented themes: increased effectiveness and attention to underlying issues, expertise and creativity in developing innovative solutions, and police-community involvement to ensure citizen satisfaction. The four stages of SARA are a strategic response to the limitations of incident-driven policing. POP is a more in-depth approach than previous police tactics (including reactive, proactive, and community-

oriented strategies) (Cordner & Biebel, 2005), and is vital if the police want to maintain a prevention role in crime (Eck, 2006).

In a recent systematic review, Weisburd and colleagues (2008) found POP to be hugely popular, but not rigorously assessed. Only ten studies met their methodological criteria, which included experimental and quasi-experimental designs with comparison groups. Even when relaxing their inclusion criteria, they were only able to assess a total of 55 POP initiatives (Weisburd, Telep, Hinkle, & Eck, 2010). The lack of high quality POP evaluations is stark considering Weisburd et al. (2010) initially identified over 5,500 POP related projects. The issues with methodological rigor are often compounded because of implementation problems. Braga and Weisburd (2006), for example, have criticized POP in practice, suggesting that several elements of the model are implemented weakly, including: shallow problem analysis, an over-reliance on crime control responses, and a tendency to be weak on collaboration (also see: Cordner, 1998; Scott, 2000). In short, problem-oriented policing may be enormously popular, but in practice its implementation is often not consistent with Goldstein's vision, and its evaluation often does not meet rigorous standards. As a result, the true value of POP as a crime-control strategy remains unclear.

In 2009, the Glendale, Arizona Police Department and researchers from Arizona State University received funding through the Bureau of Justice Assistance's (BJA) Smart Policing Initiative (SPI) to target crime at convenience stores through a problem-oriented policing approach. The Glendale SPI team devised an approach that mirrored the ideals put forth by Goldstein (1990), and provided a thorough undertaking of the SARA model. To begin the intensive SARA process, researchers from Arizona State University

trained Glendale Police Department personnel on in depth-POP; these training sessions exceeded twenty hours of classroom-based instruction. Convenience store crime was chosen during the problem identification, or scanning, phase “because the problem was chronic (tied to persistently high property crime rates), because it placed a significant burden on police resources, and because it threatened the safety of both customers and store employees” (White & Katz, 2013, p. 306). During the analysis phase all calls for service at convenience stores were examined. It was then discovered that calls for service were disproportionately occurring at Circle K stores. In 2010, Glendale’s 15 Circle K’s (23% of all convenience stores) represented 79% of the calls for service at convenience stores (White & Katz, 2013). The analysis phase also explored the causes of the disproportionality through geographic analysis, interviews of key stakeholders, and evaluations of the structural, social, and administrative environment of Circle Ks and other convenience stores. The majority of crimes being committed at these stores involved thefts of merchandise, thefts of gas, fights, disorderly conduct, panhandling, and robberies. Ultimately, the Glendale SPI team concluded that Circle K management practices were largely responsible for the crime problem (White & Balkcom, 2012).

A comprehensive response plan was developed with several targeted strategies, including: intervention with Circle K leadership, crime suppression, and prevention efforts at the six highest-activity stores. The team assessed their multi-pronged approach and found mixed results. Circle K was generally not responsive to the intervention recommendations, and did not alter their practices. White and Balkcom (2012) noted “...the Glendale team experienced resistance from Circle K management. Straightforward CPTED recommendations were often ignored, especially those that required a financial

commitment” (p. 6). The SPI team responded by creating a law enforcement working group that included agencies from neighboring cities (White & Balkcom, 2012). This working group created a collective voice in speaking to Circle K, and increased leverage on the corporate leadership (White & Balkcom, 2012). The SPI team’s second response was to publicly shame Circle K by presenting the findings to the local media (White & Balkcom, 2012). This tactic was successful in getting Circle K re-engaged in discussing the problem and modifying their practices (White & Balkcom, 2012).

The methodology employed by White and Katz (2013) for the assessment phase of the SPI was descriptive, examining changes in mean calls for service over time at all 65 convenience stores in Glendale. There were statistically significant drops in calls for service at five of the six target Circle K stores (White & Katz, 2013). Calls for service at nine non-SPI Circle K stores in Glendale also experienced a drop in crime, but these findings were not statistically significant (White & Katz, 2013). The experiences of several other non-Circle K convenience stores in the sample varied. Some of these stores had significant increases in calls for service, and other had significant declines. Although White and Katz (2013) concluded that the Smart Policing Initiative led to significant declines in crime and disorder at the targeted convenience stores, the authors specifically called for a more sophisticated and longer-term analysis, likely time series, to offer a more detailed picture of the intervention.

Based on the aforementioned research problems, this dissertation seeks to understand the effect of the Glendale SPI on the nature and prevalence of crime at six target Circle K stores. This is done by comparing changes in crime at target Circle K stores to changes in crime at non-target convenience stores. Additionally, an assessment

of crime over time surrounding the target Circle K stores will be conducted. If crime in adjacent areas is found to have changed over time, either displacement or diffusion of benefits will be ascertained. These questions will be explored using all calls for service at all convenience stores in Glendale, Arizona from January 2008 to October 2013. This extends the initial analyses (August 2009 to July 2012) by 35 months, or an almost three year increase. The impact of the intervention will be assessed using a difference in difference estimator, a negative binomial regression model to account for overdispersion, independent samples t-tests to ascertain individual store effects, and relative effect size. A descriptive model that depicts crime type over time will allow for a better understanding of the nature of the crime occurring at the Circle K stores. Lastly, a 500-yard catchment area will be assessed around the Circle K stores to investigate the potential for displacement of crime or diffusion of benefits.

Implementation of the Glendale SPI avoided the traditional pitfalls of prior POP efforts, as all elements of the SARA model were robustly employed. The evaluation conducted by White and Katz (2013) is consistent with recent meta-analysis findings on POP produced by Weisburd and colleagues (2008; 2010). White and Katz's evaluation is technically more sophisticated and adheres more closely to the SARA model than most POP projects, but the methodological rigor leaves room for questions about the intervention's impact. Because POP projects tend to be weakly implemented *and* assessed, it is imperative that this intervention is included in future analyses capturing the impact of POP as it is perhaps one of the best implementations of the SARA model to date. More troubling still, the POP and SARA paradigms are very highly regarded in policing research and practice. Millions of dollars and hours of work go into creating

problem-oriented interventions, yet only 8 of the 10 POP projects included in Weisburd's analysis reported findings in favor of problem-oriented policing; and these projects had widely varying effects. The limited positive findings in this area raise concerns about the effectiveness and utility of problem-oriented policing. A troubling lack of rigorous research on POP also limits its inclusion in the evidence-based paradigm that is highly influential on the current state of policing policy and research. Further, the Glendale SPI was initially assessed using calls for service data from August 2009-July 2012. The current assessment includes data from January 2008-October 2013, extending far beyond the projects' grant period. This longer time series can more clearly parse out if the intervention's impact was a result of any short-term fluctuations in crime in Glendale, or if the results support the assertion that the POP project indeed had a sustainable impact on convenience store crime.

None of the studies examined in Weisburd et al. (2008) reported standardized effect sizes, highlighting a more general theme of lack of transparency and reporting validity in crime and justice studies (Farrington, 2006; Lösel & Köferl, 1989). Additionally, there is usually not enough information in published problem-oriented policing studies, including White and Katz (2013), to calculate an effect size (Weisburd et al., 2008). Without a calculable effect size, inclusion in meta-analysis is nearly impossible. By calculating and reporting the treatment effect of the Glendale SPI, this dissertation will add to the literature on POP and lessen the problem of reporting validity in academic research. The secondary question addressed in this dissertation focuses on the existence of displacement of crime or diffusion of benefits resulting from the Glendale SPI, which are still contentious and debated phenomena in crime and place

research. Additionally, changes in crime type will be examined – research in this area is almost nonexistent.

Lastly, while several of the studies assessed in Weisburd et al. (2008) give credence to the existence of POP's impact on crime and place (including hot spots), none directly examined convenience stores. Although problem-oriented policing encourages unique solutions to specific community problems, convenience stores are omnipresent in the United States and are generally considered risky places (Eck, Clarke, & Guerette, 2007). At the start of 2014 there were 151,282 convenience stores in America, or one convenience store for approximately every 2,100 United States residents (National Association of Convenience Stores, 2014). The ubiquity of convenience stores and their susceptibility to crime has led to a large body of research on convenience stores as crime generators (e.g., Bellamy, 1996; Calder & Bauer, 1992; Crow & Bull, 1975; D'Alessio & Stolzenberg, 1990; Duffala, 1976; Erickson & Stenseth, 1996; Exum, Kuhns, Koch, & Johnson, 2010; Faulkner, Landsittel, & Hendricks, 2001; Hunter & Jeffrey, 1997; Petrosino & Brensilber, 2003; Petrosino, Fellow, & Brensilber, 1992; White & Katz, 2013). Convenience stores share a set of unique characteristics (including layout, operation hours, etc.) (Altizio & York, 2007) that may result in the Glendale SPI being reproducible. If this Glendale problem-oriented policing intervention can be replicated to produce positive results in other locations, it will add a new dimension to the utility of POP's policy impact.

Research Questions

Question 1: Did the POP intervention generate an effect on crime at the target Circle K stores, compared to the non-target stores?

Question 1a: What was the strength and duration of the SPI intervention's effects?

Question 2: Did crime change over time in the area surrounding the target Circle K stores? If so, does this finding suggest displacement of crime or diffusion of benefits?

CHAPTER 2: LITERATURE REVIEW

History of Police Patrol

Due to their ambiguous role in society, the police have assumed multiple responsibilities (Goldstein, 1979, 1990; Kelling & Moore, 1988; Manning, 1978, 1992). The defined mission of policing is varied. According to Bittner, the capacity to use force is the core function of the police (1970). Other definitions reflect a grimmer perception. Fagan and Davies (2000), for example, suggest that policing is about the monitoring and maintenance of poor people in poor places. Herbert (2014) recently suggested that the police represent “the now-expected insertion of state authority into the flow of everyday life” (p. 580). Manning (1978) believed the police to have an impossible mandate, which they largely imposed on themselves. Manning (1978) elaborates on this point.

To much of the public, the police are seen as alertly ready to respond to citizen demands, as crime-fighters, as an efficient, bureaucratic, highly organized force that keeps society from falling into chaos. The policeman himself considers the essence of his role to be the dangerous and heroic enterprise of crook-catching and the watchful prevention of crimes... In an effort to gain the public's confidence in their ability, and to insure thereby the solidarity of their mandate, the police have encouraged the public to continue thinking of them and their work in idealized terms, terms, that is, which grossly exaggerate the actual work done by police... The public's definitions have been converted by the police organization into distorted criteria for promotion, success, and security. (p. 12-13)

Several scholars have noted that the police have evolved over time through several stages, each with corresponding goals and strategies to achieve those goals. Since the creation of the modern police, with the London Metropolitan Police in 1829, it is

generally agreed upon that the principal function of patrol has been to reduce crime and maintain feelings of public safety. Innovations in patrol and policing strategies since that time have had large impacts on crime. For example, innovations in policing strategies are consistently among the most cited reasons for the 1990s crime decline (Levitt, 2004). There is a consensus among the police and academics that the history of policing can be organized into three eras: the political era, the professional era, and the community problem-solving era (Kelling & Moore, 1988).¹ Each era is characterized across seven dimensions: legitimacy, function, organizational design, external relationships, demand, methods, and outcome. A review of this era-based history, and of the evolving role of the police over time, provides an important backdrop for the current study. Table 1 provides an overview of this history and its evolution.

The Political Era

Early American policing was greatly influenced by the London Metropolitan Police model (Reisig, 2010). Several principles were disseminated to new London officers in 1829, attributed² to Robert Peel. These Peelian principles, according to Germann, Day, and Gallati (1968), are as follows:

- (1) The police must be stable, efficient, and organized along military lines.
- (2) The police must be under government control.
- (3) The absence of crime will best prove the efficiency of police.
- (4) The distribution of crime news is essential.
- (5) The deployment of police strength both by time and area is essential.
- (6) No quality is more indispensable to a policeman than

¹ Some have levied heavy criticism at this framework. See for example: Strecher (1991); Walker (1984); Williams and Murphy (1990).

² Lentz and Chaires (2007) are not able to find an original list of principles compiled by Peel. Additionally, subsequent lists of the Peelian principles of policing vary between, usually, 9 and 12 principles. Despite most lists having similar themes and values, the authors attribute the discrepancies to new concepts or clarifications being imposed by each unique author.

a perfect command of temper; a quiet, determined manner has more effect than violent action. (7) Good appearance commands respect. (8) The securing and training of proper persons is at the root of efficiency. (9) Public security demands that every police officer be given a number. (10) Police headquarters should be centrally located and easily accessible to the people. (11) Policemen should be hired on a probationary basis. (12) Police records are necessary to the correct distribution of police strength. (pp. 60-61)

Policing scholars believe these principles to be an indication of a shift toward rational policing (Lentz & Chaires, 2007), and essentially the birth of modern public policing (LaGrange, 1993). U.S. agencies began developing twenty years later, adopting many (but not all) aspects of the Peel model. In the U.S., local municipalities, and local political leaders, were the source of police legitimacy and authorization during this time (see Table 1). Consequently, the police and politicians were closely linked during this era (Fogelson, 1977), providing ample opportunity for corruption to result (Kelling & Moore, 1988). The police function was varied, calling for officers' involvement in crime prevention and control, as well as the provision of social services (e.g., helping with job placement, and running soup lines) (Kelling & Moore, 1988; Lane, 1980). Police during this time were de-centrally organized,³ although still maintaining an ostensible quasi-military status and unified chain of command (Kelling & Moore, 1988). This, in conjunction with "primitive communication and transportation," gave police unchecked discretion in handling the public (Kelling & Moore, 1988). There were no selection standards for police, no training, and no accountability. Violence was typically used to administer street justice and induce compliance (Haller, 1975).

³ Kelling and Moore (1988) state that the political era saw police departments divided up and run as smaller-scale departments, incapable of adequately supervising officers. This type of division often results in overlap, with de-central organization being characterized by a duplication of police services and conflicting jurisdiction.

Discriminatory laws were created during this time (largely aimed at immigrant neighborhoods) (Fogelson, 1977).⁴ The close relationships between police and lawmakers forced officers to enforce these laws, despite their unpopularity (Fogelson, 1977; Kelling & Moore, 1988). Close relationships with community members, and broad discretionary powers, led to a dysfunctional climate. Police were considered “inefficient, corrupt, and discriminatory” (Reisig, 2010, p. 12). Foot patrol was the primary patrol method during this time (Kelling & Moore, 1988; Lane, 1980). Technology was limited in the political era, but call boxes and automobiles did emerge and altered the range of coverage among officers (Kelling & Moore, 1988). The police focused on people, not crimes, during this period (Eck, 1984; Kelling & Moore, 1988); that is, the police relied on informants to identify other criminals, and gathered information on these individuals for political, and not offense-related, purposes (Kelling & Moore, 1988). The nature of the era dictated that political and citizen satisfaction were important, expected outcomes (Kelling & Moore, 1988). Limitations of the political strategy made it so that these goals were not effectively met.

⁴ Upper-class native Americans (i.e., not European immigrants) were upset by the values held by immigrant and lower-class communities during this time, and campaigned to curb the vice they associated with these groups (Fogelson, 1977). For example, laws were passed to prohibit gambling, prostitution, and business on Sundays (Fogelson, 1977). These laws were regarded as “unreasonable, inequitable, and unenforceable” (Fogelson, 1977, p. 20).

Table 1. Summary of Kelling & Moore's (1988) Policing Era Framework

	Political (c. 1840-1930)	Reform (c. 1930-1970)	Community (c. 1970-1988)
Legitimacy	Politically-based	Legally-based (not political)	Citizen- & legally-based
Function	Crime prevention/control Order maintenance Social services	Crime control Law enforcement Efficiency & expediency	Crime prevention/control Problem-solving Order maintenance & peacekeeping
Organizational Design	No supervision Decentralized	Centralized Bureaucratic specialization	Decentralized Generalist
External Relationship	Close & personal Politicians	Impartial No role with citizens	Intimate Engaged with community
Demand	Citizens	9-1-1 calls (reactive)	Not solely 9-1-1
Methods	Foot patrol	Technology (car/radio/phone)	Citizen accessibility (foot/bike patrol)
Outcome	Political satisfaction Citizen satisfaction	Crime control Uniform Crime Report (UCR)	Quality of life/Fear of crime Citizen satisfaction

The Professional Era

By the turn of the century, police leaders were unhappy with the first 50 years of policing in the United States – which was characterized by corruption, partisan influence, and overall disorganization. Earlier reform efforts of the progressives had failed.

With the end of the political era came the rise of the professional model, and preventive patrol. August Vollmer (1936), an early police reformer, called for a more efficient, nonpartisan police force with rigorous selection standards and training (see also: Fosdick, 1915; Fuld, 1909). Vollmer also suggested that all police responsibilities be stripped away, except for crime control efforts. Previous attempts at reform, mostly based on contempt over political influence corrupting the police mandate, had failed (Kelling & Moore, 1988). Around this time, J. Edgar Hoover was overhauling the Bureau of Investigation into a prestigious organization – the Federal Bureau of Investigation (FBI). Hoover developed favorable public relations between the public and the FBI, and generally increased the bureau's perceived and actual competency (Kelling & Moore, 1988). Shortly thereafter, O. W. Wilson, inspired by his mentor and Berkeley police chief Vollmer, as well as Hoover's efforts with the FBI, continued to promote the police reform organizational strategy (Wilson, 1950).

The rationale for these innovative changes was based on classical organization theory (Reisig, 2010), with a desire for rational and efficient organizational behavior driving this paradigm (Shafritz & Ott, 1996). This era sought to change the basis of police legitimacy and authorization by isolating police from political influence and making them more autonomous (Kelling & Moore, 1988). Additionally, increased police professionalism (including selection standards, training, and internal efficiency) became

the central focus of legitimacy (Kelling & Moore, 1988). As a consequence of these new organizational objectives, the police function naturally shifted. The police function became one of crime control and criminal apprehension; reconceptualized as law enforcement (Kelling & Moore, 1988). The police embraced this new mission, and during the 1950s and 1960s expressed disdain for deviations from this new orientation. Police were still involved in community affairs and order maintenance, but they were not enthused about what they identified as secondary, social work tasks (Kelling & Moore, 1988).

As aforementioned, the new police organizational design reflected classical theory. This theory posits that workers are not self-motivated, and as such, management needs to provide economic incentives to motivate workers (Kelling & Moore, 1988). The theory also calls for a greater division of labor and centralized control. Patrol became standardized, and police management attempted to limit officers' discretion (Kelling & Moore, 1988). Specialized units were created as needed, further centralizing command. This new professional model also distanced police from citizens, as crime control and crime solving were the new police objectives (Kelling & Moore, 1988). Despite this, the police were now omnipresent because of motorized patrol. The emergence of calls for service in the 1930s, or the end of the political era and beginning of the reform era, brought with it an expectation that the police would respond to citizens' calls (Walker, 1992). In 1968, these responses were expected to be rapid once the 9-1-1 emergency call system was implemented (Sparrow, Moore, & Kennedy, 1990). New advances like these helped to further centralize the police function. The community heard messages on the radio from the police encouraging citizens to use the new rapid response systems. Rapid

response to calls for service by automobile and preventive patrol became the de facto modes of police response (Kelling & Moore, 1988). Technology, in various ways, had streamlined the efficiency of the police.

The push toward greater operating efficiency gathered momentum as various new technologies (in motor vehicles, telephone systems, radio communications, data processing equipment, and ultimately computers) were adapted to police work. Thus, for several decades (especially 1940 through 1970), a concern with developing techniques to increase the control and efficiency of the police agency occupied those in the forefront of policing. (Goldstein, 1990, p. 7)

When they were not responding to emergency calls for service, the police were implementing random preventive patrol by car (Braga & Weisburd, 2010). Wilson (1950), drawing on Peel's early principles, first theorized that the rationale behind this patrol effort was one of pervasive deterrence – police would remain visible throughout communities. This omnipresence would result in both criminal deterrence and public reassurance, while simultaneously allowing the police to be more efficient at criminal apprehension (Kelling & Moore, 1988). Despite this axiom, resources were disproportionately allocated (Braga & Weisburd, 2010), and some worried that preventive patrol was simply displacing crime due to its focus in certain areas (Reppetto, 1976a). That is, crime prevention efforts were just moving crime instead of reducing or eliminating it. Even though the police recognized that crime concentrated in certain places, to combat concerns of displacement they further continued with the random preventive patrol strategy (Larson, 1972; Wilson, 1963). This focus on internal efficiency is where Goldstein's "means over ends" syndrome began. The reactive, triage approach that emerged shifted police attention away from the original mission – to solve problems. The bureaucratic model emphasizes numeric indicators of performance (internally).

Consequently, police were handling each call as quickly as possible rather than solving the problem and understanding the cause. Because of the many positive improvements in policing the reform era brought about, it was not until the late 1960s that the professional model was questioned (Goldstein, 1979; Goldstein, 1990).

The 1960s and 1970s were a time of great transition for criminology, criminal justice, and society in general. There was much civil unrest during this time, and police practices became associated with urban riots and minority mistreatment (Reisig, 2010). “If police practices were not already a subject of grievance, police responses to the demonstrations and riots raised new concerns among a much larger segment of the public” (Goldstein, 1990, p. 9). Consequently, public perceptions of the police during this time were especially poor among disadvantaged minorities (National Advisory Commission on Civil Disorders, 1968). Further, crime and fear of crime were increasing and the police were unable to quell their growth (Kelling & Moore, 1988). Additionally, Martinson's (1974) proposition that "nothing works" altered the political and academic focus of criminology for many years. Rehabilitation efforts were deemed useless; sentencing and corrections policy were in a state of flux.

Researchers were beginning to discover discrepancies between police practices and the police image; not due to corruption or poor management, but due to the impossible mandate and diverse, unmanageable public demands the police were faced with (see: Bittner, 1967; LaFave, 1965; Parnas, 1967; Reiss, 1971; Skolnick, 1966; Tiffany, McIntyre, & Rotenberg, 1967; Westley, 1970; Wilson, 1968). The professional model created social, and actual physical, distance between police and citizens. Car patrol was used instead of foot patrol, and, instead of talking to citizens, there was an over-

reliance by the police on 911. Major policing principles were also being upended during this time. The Kansas City Preventive Patrol Experiment (Kelling, Pate, Dieckman, & Brown, 1974) found that preventive patrol did not deter crime, did not alter citizen satisfaction with police, and did not affect fear of crime.⁵ Further, the Kansas City Police Department (1977) found that rapid police patrol response time to calls for service had little impact on crime. Today, policing scholars are in general agreement that random preventive patrol does not impact crime (e.g., Bayley, 1994; Braga & Weisburd, 2010; Goldstein, 1979; Kelling et al., 1974; Klockars, 1985). Overall, the research on policing during this time, which questioned the value of standard police responses, concluded: “...most serious crimes were unaffected by the standard police actions designed to control them. Further, the public did not notice reductions in patrol, reduced speed responding to nonemergencies, or lack of follow-up investigations” (Eck & Spelman, 1987, p. 35).

The mostly reactive nature of the police, while seemingly obvious to researchers in hindsight, was being called into question during this time (Goldstein, 1990; Reiss, 1971). The changes called for by Vollmer, Wilson, and others were undoubtedly necessary in order to organize, train, and make the police more competent in general (Goldstein, 1979). The formulaic approach caused police progress to plateau, though, and internal competence became more important than the intended end product of policing (Goldstein, 1979). For example, the emphasis on response time over the actual handling of the problem by police demonstrated this “means over ends” syndrome (Goldstein, 1979). Focusing on societal and community problems is the objective of policing, albeit

⁵ Although a widely influential study, the validity of its findings has been questioned due to methodological issues (Larson & Cahn, 1985; Sherman & Weisburd, 1995; Weisburd & Eck, 2004).

not obviously as citizens expect the police to enforce the law (Goldstein, 1979). In his seminal piece, Goldstein (1979) suggested “enforcing the criminal code is itself only a means to an end – one of several that the police employ in getting their job done. The emphasis on law enforcement, therefore, is nothing more than a continuing preoccupation with means” (p. 242). The strategies of the professional model were defensive in nature, and ill-suited for the unstable and changing social conditions inherent to the 1960s and 1970s (Kelling & Moore, 1988). The crises that were occurring (crises that Goldstein (1990) believed stimulated progress) were bringing to light a need for a human element in police work (Goldstein, 1979).

The Community Problem-Solving Era

Foot patrol emerged as a popular policing strategy in the 1970s and 1980s (Kelling & Moore, 1988), even being funded and implemented despite initial police opposition (Kelling, Pate, Ferrara, Utne, & Brown, 1981). Foot patrol renewed familiarity between the citizens and police (Kelling & Moore, 1988) – something that was seriously lacking in the professional era. Foot patrols are a common tactic employed in community oriented policing (Wakefield, 2007), and were adopted to improve citizen perceptions of the police and lessen fear of crime (Cordner, 1986; Jim, Mitchell, & Kent, 2006). In addition to being popular with citizens, research showed that foot patrols did indeed reduce fear of crime, improve reciprocal police-citizen perceptions (by increasing citizen satisfaction with police and improving police attitudes toward citizens), and increase morale and job satisfaction of police officers (Kelling et al., 1981; Trojanowicz, 1986). Research also showed at this time that when the police had information on crime that was

obtained by the public, (and properly managed), their impact on crime became significant (Eck, 1984; Pate, Bowers, & Parks, 1976).

Scholars suggested that the success of fear reduction via foot patrol was due in part to the order-maintenance component of the strategy (Kelling & Moore, 1988; Wilson & Kelling, 1982). Broken windows theory, developed by Wilson and Kelling (1982), posits that there is a causal relationship between crime and disorder; “disorder and crime are usually inextricably linked, in a kind of developmental sequence” (p. 31). The theory behind this was that signs of disorder might result in a breakdown of community controls (via fear), and that by maintaining order the police could bolster informal control mechanisms (Wilson & Kelling, 1982). This framework suggests that by focusing policing efforts on disorderly persons and places, crime and crime perceptions would decrease. The policy implications that result from this theory are centered on maintaining order, via a community-oriented approach (Harcourt, 2001). Early research supported this type of policing (Kelling & Coles, 1996; Sampson & Cohen, 1988; Skogan, 1990), but the relationship between crime and disorder has been questioned (Harcourt, 1998; Sampson & Raudenbush, 1999). The broken windows paradigm persisted, and more generally came to be known as order-maintenance policing (Livingston, 1997). The strategies of this era increased police understanding of citizen concerns, and conversely gave citizens the confidence to talk to police and make them aware of community problems that departments were often lacking data on (Kelling & Moore, 1988).

Although there was a return to community and political authorization for the police during this time, the police professionalism that developed during the reform era continued to be influential, especially as a potential safeguard against rampant corruption

and brutality. The police function was much broader during this era, as well, and included order maintenance and problem solving, for example (Kelling & Moore, 1988). Whereas the professional era attempted to control crime via responsive actions, the community strategy emphasized prevention (Kelling & Moore, 1988). The nature of the new tactics employed by police made it so individual officers had more decision-making power, and were subsequently more invested in their jobs (Kelling & Moore, 1988). This decentralized organizational design allowed police executives *and* officers to work together on creating problem-specific solutions (Kelling & Moore, 1988); all police ranks now had information vital to bettering community issues. Quality of life and citizen satisfaction were considered viable outcomes of this era (Kelling & Moore, 1988).

Another key development in this era involved community participation in both defining and preventing crime (Goldstein, 1990; Skolnick & Bayley, 1986; Weisburd, McElroy, & Hardyman, 1988). It includes a wide array of approaches that combine both public and police resources (Weisburd & Eck, 2004). Theoretically, community policing, broken windows policing, and order maintenance are all terms that overlap, mirroring similar concepts (Harcourt, 2001). Cordner (1999) suggests that the concepts of community policing can be grouped into four dimensions: philosophical, strategic, tactical, and organizational. The philosophical dimension focuses on the core beliefs of how the police should function, including understanding community values and assuming a service orientation (Cordner, 1999). The strategic dimension involves personal interaction with residents; this element's goal is to increase trust and support between the police and the community (Cordner, 1999). The tactical dimension specifies that police show a vested interest in the area in which they work by understanding problems and

developing solutions (Goldstein, 1987). The organizational dimension requires alteration of the department hierarchy, shifting responsibility and encouraging creative, localized problem solving (Cordner, 1999).

The Kelling and Moore historical construct has proved useful conceptually, but imprecise factually. For example, Williams and Murphy (1990) critique Kelling and Moore's (1988) analysis of the changing role of police as "disturbingly incomplete" (p. 27). They suggest that a minority perspective is lacking in the existing framework, and that slavery, segregation, discrimination, and racism have tangibly affected the evolution of the police function (Williams & Murphy, 1990). In addition to omitting race and ethnicity, the exclusion of gender, sexual orientation, citizenship status, and the intersection of these variables are also deficient in the model. The failure to examine social context, including economic, technological, and political advances, is also a notable limitation of the construct (Strecher, 1995). Walker's (1984) critique centers on the interpretation of the impact of technological innovation on police-citizen contact, and on Kelling and Moore's (1988) overstatement of crime control as a police function. Despite these limitations, Kelling and Moore have provided one rubric by which past, current, and future eras of policing can be classified, evaluated, and understood. The shortcomings of this framework, easily identified in retrospect, do not detract from the importance of this contribution to the understanding of the history of the police.

1988-Present, and New Strategies in Policing

The Kelling and Moore framework ends in 1988, and much has happened since then. In fact, we may be in a new era. Over the last 30 years, a number of policing strategies have emerged such as: problem-oriented, hot spots, offender-focused, zero-

tolerance, evidence-based, and intelligence-led policing. All are important, but problem-oriented policing remains one of the most popular and innovative strategies to emerge from this era. The next section provides a full discussion of problem-oriented policing.

Problem-Oriented Policing

In 1979, Herman Goldstein articulated a problem-oriented policing (POP) approach. This approach called for a more holistic view of crime problems; that is, crime is not isolated in its occurrence and should be evaluated as such. According to Eck (2006),

...problem-oriented policing fundamentally redefines policing. It restates the police mission by creating a new unit of analysis for evaluating police actions: the ‘problem’. It shifts policing to a scientific approach to preventing crime and away from the routine application of the law. And it replaces the notion of the police as gatekeepers to the criminal justice system with the idea that police are central to many networks that affect public well-being. (p. 117)

This approach reflected the tenets of the community problem-solving era. While community policing emphasizes police-community relations, POP attempts to understand the root causes of pervasive community issues and reduce their impact (Moore, 1992). POP aims to rectify the means over ends syndrome, by refocusing police efforts on addressing problems (Goldstein, 1979). Officers had been so focused on administrative competence that they had lost a problem-solving focus. Goldstein, however, felt that the impossible police mandate made problem-solving unattainable, and was careful to avoid this term (Scott, 2000); “reducing harm, alleviating suffering, and/or providing some measure of relief are ambitious enough aims for the police” (Braga, 2014, p. 109). Crime is often a reflection of a larger societal and legal climate (Bayley, 1994; Gottfredson & Hirschi, 1990), but conventional thought suggests the police can temper the consequences

of these macro occurrences and impact crime rates. Although POP was intended to address a variety of police issues (e.g., budgetary/personnel issues, guide police discretion, and ground policing in applied social science; Eck, 2006; Goldstein, 1979, 1990), it is generally discussed in the context of crime and disorder (Braga, 2014).

Principles and Process of Problem-Oriented Policing

The POP approach was made operational by researchers from the Police Executive Research Forum and officers from Newport News, Virginia (Eck & Spelman, 1987). Eck and Spelman (1987) put forth the SARA strategy, built on three main POP themes: increased effectiveness and attention to underlying issues, expertise and creativity in developing innovative solutions, and police-community involvement to ensure citizen satisfaction. Essentially, POP and SARA are a response to the limitations of incident-driven policing (Eck & Spelman, 1987). The SARA model is as follows: scanning, analysis, response, and assessment (Eck & Spelman, 1987). Scanning involves identifying problems, or “a cluster of similar, related, or recurring incidents rather than a single incident; a substantive community concern; or a unit of police business” (Goldstein, 1990, p. 66). This identification is done via officer knowledge of community issues, consultation with community groups, or examining calls for service or incident reports (Braga, 2014). Related to the latter, inequitable distribution of crime at place (i.e., the study of “hot spots” of crime⁶) is identified in this way. Braga (2014) suggests that blending identification techniques is the most efficient approach.

⁶ The introduction of advanced technology in the 1980s brought with it capabilities for a more nuanced examination of crime concentration (Braga & Weisburd, 2010). The resulting research on hotspots of crime demonstrated a spatial clustering of various crime problems. For example, Sherman, Gartin, and Buerger (1989) found that 3% of all

The analysis phase instructs officers to gather all relevant information, from various sources, to understand and bring to light the underlying cause of the crime or community issue (Braga, 2014; Eck & Spelman, 1987). Atypical data sources that can be used in the analysis phase include victimization surveys, community crime audits, and offender interviews (Clarke, 1998). This phase is typically difficult for police to implement, often resulting in an inadequate depth of analysis producing approaches like directed patrol or a focus on repeat offenders (Braga, 2014; Goldstein, 1990). Comprehensive problem analysis often takes time and skills the police do not have. Ideally, based on the results of the analysis phase, an appropriate and creative response is then developed. Goldstein (1990) envisioned the POP response to be an innovative way of dealing with community issues. Responses can vary greatly because they must reflect “action suitable to the characteristics of the problem” (Eck & Spelman, 1987, p. 2). Responses should aim to reduce crime opportunities and/or increase informal social control, and can be done by working with the public, businesses, and community agencies (Braga, 2014; Eck & Spelman, 1987). Police should avoid over-reliance on law enforcement-only responses. Assessment of the response is the last step in the model.

addresses accounted for 50% of all calls for service in Minneapolis. Characteristically high-crime neighborhoods also display this crime clustering, with most areas in troubled neighborhoods not exhibiting problematic crime statistics (see for e.g., Groff, Weisburd, & Morris, 2009; Sherman et al., 1989; Weisburd & Green, 1994). Hotspots policing is defined as “the application of police interventions at very small geographic units of analysis” (Braga & Weisburd, 2010, p. 9), and is strongly supported as a POP crime reduction technique (see for e.g., Braga, Papachristos, & Hureau, 2012; Braga & Bond, 2008; Sherman et al., 1989; National Research Council, 2004; Rosenfeld, Deckard, & Blackburn, 2014; Weisburd & Braga, 2006). In a recent systematic review of the available evidence, Braga et al. (2012) found that hot spots policing significantly reduced crime, disorder, and citizen calls for service.

The assessment phase is important because it is a way to maintain police accountability to the public, and it allows the police to understand the efficacy of their actions (Braga, 2014). This phase should occur in real-time and allow for course corrections in the response. The police are able to improve their efforts as a result (Braga, 2014). The assessment of POP initiatives should describe the four phases, and measure “inputs, activities, outputs, and whatever can be said about the outcomes” of the implemented responses (Braga, 2014, p. 107). The assessment phase is also problematic for police, but that can be remedied by partnering with independent researchers (Braga, 2014). Clarke (1998) suggests that if police undertake this phase alone, they should be rigorous and thorough in their development and presentation of the undertaken POP initiative to rule out alternate explanations, and they should be cognizant of crime displacement that may have occurred.

The Center for Problem-Oriented Policing is a repository of many tools that researchers and practitioners can use to guide their problem-oriented strategies. The Center’s mission is to advance the concept and practice of problem-oriented policing by providing accessible information and networking tools (Center for Problem-Oriented Policing, 2015). The website (popcenter.org) provides numerous problem specific guides, including: elderly abuse, home invasion, robbery, hate crimes, bullying, street prostitution, and so on. The website also provides core readings on POP and its implementation; for example, readings on situational crime prevention and its corresponding techniques.

Theoretical Perspectives

POP has a strong theoretical foundation that can serve to guide its implementation in the field. A thorough review of these theoretical foundations is warranted. Developed by the British government's criminological research department in the mid-1970s (Clarke & Mayhew, 1980; Mayhew et al., 1976), situational crime prevention has long been central to the POP movement (Clarke, 1997). Situational crime prevention advocates for a general approach to opportunity reduction, with techniques that are:

- (1) directed at highly specific forms of crime
- (2) that involve the management, design, or manipulation of the immediate environment in as systematic and permanent way as possible
- (3) so as to increase the effort and risks of crime and reduce the rewards as perceived by a wide range of offenders. (Clarke, 1997, p. 4)

Research has long-established that individuals respond differently to stimuli (e.g., Thomas, 1927), and situational crime prevention uses this dynamic understanding to be applicable in a variety of situations (see Table 2). Situational analysis, therefore, can be considered “the search for regularities in relationships between behavior and situations” (Birkbeck & LaFree, 1993, p. 116). With POP and situational crime prevention based upon the idea that preventive measures (e.g., defensible space architecture, target-hardening, and neighborhood watch) can reduce the opportunity for crime to occur (Clarke, 1983), opportunity theories of crime (i.e., routine activities and rational choice) naturally form their theoretical underpinnings (Braga, 2008; Clarke, 1997; Newman, Clarke, & Shoham, 1997; Reiss, 2010).

The routine activity perspective, originally formulated as a macro theory, states that structural changes in routine activity patterns influence crime rates by affecting the convergence in time and space of motivated offenders, suitable targets, and the absence

of capable guardianship against a violation or crime (Cohen & Felson, 1979). Changes in routine activities in an area can alter the opportunity structure present, despite the proportion of offenders or targets in an area remaining stable. This notion is long supported, as individuals are known to traverse between antisocial and conforming behavior (Merton, 1938). Osgood and colleagues (1996) extended the routine activity framework to the individual level by examining how peer influence, absence of authority (guardianship) and the corresponding reduced social control, and unstructured time present opportunities for deviant behavior. Elements of POP, specifically the response phase of SARA, require officers to look beyond the convergence of time and space for crime (Goldstein, 1990).

Routine activity theory and rational choice are often discussed in conjunction, as together they offer greater explanatory power and insight into the criminal event (Clarke & Felson, 1993). Offenders must choose if it is a rational decision to commit a crime when they happen upon a criminal opportunity, or situation. Specifically, rational choice theory focuses on the decision to initiate, continue, and desist from criminal behavior, thus yielding “potentially valuable insights for crime prevention” (Braga, 2014, p. 110). Crime events can be altered via crime prevention techniques if the situational elements of crime and routine activity patterns are considered (Groff, 2007). LaFree and Birkbeck (1991) define the term situation as “*the perceptive field of the individual at a given point in time*” (p. 75). Individuals may exercise restraining judgments (Athens, 1980), self-control (Gottfredson & Hirschi, 1990), or varying levels of self-regulation (Mischel, 1973) based on the perception of the situation (Stebbins, 1972). Table 2, for example, details techniques that can be used to reduce provocation. These techniques are designed

Table 2. 25 Techniques of Situational Crime Prevention (Cornish & Clarke, 2003, p. 90)

Increase the Effort	Increase the Risks	Reduce the Rewards	Reduce Provocations	Remove Excuses
<p>1. Target harden:</p> <ul style="list-style-type: none"> Steering column locks and immobilizers Anti-robbery screens Tamper-proof packaging 	<p>6. Extend guardianship:</p> <ul style="list-style-type: none"> Take routine precaution: go out in groups at night, leave signs of occupancy, carry phone "Cocoon" neighborhood watch 	<p>11. Conceal targets:</p> <ul style="list-style-type: none"> Off-street parking Gender-neutral phone directories Unmarked bullion trucks 	<p>16. Reduce frustrations and stress:</p> <ul style="list-style-type: none"> Efficient queues and polite service Expanded seating Soothing music/muted lights 	<p>21. Set rules:</p> <ul style="list-style-type: none"> Rental agreements Harassment codes Hotel registration
<p>2. Control access to facilities:</p> <ul style="list-style-type: none"> Entry phones Electronic card access Baggage screening 	<p>7. Assist natural surveillance:</p> <ul style="list-style-type: none"> Improved street lighting Defensible space design Support whistleblowers 	<p>12. Remove targets:</p> <ul style="list-style-type: none"> Removable car radio Women's refuges Pre-paid cards for pay phones 	<p>17. Avoid disputes:</p> <ul style="list-style-type: none"> Separate enclosures for rival soccer fans Reduce crowding in pubs Fixed cab fares 	<p>22. Post instructions:</p> <ul style="list-style-type: none"> "No Parking" "Private Property" "Extinguish Camp Fires"
<p>3. Screen exits:</p> <ul style="list-style-type: none"> Ticket needed for exit Export documents Electronic merchandise tags 	<p>8. Reduce anonymity:</p> <ul style="list-style-type: none"> Taxi driver IDs "How's my driving?" decals School uniforms 	<p>13. Identify property:</p> <ul style="list-style-type: none"> Property marking Vehicle licensing and parts marking Cattle branding 	<p>18. Reduce emotional arousal:</p> <ul style="list-style-type: none"> Controls on violent pornography Enforce good behavior on soccer field Prohibit racial slurs 	<p>23. Alert conscience:</p> <ul style="list-style-type: none"> Roadside speed display boards Signatures for customs declarations "Shoplifting is stealing"
<p>4. Deflect offenders:</p> <ul style="list-style-type: none"> Street closures Separate bathrooms for women Disperse pubs 	<p>9. Utilize place managers:</p> <ul style="list-style-type: none"> CCTV for double-deck buses Two clerks for convenience stores Reward vigilance 	<p>14. Disrupt markets:</p> <ul style="list-style-type: none"> Monitor pawn shops Controls on classified ads License street vendors 	<p>19. Neutralize peer pressure:</p> <ul style="list-style-type: none"> "Idiots drink and drive" "It's OK to say No" Disperse troublemakers at school 	<p>24. Assist compliance:</p> <ul style="list-style-type: none"> Easy library checkout Public lavatories Litter bins
<p>5. Control tools/weapons:</p> <ul style="list-style-type: none"> "Smart" guns Disabling stolen cell phones Restrict spray paint sales to juveniles 	<p>10. Strengthen formal surveillance:</p> <ul style="list-style-type: none"> Red light cameras Burglar alarms Security guards 	<p>15. Deny benefits:</p> <ul style="list-style-type: none"> Link merchandise tags Graffiti cleaning Speed humps 	<p>20. Discourage imitation:</p> <ul style="list-style-type: none"> Rapid repair of vandalism V-chips in TVs Censor details of modus operandi 	<p>25. Control drugs and alcohol:</p> <ul style="list-style-type: none"> Breathalyzers in pubs Server intervention Alcohol-free events

to reduce frustration, avoid disputes, and reduce emotional arousal (Cornish & Clarke, 2003). Emphasis on the victim, as opposed to the offender, theoretically and methodologically limits situational theories of crime (Birkbeck & LaFree, 1993). If the definition of a situation remains constant, behavioral responses are predictable (Thomas, 1927). If the situation changes, so too will situational reactions. This fundamental point of situational crime prevention gives the POP paradigm utility, because POP aims to use situation- and place-specific tactics to alter criminal behaviors and choices.

Offender decisions are reconstructible; that is, they are predictable and not random (Brantingham & Brantingham, 1978; Brantingham & Brantingham, 1993a; Clarke & Cornish, 1985; Cusson, 1983; Walsh, 1978; Willmer, 1970). There are multiple decision points in a criminal event, beginning with the willingness and decision to commit an offense (Clarke & Cornish, 1985). Arguably, everyone weighs the costs and benefits of their actions, oftentimes without full and accurate information (Cook, 1980). Further, not everyone weighs these costs and benefits the same (Clarke & Cornish, 1985). For example, some offenders are emboldened at the idea of being punished (Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003). Another example of this is how people use perceptual shorthand in their decision-making. That is, people do not consciously reevaluate their decisions and options in certain circumstances (Simon, 1957). This is particularly relevant when examining places, for example, as offenders may make judgments on crime opportunities, influencing the perpetuation of crime attraction and generation. Further, offender decision-making varies by crime type (see Topalli, 2005 for a general discussion), making situational crime prevention offense specific. Changing situations alters perceived effort, risk, and benefits, thereby altering choices and behavior

(Clarke, 1997). Understanding these situational contingencies, and enacting context specific preventive measures, increases the ability to effectively intervene and develop appropriate POP strategies (Clarke, 1995). For example, Table 2 details several techniques of situational crime prevention that can be used to increase perceived effort, including: target hardening (e.g., tamper proof packaging), controlling access to facilities (e.g., baggage screening), screening exits (e.g., electronic merchandise tags), and so on. Techniques to increase the risk of crime at place, also outlined in Table 2, include: assisting natural surveillance (e.g., improved street lighting), utilizing place managers (e.g., mandating two clerks per shift at convenience stores), and strengthening formal surveillance (e.g., employing security guards and installing alarms).

Crime pattern theory (Brantingham & Brantingham, 1984, 1991), a branch of situational crime prevention that incorporates elements of routine activity theory and rational choice theory, attempts to explain why individuals commit crimes in certain areas. Crime pattern theory aids in the analysis phase of SARA by providing a theoretical basis for the distribution of crime opportunities (Braga, 2014). By understanding the reproducible activities that individuals engage in, crime pattern theory provides POP with a basis for situation and place specific preventative measures.

Crime pattern theory. Koffka (1935) suggested there exists a geographic environment, which is made of physical structures and relationships, and a behavioral environment, which is an individual's perception of a geographic environment. Lewin (1936) furthered this idea by suggesting that individual behavior results from the interaction of personality with perceived environment. Gans (1972) proposed a potential and an effective environment, whereby the potential environment is the physical reality

that informs behavior via societal expectations and cultural norms. Around the same time, Sonnenfeld (1972) categorized the environment as having geographical, operational, perceptual, and behavioral elements. In this conceptualization, the geographical environment is the objective reality. The geographical environment impacts an individual's behavior via the operational environment. The operational environment has a perceptual component, which is essentially what Brantingham and Brantingham (1984) would later term awareness space. Awareness is affected by direct and indirect experiences, among other things. The behavioral environment, a component of the perceptual environment, triggers action (Sonnenfeld, 1972; also see Porteous, 1977).

In their seminal work on crime patterns, the Brantinghams (1984) defined the concept of environment as follows:

For any individual the *environment* is the totality of objects – people, places and things – that he or she comes in contact with and the relationships that influence his or her behavior. The environment of a criminal act is the totality of objects and relationships that influence the commission of that criminal act. (p. 333)

How environments are perceived affects spatial behavior. Although the cause and strength of criminal motivation varies, it is indisputable that there are people motivated to commit crimes (Brantingham & Brantingham, 1984). The existence of motivated offenders makes it possible to examine how exactly spatial decisions are related to environmental perception (Brantingham & Brantingham, 1984). This basic model of target selection is described by the following propositions, put forth by Brantingham & Brantingham (1978):

I. Given the motivation of an individual to commit an offense, the actual commission of an offense is the end result of a multi-staged decision process which seeks out and identifies, within the general environment, a

target or victim positioned in time and space. II. The environment emits many signals, or cues, about its physical, spatial, cultural, legal and psychological characteristics.

III. An individual motivated to commit a crime uses cues (either learned through experience or learned through social transmission) from the environment to locate and identify targets or victims.

IV. As experiential knowledge grows, an individual motivated to commit an offense learns which individual cues are associated with “good” victims or targets. These cues, cue clusters, and cue sequences (spatial, physical, social, temporal, and so on) can be considered a template which is used in victim or target selection. Potential victims or targets are compared to the template and either rejected or accepted, depending on the consequence.

V. Once the template is established, it becomes relatively fixed and influences future searching behavior, thereby becoming self-reinforcing.

VI. Because of the multiplicity of targets and victims, many potential crime selection templates could be constructed. But because the spatial and temporal distribution of targets and victims is not regular, but clustered or patterned, and because human environmental perception has some universal properties, individual templates have similarities which can be identified. (pp. 107-108)

Per proposition V, crime templates endure. That is, once a target, victim, or setting is identified as a suitable target (either via experience or social transmission) a criminal will feel comfortable in offending there, and that their behavior will not be interrupted (Brantingham & Brantingham, 1984). Additionally, different behavior occurs in different contexts (Brantingham & Brantingham, 1978, 1984). When a motivated offender perceives their behavior to be appropriate for a certain setting, and finds a target that matches their perceptual template, a decision is made to offend or not (Brantingham & Brantingham, 1978, 1984). Further, offenders disproportionately find suitable targets in certain settings (Block, Felson, & Block, 1985), often through overlapping activity spaces (Felson, 2006). Activity spaces are areas within which daily activities occur (Horton & Reynolds, 1971). Crime pattern theory posits that because offenders are influenced by their awareness and activity spaces, there exists an underlying structure to

crime patterns (Brantingham & Brantingham, 1993b). Even when not totally predictable, behavior is patterned (Brantingham & Brantingham, 1984). This has obvious relevance to the police under a problem-oriented approach.

Patterned behavior is often found in places that attract and generate crime, like convenience stores. Crime generators are places (business, facilities, institutions, etc.) that are easily accessible to large numbers of the public, and consequently are fertile grounds for opportunistic crime (Brantingham & Brantingham, 1995; Kinney, Brantingham, Wuschke, Kirk, & Brantingham, 2008; see also, McCord, Ratcliffe, Garcia, & Taylor, 2007). Crime attractors are places that are known to provide opportunities for deviance; they do not necessarily attract large numbers of people like crime generators, but contain attractive and weakly guarded targets (Bernasco & Block, 2011; Brantingham & Brantingham, 1995; Kinney et al., 2008). A store's design, for example, can cause it to be labeled a crime attractor if the layout is deemed indefensible against crime (either via personal or socially transmitted experience).

Crime prevention through environmental design. Crime prevention through environmental design (CPTED) attempts to influence offender decision-making, and is often employed at places that are known as crime attractors or generators. Jacobs (1961) suggested that there are three primary qualities that make city streets safer: a clear demarcation between public and private space, diversity of street use, and fairly constant sidewalk use. Jacobs (1961) posited that maintaining informal social control was necessary to deter crime, or what she termed “an almost unconscious network of voluntary controls and standards among the people themselves, and enforced by the people themselves” (p. 31). Jacobs (1961) stated that although the police are necessary,

keeping the peace is not primarily their function. Jacobs' model of land use and commercial space may have proven to be inapplicable in many places (Angel, 1968; Reppetto, 1976b), but Angel (1968) suggested that, by designing environments such that evening establishments are centralized and easily monitored, the opportunities for crime would decrease. More specifically, a "critical high-crime intensity zone" was hypothesized; pedestrian circulation needs to be balanced so that it does not attract the attention of offenders, and still provides sufficient surveillance. It was later found that Angel's model did not significantly reduce crime (Wilcox, 1974). Additionally, Jeffery's (1971) *Crime Prevention through Environmental Design* posited that crime risk may be reduced through modifications to the business environment, and that the sociological focus on the social causes of crime were greatly exaggerated. Jeffery greatly contributing to the theoretical development of CPTED, and is generally credited with coining the term. His work was (and is) oft-neglected by criminologists (Robinson, 1999), due to its emphasis on biological and environmental determinants (which have historically gone through phases of acceptance among the criminological community). Discussions of POP acknowledge Jeffery's contributions, but CPTED has since moved in a different direction. Why people offend, as Eck (2000) suggests, is not especially relevant to the police; opportunities and decision-making surrounding places, targets, and times has much more utility for the implementation of POP interventions (Braga, 2014; Eck, 2000; Felson & Clarke, 1998).

The notion that certain design features can affect the probability of crime is borne from architect Oscar Newman's theory of defensible space (1972); this is a key component of CPTED developed almost concurrently with Jeffery's work. Building on

previous work, Newman suggested that defensible space, or space manipulated to alter behavior and increase security, would increase mutual responsibility and surveillance, as well as increase perceptions of risk of apprehension to motivated offenders. Today, CPTED is understood to be the “proper design and effective use of the built environment” which “can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life” (Crowe, 2000, p. 46). Brantingham and Faust (1976) developed a conceptual model of crime prevention, with three levels:

(1) primary prevention, directed at modification of criminogenic conditions in the physical and social environment at large; (2) secondary prevention, directed at early identification and intervention in the lives of individuals or groups in criminogenic circumstances; and (3) tertiary prevention, directed at prevention of recidivism. (p. 284)

Primary crime prevention specifically identifies risky aspects of an environment that provide opportunities for and even precipitate criminal behavior, with the goal of stopping crime before it occurs. Secondary prevention identifies risky individuals or groups, with the intent to prevent risk from materializing further. Tertiary crime prevention is aimed at reducing recidivism via controlling routine activities rather than therapeutic intervention (Brantingham & Faust, 1976).

Wortley (1997, 1998) has suggested that opportunity reduction *and* an understanding of the precipitators of behavior are necessary to fully grasp situational crime prevention. These are also basic tenets of POP, as conceptualized by Goldstein (1979; 1990). According to Wortley (2001), there are several ways situations precipitate criminal responses:

Situations can present cues that *prompt* an individual to perform criminal behavior; they can exert social *pressure* on an individual to offend; they can weaken moral prohibitions and so *permit* potential offenders to

commit illegal acts; and they can produce emotional arousal that *provokes* a criminal response. (pp. 6-7)

In turn, Wortley put forth the strategies of controlling prompts, controlling pressures, reducing permissibility, and reducing provocations – each with four corresponding techniques (2001, p. 7). Situational conditions may present subtle cues that elicit criminal behavior (Wortley, 2001). To control prompts, Wortley (2001) suggest controlling triggers (e.g., prohibiting sex offenders from working with children), providing reminders (of appropriate and lawful behavior), reducing inappropriate imitation (e.g., broken windows theory premise), and setting positive expectations (i.e., alter offender expectations). The four prevention techniques associated with controlling pressures are reducing inappropriate conformity, reducing inappropriate obedience, encouraging compliance, and reducing anonymity (Wortley, 2001). These techniques revolve around complying with requests, obeying instructions, conforming to group norms, and so on.

Reducing permissibility refers to the idea that situational factors may contribute to decision-making processes; that is, some environmental contexts facilitate criminal involvement (Wortley, 2001), thereby distorting morality and giving way to excuses of behavior (see: Sykes & Matza, 1957). To reduce permissibility, rule setting (i.e., reducing rule ambiguity), clarifying responsibility (e.g., controlling alcohol intake), clarifying consequences (by explaining the cumulative impact of seemingly minor offenses), and personalizing victims are suggested. Situational stress, or provocation, may lead to antisocial responses (Wortley, 2001; for a discussion of strain, personality, and delinquency see: Agnew, Brezina, Wright, & Cullen, 2002) To reduce provocation, Wortley (2001) suggests reducing frustration (for e.g., stress can be reduced for drivers

via more efficient traffic flow), reducing spatial crowding (i.e., reduced social density), respecting territory (i.e., identifying and regulating territorial possession), and controlling environmental irritants (i.e., stress results from intense heat, noise, etc.). More recently, Cornish and Clarke (2003) responded to Wortley (2001), adding more techniques to their framework (see Table 2).

All of this has importance for the police because they can work with place managers to alter the crime-prone environment. As a result, police often receive CPTED training (Cozens, Thorn, & Hillier, 2008; Kelpczarek, 2003; McDonald & Kitteringham, 2004). Their role cannot be understated – the police have current, firsthand knowledge of criminal behavior (both micro and macro), as well as an understanding of the crime-prone locations (Potts, 1989). If a space is consistently a factor in the commission of crimes, the police are in the best position to understand why that is so. Specifically, police involvement in CPTED can be realized as:

Development of crime prevention strategies based on environmental principles; development of profile data of the target areas; development of victim oriented approaches which are based on maximising security but relate to both the physical and social environment; and identification of new criminal techniques and activity and use of CPTED and other measures to combat them. (Potts, 1989, p. 74)

Crime displacement and diffusion. According to the rational choice perspective (Cornish & Clarke, 1987), offenders weigh the difficulty and riskiness of a situation before taking action. Situational crime prevention posits that by manipulating the perceived risks and/or rewards of an opportunity, the likelihood of crime can be reduced (Clarke, 1983). As opportunity theories of crime and prevention assume offender motivation to be stable, it can be plausibly deduced that a motivated offender will not be

deterred by a blocked opportunity, but will instead target something or somewhere else (Johnson, Guerette, & Bowers, 2014). Thomas Reppetto (1976a) articulated this phenomenon in his seminal article, providing a foundational hypothesis for future empirical assessments. This phenomenon is termed displacement, and critics of situational crime prevention and CPTED often mention it as a limitation to these approaches.⁷

By blocking or preventing crime in one area, crime may simply move in location or time (spatial and temporal displacement) or transform into a different crime type (crime type or offense displacement) (Gabor, 1981; Reppetto, 1976a). Other opportunities may also be found via different targets (target displacement), or through the use of different methods (tactical displacement) (Hakim & Rengert, 1981; Hesselting, 1994). Barr and Pease (1990) suggest a sixth type of displacement exists: perpetrator displacement. Using the example of drug trafficking, the authors state that some crime opportunities are so compelling that they will continually be repeated by whichever offender is available for the task (Barr & Pease, 1990, p. 279). In Guerette and Bowers' (2009) review of displacement in situational crime prevention evaluations, the authors found that spatial displacement and diffusion were the most commonly examined (47%), followed by offense (24%), target (14%), tactical (9%), and perpetrator displacement

⁷ Few studies have found evidence of displacement (e.g., Gabor, 1981; Holt, Blevins, & Kuhns, 2008; Lateef, 1974; Tyrpak, 1975). A study by Taylor, Koper, and Woods (2011) examining displacement did find, however, that POP buffer zones experienced increases in violence and calls for service. The authors do not regard this as evidence of displacement, though; they suggest that the POP intervention caused more community engagement with policing efforts, and that the likelihood of reporting crime increased during this time.

(<1%). Eck (1993) also found spatial displacement to be the most recognizable and studied form of displacement.

Proponents of the existence of displacement purport the following:

...[A]ny pattern of crime can be thought of as the distribution of people and places from which crime has not been displaced. The observed pattern is a temporary product of a particular set of physical and social arrangements. Crime patterns at any time are frozen displacement patterns. Displacement is but another placement. (Barr & Pease, 1990, p. 281)

Displacement often assumes that offenders are not specialized, but rather generalist in their offending; and that criminal inclination is constant (Cornish & Clarke, 1986b). This notion has recently been (partially) debunked, with Sullivan, McGloin, Pratt, and Piquero (2006)⁸ finding more evidence of specialization than versatility in offending. Many theories of criminality also assume displacement to be inevitable (e.g., Yochelson & Samenow, 1976). Studies have found, however, that when offenders are prevented from committing a crime, the majority do not seek out alternative opportunities (e.g., Bennett & Wright, 1984). Additionally, Eck (1993) developed the familiarity decay hypothesis: offenders' likelihood of targeting a crime opportunity is inversely related to the distance from their routine activity space (Cohen & Felson, 1979). In other words, an offender's mental map of his/her environment (Brantingham & Brantingham, 1981) extends only so far, and criminal behavior is not random; if an offender does not have the advantage of a known location he/she will be less likely to offend (Eck, 1993). In other words, desistance from crime is more likely than displacement (Johnson et al., 2014). This decay is also applicable temporally, with recent awareness spaces losing their familiarity as

⁸ According to Sullivan et al. (2006), "short-term offense specialization is not a methodological artifact but rather a reflection of an enduring empirical reality" (p. 222).

time progresses (Bernasco, 2010). CPTED and situational crime prevention seek to disrupt the intersection of awareness space and suitable target in a certain location, with longer interventions theoretically able to reduce sentimentality or familiarity with a preferred offending location.

Several studies have found that problem-oriented policing approaches do not cause crime displacement (e.g., Braga et al., 1999; Gabor, 1990⁹; Rosenfeld et al., 2014; Weisburd et al., 2006).¹⁰ Spatial displacement has been found to be relatively rare for place-based interventions at large-scale geographic areas (Telep, Weisburd, Gill, Vitter, & Teichman, 2014). Additionally, a meta-analysis examining smaller geographic areas, including hotspots, found that geographically focused policing initiatives have an overall reductive impact on crime outcomes, and that a diffusion of benefits is a more likely outcome than displacement (Bowers, Johnson, Guerette, Summers, & Poynton, 2011). Diffusion of benefit is essentially the displacement of positive effects received from an intervention onto an area that did not receive an intervention (Clarke & Weisburd, 1994), and it has been documented in several crime prevention studies (e.g., Bowers & Johnson, 2003; Chaiken, Lawless, & Stevenson, 1974; Green, 1995; Miethe, 1991; Weisburd et al., 2006; Weisburd & Green, 1995a). Further, there is the potential for communities to benefit from offenders being displaced from more to less violent crime (Barr & Pease, 1990). Of the seven major reviews of empirical studies examining displacement since

⁹ Gabor (1990) stated that the evidence supporting displacement is ambiguous, and that usually only a *partial* displacement effect is identified. In other words, “the volume of displaced crime does not equal that deterred or prevented” (p. 66).

¹⁰ Barr and Pease (1990) have put forth the concepts of benign and malign displacement. The authors also examine “how displacement could be used purposefully to create an optimal distribution of crime” (p. 278).

1990, all have concluded that there is little evidence that place-based prevention strategies result in displacement (Barr & Pease, 1990; Bowers et al., 2011; Eck, 1993; Guerette & Bowers, 2009; Hesseling, 1994; Johnson, Guerette, & Bowers, 2012; Telep et al., 2014).

Weighted displacement quotient. Prior to 2003, displacement was discussed primarily in a theoretical context. Standardized techniques related to quantifying displacement were absent. Advocates of the situational approach have long-noted these issues (e.g., Barnes, 1995), in addition to contending with persistent and substantial criticisms of displacement. Previous approaches to the measurement of displacement have advanced the field significantly (e.g., Braga et al., 1999; Weisburd & Green, 1995a), but have highlighted several problems in the approaches taken. Bowers and Johnson (2003) outline these issues in their seminal piece on the standardization of measurement for displacement and diffusion. The authors draw attention to the problem of attributing changes in the displacement zones to treatment that has taken place in the intervention area. Weisburd and Green (1995b) believe that looking for evidence of displacement around the intervention area is nonsensical *if* the intervention tested has not reduced offending. Measuring “phantom displacement” can result from using previous displacement measurement tactics (Bowers & Johnson, 2003, p. 277).

An additional problem arises when defining the catchment area, or the area crime is most likely to be displaced. These areas are also termed “buffer zones,” and defining an appropriate size for these areas is often contentious. In the first account of using these zones, Allatt (1984) examined “a small area of private housing to the west of the target estate and, to the north, across a thoroughfare, a council estate” (p. 102). There is no

standardized selection process for defining a buffer zone. Boba (2005) defines a buffer as “a specified area around a feature on a map” (p. 43). Many GIS scientists examine displacement using polygon shapes around an object (convenience store, restaurant, etc.) that are created to be uniform in size (Ratcliffe & Breen, 2011). Ratcliffe and Breen (2011) detail the nuance that *should* be used to ascertain if a catchment area is appropriate.

The assumption of isotropic geographical space (Tobler, 1993) might be incorrect when placed in the context of predicting likely displacement or diffusion of benefits resulting from crime prevention activity. There are no firm rules for selection of buffer areas, but... [Ratcliffe and Breen] were able to combine local knowledge regarding offender behavior to determine context-specific buffer areas. (p. 235)

Weisburd and Green (1995b) also note that displacement assessments are often after-thoughts. That is, most studies are designed to test an intervention’s effects and therefore lack a powerful research design for examining displacement and, relatedly, diffusion. The authors believe that studies need to be specifically designed to identify these phenomena in order for the field of criminology to produce rigorous, progressive research. John Eck’s (1993) concept of familiarity decay is critical to this discussion. Eck posits that offenders are more likely to target familiar places than unfamiliar areas. Relatedly, environmental criminology supports this assertion by examining offenders’ target selections in relation to their routine activities (Brantingham & Brantingham, 1981). In the extant literature, buffer zones vary in size, although many scholars choose an approximate two-block radius. This catchment size is reasonably close enough to detect any reliable displacement effects, and far enough from the target that any existing spatial

displacement will not be diluted (see: Telep, Mitchell, & Weisburd, 2014; Weisburd & Green, 1995b; Weisburd et al., 2006).

Bowers and Johnson (2003) devised the weighted displacement quotient (WDQ) to standardize the measurement of the geographical displacement of crime, which is applicable to any geographical boundary. Bowers and Johnson (2003) provide insight into using the WDQ as follows:

- 1.) Over any given time period, buffer zone (B) will account for a particular proportion of the crime committed within a control area (C);
- 2.) If geographic displacement does occur it should displace from the intervention area (A) into the buffer zone (B) that surrounds it; and
- 3.) If displacement does occur then, relative to the control area (C), crime in the buffer zone (B) should increase while crime in the action area (A) should decrease.

Because the WDQ examines changes in crime *rates* and not *volume*, the data are standardized and able to be compared across studies¹¹ (Bowers & Johnson, 2003, p. 287).

Building on Bowers and Johnson's (2003) work, Ratcliffe and Breen (2011) sought to strengthen the utility of the WDQ by introducing a measure of statistical significance to be used in conjunction. Prior to employing the WDQ, Ratcliffe and Breen (2011) suggest calculating phi. Phi has two main purposes in relation to the WDQ: to determine the statistical significance of the data *prior* to calculating the WDQ, and to confirm that the target area and buffer zone operate independently. The phi statistic assesses the existence of a statistically significant difference between crime in the buffer area and the target area, signaling that displacement is not a "foregone conclusion" in place-based interventions (Ratcliffe & Breen, 2003, p. 237).

¹¹ Jerry Ratcliffe has developed a WDQ spreadsheet calculator, which is accessible via his personal website: <http://www.jratcliffe.net/software/wdq-spreadsheet-calculator/>

Evaluation of Problem-Oriented Approaches

An early review by Sherman (1991) suggested there was a lack of rigorous evidence to support Goldstein's (1990) assertion that POP was a superior strategy to traditional policing. Today there is general agreement that POP is effective and practical at reducing crime and disorder, which is evident by its widespread, worldwide implementation (Braga, 2014). The popularity of POP is not enough to conclude it is effective, though, and the extant literature is lacking in rigorous study design and assessment of this police strategy. Weisburd, Eck, Hinkle, and Telep (2008) conducted a systematic review examining the effect of POP on crime and disorder. Surprisingly, despite POP being popular and implemented often, only ten studies met their rigorous methodological criteria for inclusion. The authors found a modest but significant impact of POP techniques on the reduction of crime and disorder. Weisburd and colleagues (2010) extended their systematic review to also include less rigorous study designs (quadrupling their sample size). Their findings again found strong evidence to support POP's effectiveness at reducing crime and disorder. Additionally, White, Fyfe, Campbell, and Goldkamp (2003) found that POP can reduce crime, but posit that this finding is likely dependent upon effective leadership and reliable implementation. In fact, leadership plays a key role in ideal applications of POP. Goldstein (1979, 1990) originally suggested that POP efforts be located within police headquarters; as decentralized approaches may actually reduce the quality of POP interventions, because officers are ill-equipped to work through the SARA model without assistance (Eck, 2006).

In 1987, the National Institute of Justice selected the Newport News Police Department to serve as the pilot test site of problem-oriented policing (Eck et al., 1987). John Eck and William Spelman assisted in conducting the first application of POP, in consultation with Herman Goldstein. The police department, in conjunction with the research partners, developed a four-stage problem-solving process: scanning, analysis, response, and assessment (SARA). An evaluation of the project revealed reduced burglaries at a problematic apartment complex, a reduction in robberies in the city's business district, and a reduction in thefts from vehicles (Eck et al., 1987). The effectiveness of the project was encouraging, and emboldened other police departments to implement problem-oriented policing initiatives. Two more recent applications of POP that are oft-cited are the Boston Police Department's Operation Ceasefire intervention to prevent gang violence (Braga, Kennedy, Waring, & Piehl, 2001), and the Charlotte-Mecklenburg Police Department's program to reduce theft from construction sites (Clarke & Goldstein, 2002). Braga and colleagues (2001) found that Operation Ceasefire, a pulling levers approach focused on chronic offenders, was associated with significant reductions in homicide victimization, certain types of calls for service, and gun assaults. Clarke and Goldstein (2002) also reported positive results. After identifying construction site theft of appliances in Charlotte, North Carolina as a problem, a cost-effective response was developed: delay installation of home appliances until homeowners take residence. Although builder compliance varied, the analysis revealed declines in appliance theft with no resulting displacement of theft to surrounding areas. Theoretically, POP has a sound basis, and research has shown that POP is effective at

reducing crime and disorder. The translation from theory to practice is often an issue in much of criminology, though.

POP is considered by some to be the apex of modern police strategies, and is “widely regarded as the most analytical and intellectually challenging strategy in the police arsenal” (Cordner & Biebel, 2005, p. 155). That said, the implementation of POP often suffers as a result of its demanding nature, and falls short of the model envisioned by Goldstein. Because POP is often not implemented as intended and with fidelity, more research is needed to conclude its effectiveness. Generally, the police are adept at the scanning phase and identifying problems (Bynum, 2001), but often unintentionally undermine the intended POP initiative by focusing on problems either too big or too small. This then hinders the POP project by placing successful implementation out of reach. The analysis phase, which aims to understand the nature of a problem’s existence, also often falls short. In practice, the analysis phase of POP is often “cursory or nonexistent” (Cordner & Biebel, 2005, p. 159), and shallow (Braga & Weisburd, 2010). Even the most exemplary POP projects have difficulty ascertaining why an issue is occurring, and instead just settle for identifying its existence (Scott, 2000) – a problem endemic to various academic endeavors, though. Research has consistently found that officers have difficulty understanding the nature of the problems they are addressing (Capowich & Roehl, 1994; Tilley, 1999; Webster & Connors, 1993). For example, in an examination of POP projects in forty-three police departments, Read and Tilley (2000) found analysis to be generally weak, with departments shallowly defining problems using short-term data.

There are noted problems with the response phase of SARA as well. There is often excessive dependence on traditional crime-control strategies. Responses are typically characterized by a lack of innovativeness, collaboration, and engagement with other stakeholders. In 2005, Goldstein lamented the overreliance on enforcement in POP responses (Cordner & Biebel, 2005). Clarke (1998), discussing subpar POP projects nominated for the Herman Goldstein award¹², stated that (aside from CPTED implementation) there was a dearth of unconventional and creative responses in POP. Assessment is also a difficult phase for officers to thoroughly conduct. Tilley (1999) found that police rarely “assess their own problem-oriented initiatives as anything other than successes” (p. 273). Assessment is rarely conducted in a comprehensive manner, and is usually imprecise or anecdotal (Capowich & Roehl, 1994; Scott, 2000; Scott & Clarke, 2000). Cordner & Biebel (2005) attribute this to police officers being “more prone to action than to research” (p. 159). There are problem-oriented interventions that do follow the SARA model as originally envisioned. The New Haven SPI, for example, followed the SARA paradigm and found large reductions (up to 56%) in crime in high-risk areas (Sedelmaier, 2015). The initiative did find, though, that upper command support for the problem-oriented strategy was inconsistent; most likely because shifts in organizational culture take significant time (Sedelmaier, 2015). Overall, POP interventions tend to fall short of the ideal model put forth by Goldstein (e.g., Cordner & Biebel, 2005), and instead reflect a more shallow and simple problem-solving effort (Braga & Weisburd,

¹² This award, first introduced in 1993 and named for the founder of problem-oriented policing, recognizes innovative and effective problem-solving police efforts worldwide (Center for Problem-Oriented Policing, 2015). The quality of the submissions vary greatly, and the number of submissions averages approximately 50-70 per year. Of these submissions, 5-10 are selected as finalists.

2006). In sum, POP is often not implemented as intended; is rarely evaluated rigorously; and as a result, its potential for crime control is not clear. The current study will examine a POP project in Glendale, AZ that avoided these common implementation and evaluation pitfalls, using a rigorous research design that reaches Level 4 on the Maryland Scientific Scale¹³ (Sherman et al., 1998).

Smart Policing Initiative

The Great Recession of the late 2000s affected many aspects of the criminal justice system, but the sharp economic decline had a noticeable impact on policing practices. Budget reductions affected police hiring, equipment purchases, and patrol tactics (Coldren, Huntoon, & Medaris, 2013). After all of the innovation that had been achieved in policing over the last several decades, many police departments were forced to revert back to mainly responding to calls for service (Coldren et al., 2013). Notably, many of the major innovations in policing were born from local police departments and universities (Coldren et al., 2013). For example, POP originated during Herman Goldstein's time at the University of Wisconsin, and the beginnings of community policing came from Robert Trojanowicz's time at Michigan State University (Coldren et al., 2013). These local solutions tended to be more cost effective than traditional strategies. The Bureau of Justice Assistance (BJA) took note of these local innovations and their corresponding crime reduction, and in 2009, spurred by the downtrodden

¹³ The Maryland Scale of Scientific Methods ranks studies from weakest (1) to strongest (5) on overall internal validity (Sherman et al., 1998). For example, a Level 1 study examines correlation between prevention programs and crime at a single time point. A Level 4 study will compare multiple units, control for other factors, or use comparison units. A Level 5 study employs random assignment and analysis of intervention and control groups.

economy, released the first Smart Policing Initiative (SPI) solicitation (Coldren et al., 2013).

The Smart Policing Initiative is a collaborative effort to test solutions to serious crime problems in specific jurisdictions. According to BJA's Smart Policing website (2010), "effective policing requires a tightly focused, collaborative approach that is measurable; based on sound, detailed analysis; and includes policies and procedures that promote and support accountability." There are five key principles of Smart Policing, including: (1) performance measurement and research partnerships, (2) outreach and collaboration, (3) managing organizational change, (4) strategic targeting, and (5) making better use of intelligence and other data and information systems ("Smart Policing," 2010). According to Coldren et al. (2013), Smart Policing demonstrates the following characteristics: (1) locally driven, with no required approach to crime control; (2) a focus on science and rigorous evaluation, with a particular emphasis on experimental and quasi-experimental designs; (3) a multifaceted approach to problem-solving, derived from analysis; (4) results that clearly indicate effectiveness of the initiative; and (5) innovative approaches that test new and existing crime control and prevention strategies (p. 278). The tenets of Smart Policing essentially further and strengthen the evidence-based policing movement, whereby "...police practices should be based on scientific evidence about what works best" (Sherman, 1998, p. 2). Several professional organizations have been developed to increase awareness of and advocate for evidence-based practices (see: Society of Evidence-Based Policing, Australian-New Zealand

Society of Evidence-Based Policing, Center for Evidence-Based Crime Policy).¹⁴ Police departments and researchers are conflicted over the implementation of these practices; recent and strong demands for police change call for a totally-evidenced approach to be explored, but traditionally this movement has evolved incrementally (Sherman, 2015).

Local SPI projects have addressed a gamut of problems, including homicide, domestic violence, property crime, repeat offending, and many others (Coldren et al., 2013). The strategies employed and implemented by the SPI teams vary, as well. These tactics can be place- or offender-based, geared toward a problem- or community-oriented approach, use predictive-analytic or intelligence-led policing, or a combination of these, for example (Coldren et al., 2013). “SPI does not prescribe any model or approach; rather, it stresses the importance of in-depth problem analysis and definition (with, presumably, the help of a research partner) to support the selection and combination of various approaches in SPI sites” (Coldren et al., 2013, p. 282). Funding from BJA, however, is partly contingent upon research and analysis focusing on the SARA model (“Smart Policing,” 2010).

Research partnerships are a fundamental component of SPI. Initially intended to capitalize on the “local genius” (Coldren et al., 2013, p. 277) of nearby universities and police departments, the need for police-research partnerships became more apparent after research by Weisburd and colleagues (2010) was published examining the effects of POP. This systematic review identified 5,500 articles addressing the effectiveness of

¹⁴ These organizations can be found online at: www.debp.police.uk, www.anzsebp.com/, and cebc.org.

POP, but only ten¹⁵ of these studies had rigorous research designs that would allow them to be included in the review. Although the results of these studies were positive, BJA started emphasizing and strengthening research partner requirements. An assessment of several of the local SPI police-researcher partnerships revealed that both police and researchers rated the partnerships positively (Martin-Roethele, 2013; White, 2012). These relationships are “productive and mutually beneficial” and “researchers have more impact than they give themselves credit for” (Coldren et al., 2013, p. 280). Since SPI’s inception, police and researchers have successfully worked together to design evidence-based strategies effective in micro-places (Joyce, Ramsey, & Stewart, 2013).

Although POP and hot spots policing have developed on two separate, parallel tracks, they do overlap occasionally. Most hot spots initiatives give little direction in terms of what to do at these micro-places, but the natural symmetry between POP and hot spots joins them together in a way that provides cohesion and direction. There are several Smart Policing examples of these types of place-based interventions, including the Philadelphia SPI, the Boston SPI, and the Glendale SPI. In an effort to determine the impact of differential policing strategies employed at violent crime hotspots, the Philadelphia Police Department and its research partners at Temple University implemented a randomized controlled design to test foot patrol, problem-oriented policing, and offender-focused policing. An examination of Philadelphia’s crime incident database identified 81 mutually exclusive hotspots (Ratcliffe, Groff, Haberman, Sorg, &

¹⁵ The included studies were: Baker & Wolfer (2003); Braga et al. (1999); Knoxville Police Department (2002); Mazerolle, Price, & Roehl (2000); Sherman et al. (1989); Stokes, Donahue, Caron, & Greene, (1996); Stone (1993); Thomas (1998); Tuffin, Morris, & Poole (2006); Weisburd & Green (1995a).

Joyce, 2013). 20 hotspots received foot patrol, 20 received problem-oriented policing, and 20 received an offender-focused initiative; all with 7 control hotspots, respectively. Despite following the SARA paradigm, the SPI team only found a significant reduction in crime in the areas implementing offender-focused strategies (a 31% decrease in violent street felonies). The researchers do not disregard the potential of POP, though. Ratcliffe and colleagues (2013) simply suggest that complex strategies, like POP, may work but not in the short-term. That is, other strategies may generate crime reduction quicker than problem-oriented policing. Problem-oriented initiatives try to understand the deep-seated social and environmental causes of crime, thereby naturally taking longer for change to take hold.

The Boston SPI was also a place-based, POP intervention. From 2004 to 2006 Boston experienced notable increases in violent crime, concentrated in disadvantaged areas (Braga, Davis, & White, 2012). In 2006, the new Commissioner of the Boston Police Department (BPD), Edward Davis, set about addressing this problem. The Safe Street Team strategy was developed, assigning teams of officers to 13 different violent crime hotspots to apply problem-oriented, community-policing strategies. The BJA's SPI funded the BPD to conduct an ex-post facto evaluation of the strategy. Partnering with researchers from Rutgers University, a longitudinal analysis of the stability of hotspots was conducted using a nonrandomized quasi-experimental design. Although the location of violent crime hotspots proved to be stable over time, the deployment of nearly 400 different situational/environmental, enforcement, and social service interventions in the hotspots resulted in a 17.3% reduction in the total number of violent crimes (Braga et al., 2012). The Boston SPI showed that retrospective, rigorous evaluation can be conducted

effectively and with value to other police departments. Similarly, the Glendale SPI also provides an example of the marriage between POP, hotspots, smart policing, and ex-post facto evaluation.

Current Focus

In 2009, after receiving funding from the BJA's SPI, the Glendale, AZ Police Department sought to address crime at convenience stores through a problem-oriented policing approach. The Glendale SPI provides a roadmap for implementing POP, especially during the most difficult phases of analysis and assessment. With the SPI providing the ingredients to avoid the common pitfalls of POP, along with the guidance of the research partners, rigorous analysis and robust evaluation can result. Arizona State University trained Glendale Police Department personnel from two squads on POP, using the Center for Problem-Oriented Policing model curriculum.¹⁶ The seven training sessions, which exceeded twenty hours of classroom-based instruction delivered over a period of several months, were conducted to enhance officers' knowledge of in-depth POP. The curriculum included a historical overview (including Goldstein's vision, and the evolution of COP/POP), theoretical foundations (situational crime prevention, routine activities, and broken windows), and the SARA model (lectures, and group assignments). During the training sessions, the officers carried out the scanning and analyses phases of SARA, and devised detailed, comprehensive response and assessment plans. The training also included POP knowledge assessments (tests), which were given pre- and post-training on December 1st, 2009 and April 28th, 2010, respectively. During this five-month

¹⁶ See http://www.popcenter.org/learning/model_curriculum/.

lag between tests, officer knowledge improved significantly. The average score increased from 68.5% to 80.5%.¹⁷

Convenience stores were chosen during the scanning phase because officers identified these locations as crime hot spots that threatened both citizen safety and officer resources (White & Katz, 2013). During the analysis phase all calls for service at convenience stores were examined. It was then discovered that calls for service were disproportionately occurring at Circle K stores. In Glendale, Arizona there are 65 convenience stores, 15 of which are Circle Ks.¹⁸ In 2010, these 15 stores (23% of all stores) represented 79% of the calls for service at convenience stores (White & Katz, 2013). Several of the Circle K stores averaged more than 500 calls for service per year. The analysis also explored the causes of the disproportionality through geographic analysis, interviews of key stakeholders, and CPTED evaluations of Circle Ks and other convenience stores. White and Balkcom (2012) demonstrated the economic impact of Circle K calls for service by estimating that the top six most active stores generated more than \$15.2 million in total crime victimization costs in 2010 alone.

The majority of crimes being committed at these stores involved thefts of merchandise, thefts of gas, fights, disorderly conduct, panhandling, and robberies. The most frequently committed crime involved the theft of large quantities of beer. Sometimes these beer thefts, more commonly known as “beer runs,” turn violent when clerks and good Samaritans attempt to intervene. Additional analyses, which included

¹⁷ Questions included multiple choice, fill-in-the-blank, and short answer.

¹⁸ Founded in 1951, Circle K is a convenience store retail chain which self-reports more than 7,500 stores worldwide (Circle K, 2014).

multiple environmental design assessments done at Circle K stores, helped the Glendale SPI team to conclude:

...Circle K management practices were largely responsible for the theft problem. These practices included inadequate staffing, especially during high-risk theft times; failure to respond to panhandling, loitering, and graffiti; and violations of basic CPTED principles, such as keeping open lines of sight, employee personal items stored in plain view, and placing products in at-risk locations. (White & Balkcom, 2012, p. 5)

A multi-pronged response plan was developed by officers, civilians, crime analysts, and ASU faculty by engaging in open dialogue during training sessions. The proposed responses included: intervention with Circle K leadership, crime suppression strategies, and prevention efforts at the six highest-activity stores. The intervention called for proposed changes to practices and operations, including more than 220 CPTED recommendations to address issues at the six target stores. For example, the Glendale SPI team suggested changes to the store design and environment, as well as suggested employing two clerks during “hot times” (Friday and Saturday from 10 p.m. to 2 a.m.). The SPI team attempted to engage Circle K to change the culture in targeted locations, and had some initial successes with Circle K engagement. This included: Glendale Police Department training and access to in-store surveillance systems, trespass authorization approval, Circle K victim impact statements to be used during criminal prosecution of offenders, CADMINE alerts (Glendale Police Department email to Circle K loss prevention supervisor immediately after call for service), data sharing (Circle K repeat offender file), Circle K representative at bi-weekly SPI meetings, and a meeting with corporate Circle K leaders.

The traditional suppression strategy consisted of targeted surveillance and enforcement operations at the six intervention stores during nine weekends in August and September of 2010, as well as periodically through 2011. Circle K security guards, Glendale Police Department squads, ICE agents, and others were included in these operations. Arrestees were also debriefed by the ASU researchers. These operations resulted in 48 arrests, nearly \$900 in recovered merchandise, the identification of two distinct offender groups (prolific, serious offenders and juveniles who were “party hopping”), and learning that nearly one fourth of offenders were juveniles. The salience of prevention was highlighted because of the prevalence of juveniles committing the crimes. The team identified underage “beer runs” at Circle K stores to be an underlying cause of much of the crime problem. A public service announcement video was created¹⁹ to address the issue of beer theft.

The team assessed their multi-pronged approach and found mixed results. Circle K was generally not responsive to the intervention recommendations, and did not alter their practices. That said, several store managers did follow the CPTED recommendations, but adherence was not consistent across stores. White and Balkcom (2012) noted “...the Glendale team experienced resistance from Circle K management. Straightforward CPTED recommendations were often ignored, especially those that required a financial commitment” (p. 6). The SPI team responded by creating a law enforcement working group that included agencies from neighboring cities (White & Balkcom, 2012). This working group created a collective voice in speaking to Circle K, and increased leverage on the corporate leadership (White & Balkcom, 2012). The SPI

¹⁹ See <http://www.youtube.com/watch?v=hQZ6s2BTAo8>.

team's second response was to publicly shame Circle K by presenting the findings to the local media²⁰ (White & Balkcom, 2012). This tactic was successful in getting Circle K re-interested in discussing the problem and modification of their practices (White & Balkcom, 2012).

The methodology employed by White and Katz (2013) for the assessment of the SPI was descriptive, examining changes in calls for service over time for all 65 convenience stores in the city of Glendale. Specifically, ANOVA was employed to examine mean monthly changes in calls for service between the pretest period (August 2009-July 2010) and the posttest period (August 2011-July 2012). There were statistically significant drops in calls for service at five of the six target Circle K stores. Calls for service at nine non-SPI Circle K stores in Glendale also experienced a drop in crime, but these findings were not statistically significant (White & Katz, 2013). The impact on the target stores was unique. Although White and Katz (2013) concluded that the Smart Policing Initiative led to significant declines in crime and disorder at the targeted convenience stores, the authors specifically call for a more sophisticated analysis, likely time series, to offer a detailed and longer-term picture of the intervention. Additionally, their study did not examine displacement or diffusion of benefits resulting from the intervention. The SPI may have displaced crime to the surrounding area, or may have improved neighboring crime. By examining displacement/diffusion, changes in crime and call type, and using a more sophisticated analysis (growth curve modeling), this dissertation seeks to build on White and Katz (2013). The Glendale SPI is one of the few

²⁰ For example, see:

<http://www.azcentral.com/community/glendale/articles/2011/07/10/20110710asu-study-circle-k-police-calls.html>.

documented cases of POP being implemented as envisioned by Goldstein. Building on this study will create a stronger evidence-base for problem-oriented policing by allowing this initiative's effect size to be included in future meta-analyses, as well as discussions of ideal applications of POP as envisioned by Goldstein. Additionally, the discussion and conclusions will add to the limited extant literature on corporate involvement in crime, as Circle K's potential complicity in the crime at their stores is examined.

Research Questions

Question 1: Did the POP intervention generate an effect on crime at the target Circle K stores, compared to the non-target stores?

Question 1a: What was the strength and duration of the POP intervention's effects?

Question 2: Did crime change over time in the area surrounding the target Circle K stores? If so, does this finding suggest displacement of crime or diffusion of benefits?

CHAPTER 3: METHODOLOGY

Data

Dependent Variable

All data for the analyses have been provided by the Glendale Police Department. The dependent variable for these analyses is all monthly calls for service²¹ from January

²¹ Calls for service have long been regarded as a reliable indicator of time and place variations in crime (Pierce, Spaar, & Briggs, 1988). Since the utility of calls for service has been recognized, much of the research on crime and place has been effectively using these data in analyses (e.g., Bursik & Grasmick, 1993; Bursik, Grasmick, & Chamlin, 1990; LeBeau, 2002; Sherman et al., 1989; Sherman & Weisburd, 1995; Warner & Pierce, 1993). However, the data have limitations; specifically, calls for service may not match with official statistics. Different measures of crime have been shown to yield disparate findings (Elliot & Ageton, 1980; Hindelang, 1976; Hindelang, Hirschi, & Weis, 1979, 1981). Discrepant findings have also been shown to be due to the actual study design (Weisburd, Lum, & Petrosino, 2001). Issues with self-report measures are widely

2008 to October 2013 at all 74²² convenience stores in Glendale, Arizona (70 time points per store). Displacement of crime and/or diffusion of benefits resulting from the intervention will be assessed using data on all calls for service in the 500-yard catchment area around the six target Circle K stores from January 2008 to October 2013. The target Circle K stores are located at: (1) 4306 W Maryland, (2) 5880 W Camelback, (3) 5907 W Bethany Home, (4) 5102 W Camelback, (5) 7428 N 51st Ave., and (6) 4648 W. Bethany Home. In addition to the six Circle K stores targeted for the intervention, there are other Circle K stores in the sample ($n = 13$). The 13 Circle K stores that did not receive the intervention will serve as one comparison group in this study. The second comparison group is comprised of the 68 convenience stores that did not receive an intervention.²³ There are 74 total convenience stores in the sample ($N = 74$). Data management was conducted using IBM SPSS Statistics 20 and ArcGIS 10.2.

Independent Variables

The main independent variable in this dissertation is the policing intervention. This was coded as a binary variable, if a store received the intervention or not. The SPI intervention began and ended at all of the target stores at the same time, August 2010 –

documented and long-established (for e.g. see: Huizinga & Elliot, 1986; Levine, 1976; Short & Nye, 1957, 1958; Skogan, 1975), as are issues with official crime data (Geerken, 1994; Skogan, 1975). Although bias may exist within calls for service data, this issue is not specific to one type of measurement in criminal justice.

²² White and Katz (2013) examined 65 convenience stores in their analyses, 15 of which were Circle K stores. This dissertation examines 74 total stores, 19 of which are Circle K stores. This discrepancy is likely due to White and Katz receiving incomplete convenience store data for their initial study.

²³ This larger comparison group includes the 13 Circle K stores that did not receive the intervention. The Circle K stores were parsed out to create a second comparison group that would allow Circle K stores that received the intervention to be compared to Circle K stores that did not receive the intervention.

July 2011. The data were coded as being pre-intervention (January 2008-July 2010), intervention (August 2010-July 2011), or post-intervention (August 2011-October 2013), for all stores (intervention and comparison). These time periods have 31, 12, and 27 data points, respectively. Additionally, an interaction term for the post-intervention period and the policing intervention is included to test the moderating effects of these variables on each other.

Analytical Strategy

Difference-in-Difference

Several methods²⁴ associated with longitudinal analyses could be used to examine a POP project's influence, including, for example, interrupted time series²⁵, but a difference in difference (DID) technique will be used in this dissertation. This type of model allows for the estimation of inter-store effects in intra-individual change over time (Curran, Obeidat, & Losardo, 2010). DID is a quasi-experimental technique that can be used to understand the effects of a policy implementation. By examining cross-sectional and time series' differences, the DID estimator is a fixed-effects design which avoids the

²⁴ Currently, trajectory approaches are often used as an assessment method in policing literature. Trajectory modeling is inappropriate for this dissertation for several reasons: (1) the sample size of convenience stores is relatively small ($n = 74$), (2) trajectory modeling examines between-group changes and this dissertation is concerned with both inter- and intra-store changes, and (3) trajectory models have to be optimized; this can be subjective and there is a tendency to reify groups. Refer to Sampson and Laub (2005) and Nagin and Tremblay (2005a, 2005b) for debate about the appropriateness and adequacy of trajectory modeling, and the meaning of group membership more generally.

²⁵ ARIMA, or autoregressive integrated moving average, could have been used for this analysis. ARIMA is particularly sensitive to values of zero, but will fit a time series model anyway. This leads to a nonsensical model, which is not evident unless the methodologist is aware of this limitation of ARIMA. This dissertation will not be using ARIMA because many of the comparison stores reported zero calls for service for several months; low base rates do not bias or misspecify difference in difference models.

threat of differences between- and within-group biasing the model; essentially this design mimics an experimental design not affected by selection bias issues. Acknowledging the practical necessity that most program evaluation must be done with nonexperimental techniques, Ashenfelter and Card (1985) devised a new methodology to work with this data limitation. In one of the most recognized DID examples, Card and Krueger (1994) assessed the impact of minimum wage increases on employment. Using data measured at two time points, the minimum data requirement to run a DID model, the authors controversially found that minimum wage increases led to an increase in employment. New Jersey received the “treatment”, that is the increase in wages, and Pennsylvania was used as a control or comparison (because the state did not alter their wage structure during this time). New Jersey experienced an increase in employment pre- and post- the minimum wage increase, while Pennsylvania experienced a decrease. The difference between these two figures is the DID estimator. This is illustrated in Table 3.

Table 3. Difference in Difference Example

	Pre	Post	Post-Pre Difference
Treatment	Y_0^T	Y_1^T	$Y_1^T - Y_0^T$
Control	Y_0^C	Y_1^C	$Y_1^C - Y_0^C$
T-C Difference	$Y_0^T - Y_0^C$	$Y_1^T - Y_1^C$	$(Y_1^T - Y_1^C) - (Y_0^T - Y_0^C)$

Negative Binomial Regression

This dissertation seeks to determine if there is a decrease in calls for service in the targeted group of convenience stores and, if so, whether it is significantly greater than the decrease in the non-targeted group of stores. To supplement the DID estimator, which analyzes raw counts, a negative binomial regression model will also be used, which

employs rates. The calls for service in this dissertation are a form of count data, and require a Poisson-based estimator to predict variation in the dependent variable. If the count-dependent variable is overdispersed (with respect to a Poisson distribution), or the variance is greater than its mean, a negative binomial regression model becomes appropriate. Negative binomial models adjust the variance (i.e., overdispersion) independently of the mean by incorporating *both* a mean and variance parameter into the model (Osgood, 2000). This analysis will be conducted using Stata/IC 14. The Stata code used reflects a longitudinal negative binomial random effects model.

Theoretically and statistically a random effects model is appropriate for this analysis. A random effects model will allow for individual store effects, as there is no within store variation in treatment (making fixed effects inappropriate). A Durbin-Wu-Hausman test, performed to test bias and inefficiency of fixed versus random effects models, concluded that the null hypothesis that differences in coefficients are systematic cannot be rejected ($\chi^2 = 15.71, p = 1$). Because of this, a random effects model should be employed.

Effect Size

Many social scientists, particularly outside of the field of criminology, consider null-hypothesis significance testing (NHST) to be insufficient for interpreting data (Berkson, 1938; Cohen, 1994; Loftus, 1996; Lykken, 1968; Meehl, 1978; Snyder & Lawson, 1993). Some of the limitations of NHST are as follows: (1) NHST lacks falsifiability and therefore cannot fully answer research questions (Cohen, 1994; Ferguson, 2009; Kirk, 1996), (2) no two sample means are ever identical, resulting in efforts to find

any difference as significant²⁶ (Ferguson, 2009; Tukey, 1991), and (3) *p* levels are arbitrary,²⁷ leading to different conclusions from equal treatment effects (Ferguson, 2009; Kirk, 1996). Alternatively, effect sizes are a way to grasp the comparative magnitude of an intervention by producing standardized coefficients.

Ferguson (2009) categorizes effect sizes into four general classifications: group difference indices, strength of association indices, corrected estimates, and risk estimates (also see: Kline, 2004; Vacha-Haase & Thompson, 2004). Group difference indices examine the magnitude of difference between groups, using Cohen's *d* to determine the significance of the magnitude of the effect size. Cohen (1988) defined *d* as the difference between the means, divided by the standard deviation of each group. Effect sizes are considered small, medium, and large if *d* is 0.2, 0.5, and 0.8, respectively (Cohen, 1988).

In this dissertation, the data in the intervention and comparison groups are dissimilar; specifically, the volume of calls for service differs. Because of this, examining proportional differences rather than mean differences in both groups' response to the intervention is a more appropriate effect size analysis. Odds ratio statistics, specifically relative effect size (RES) calculations, estimate the extent of association between two binary variables; in this case, the intervention and time period. Farrington, Gill, Waples, and Argomaniz (2007) used this measure to conduct a meta-analysis of quasi-experimental multi-site closed-circuit television (CCTV) projects. Implementation issues,

²⁶ Ferguson notes "sampling error is underestimated in NHST when sampling is nonrandom" (2009, p. 532). This provides one reason to supplement NHST with effect size calculations because the sample in this dissertation is nonrandom, making NHST somewhat futile.

²⁷ "Surely God loves the .06 nearly as much as the .05" (Rosnow & Rosenthal, 1989, p. 1277).

specifically the lack of randomized controlled designs in the projects evaluated, created comparability issues for Farrington et al. (2007). Welsh and Farrington (2002), in a previous evaluation of the crime prevention effects of closed-circuit television, found that the only comparable data that were consistently reported was the number of crimes before and after implementation of the projects. This finding led to the authors repurposing the odds ratio as a measure of effect size:

$$RES = (a*d)/(b*c)$$

Table 4. Relative Effect Size (RES)

	<u>Before</u>	<u>After</u>
Experimental	a	b
Control	c	d

In order to assess the strength and generality of the intervention’s effectiveness, and to enable this project to be compared to other POP endeavors, RES will be calculated (see Table 4). This statistic is easily translated into Cohen’s *d*, and other effect size measures. Inclusion in meta-analysis requires standardized effect size calculations, for comparative reasons (see: Lipsey & Wilson, 1993, 2001). Effect sizes are also used for calculating cost-benefit-analyses (Petitti, 2000). Further, relative effect size assumes a Poisson process, and is most applicable for comparisons of small areas (Farrington et al., 2007). Three effect sizes will be calculated: pre-intervention to intervention, intervention to post-intervention, and pre-intervention to post-intervention. Additionally, confidence intervals (CIs) will also be reported. This allows for effects across studies to be compared, for precision of the estimates to be evaluated, and for examining CIs across studies (allowing for an eventual accurate estimate of parameters) (Schmidt, 1996;

Vacha-Haase & Thompson, 2004; Wilkinson & Task Force on Statistical Inference, 1999).

Phi, Weighted Displacement Quotient, & Crime Type

In order to answer the second research question and assess any displacement of crime or diffusion of benefits, phi and the weighted displacement quotient (WDQ) will be employed. Prior to measuring the WDQ, Ratcliffe and Breen (2011) suggest calculating phi. The phi statistic will show if there is a statistically significant difference between crime in the buffer area and the target area. If so, proceeding with the WDQ is logical. If phi suggests there is no association, calculation of the WDQ is unwarranted. This study employs a 500-yard catchment area to assess any displacement of crime or diffusion of benefits. In the Southwest United States, 500 yards equates to about 2.84 blocks, or approximately 1500 feet. Phi is calculated as follows:

$$\Phi = \sqrt{\frac{x^2}{N}}$$

Table 5 provides the interpretation for the calculated phi value. A phi close to zero indicates no predictive measure of association between the target and buffer areas. If a phi greater than 0.1 (and below 0.3) is calculated, it is appropriate to move onto calculating the WDQ; there is no direct correlation between the two areas and there is no assumption of spatial autocorrelation (Ratcliffe & Breen, 2011). Further, phi values below 0.3 indicate that a buffer is appropriately sized. A phi greater than 0.3, though, indicates a direct correlation between the buffer and target zones, and no need to run the subsequent WDQ. In this case, “it is likely that displacement or diffusion has been an

automatic outcome of the operation due to the close association between target and displacement area” (Ratcliffe & Breen, 2011, p. 236).

Table 5. Interpretation of Phi (Φ) Values

<u>Phi Value</u>	<u>Interpretation</u>
0 < Phi < 0.1	No predictive measure of association between the target and buffer areas
0.1 < Phi < 0.3	Moderate (positive or negative) association
Phi > 0.3	No reason to run WDQ (target and displacement area close association)

Note. These values and interpretations are sourced from Ratcliffe & Breen (2011).

The WDQ equation contains two parts, whereby the first set of parentheses describes the measure of displacement or diffusion in the buffer area, and the second set of parentheses captures the success of the intervention (Ratcliffe & Breen, 2011). Table 6 outlines the interpretation of the quotient produced. The equation for the WDQ is as follows:

$$WDQ = (B_{t1}/C_{t1} - B_{t0}/C_{t0}) / (A_{t1}/C_{t1} - A_{t0}/C_{t0})$$

In the equation provided by Bowers and Johnson (2003), *A* is the count of crime events in the target area, *B* is the count of crime events in the buffer area, *C* is the count of crime events in the control area, *t1* is the time of the intervention, and *t0* is the pre-intervention time period. A WDQ greater than or equal to 0 indicates that displacement of crime is likely not occurring.

There can be benefits to crime displacement, however, if it does occur. Displacement of crime can indicate that some people have avoided victimization (Barnes, 1995). Benign displacement is another possible benefit; there is a change in offense type, whereby the offender is now committing a less serious crime than those prevented (Barr & Pease, 1990). Because the WDQ only examines geographical displacement of crime or diffusion of benefits, additional analyses are warranted to examine if crime type changed

significantly. This will also allow for a greater understanding of offense displacement, as there is limited research on this type of crime displacement.

Table 6. Interpretation of Weighted Displacement Quotient (WDQ) Values

<u>WDQ Value</u>	<u>Interpretation</u>	
WDQ > 1	Diffusion greater than direct effects	Positive net effect of the program
WDQ near 1	Diffusion about equal to direct effects	
1 > WDQ > 0	Diffusion but less than direct effects	
WDQ = 0	No displacement or diffusion	
0 > WDQ > -1	Displacement but less than direct effects	
WDQ near -1	Displacement about equal to direct effects	No net benefit to program
WDQ < -1	Displacement greater than direct effects	Program worse than doing nothing

Source: Bowers & Johnson (2003, p. 286)

The calls for service around the targeted convenience stores ($n = 13295$) were recoded into 25 categories as defined by the UCR, ranging from least to most serious: (0) non crime, (1) runaway, (2) curfew and loitering, (3) suspicion, (4) other offenses, (5) vagrancy, (6) disorderly conduct, (7) liquor violations, (8) DUI, (9) offense against family/children, (10) gambling, (11) drugs, (12) sex offenses, (13) weapons violations, (14) vandalism, (15) stolen property, (16) forgery/embezzlement/fraud, (17) simple assault, (18) arson, (19) stolen motor vehicle, (20) larceny-theft, (21) burglary, (22) aggravated assault, (23) robbery, (24) rape, and (25) homicide.²⁸ This will be examined via a descriptive model that depicts crime type over time, and will be assessed regardless of the outcomes of the spatial displacement measures (phi and WDQ). Additionally, because all of the buffer areas are uniform, a simple comparison of the number of crimes

²⁸ See Sellin and Wolfgang (1964) for the first application of scaling procedures to offense seriousness.

falling within each catchment area will be assessed. This parsimonious assessment of displacement is more straightforward, and still allows for causal interpretation.

To obtain a crime count around the intervention stores for the displacement analyses, address interpolation and geocoding were performed in ArcGIS 10.2. The geocoding process has provided a map displaying the location of the target stores in relation to each other. Each of the six stores has two catchment areas around it. The buffer is a 250-yard area around the store, and the control area is a 250-yard area around the buffer.²⁹ Crime incidents in the 500-yard area around the target stores are geocoded to be included in either the buffer or control areas. There is no overlap between these stores. In other words, a target store never appears in the catchment area of another target store.

CHAPTER 4: DESCRIPTIVE STATISTICS AND DIAGNOSTICS

Study Site & Sample

This study examines crime at and in the areas surrounding convenience stores in Glendale, AZ from 2008 to 2013. Glendale is located in the northwest corner of the Phoenix metro area. According to the U.S. Census Bureau, in 2010 Glendale, AZ had a population of 226,721. The residents were mostly White (67.8%), with smaller percentages of Black (6.0%), Asian (3.9%), American Indian/Alaskan Native (1.7%), and Native Hawaiian/Other Pacific Islander (0.2%) (U.S. Census Bureau, 2010). Over a third

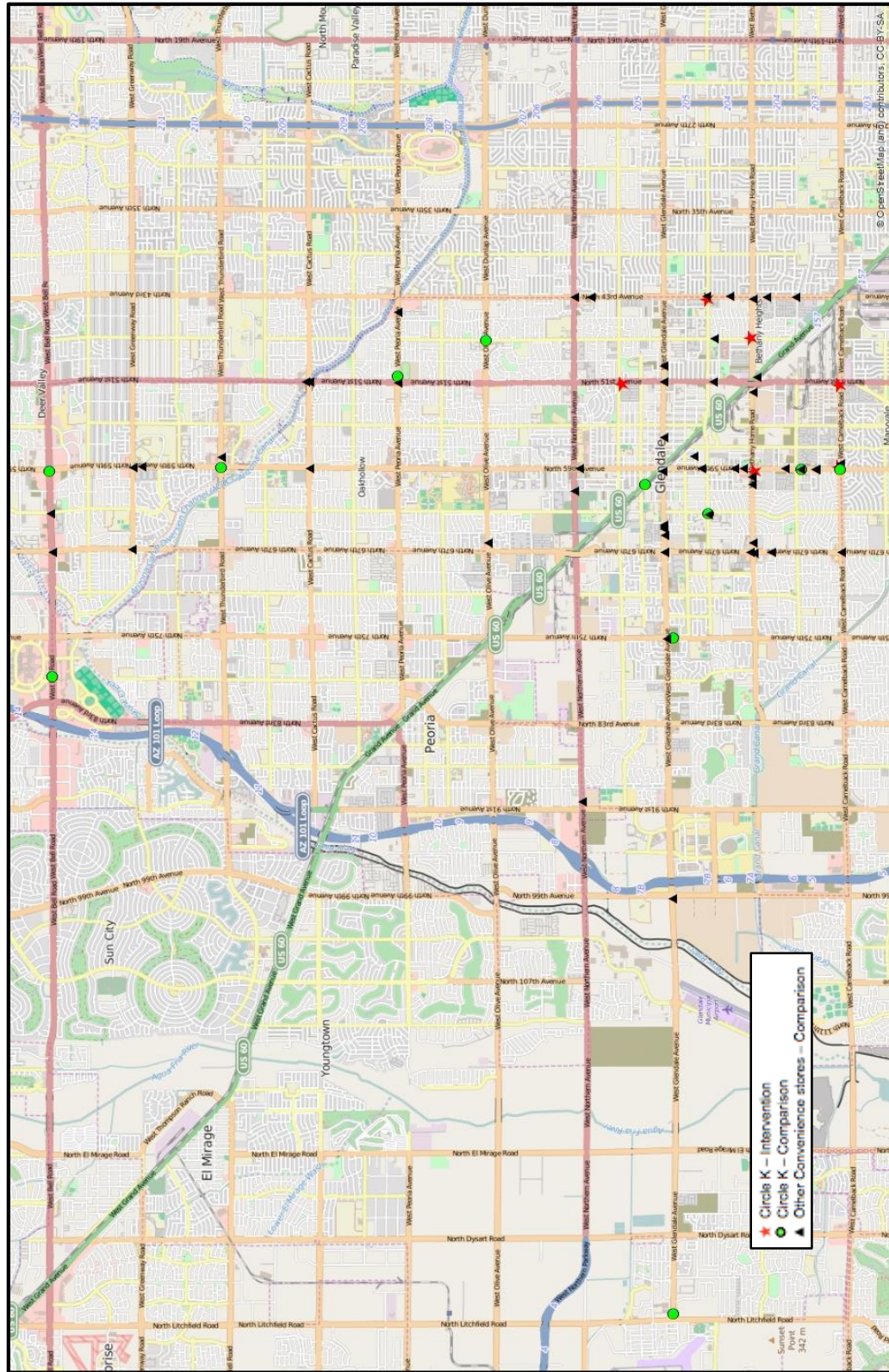
²⁹ There is no standardized catchment area in the displacement literature. For example, in their article putting forth the WDQ technique, Bowers and Johnson (2003) used 400-meter buffers. In Weisburd et al.'s (2006) seminal displacement study, the authors used both one- and two-block catchment areas. Rules of thumb related to choosing catchment areas consider physical obstructions or natural boundaries (Brantingham & Brantingham, 2000; Weisburd et al., 2006), displacement contamination (Weisburd & Green, 1995b), and familiarity decay (Eck, 1993). Succinctly, Bowers and Johnson (2003) state: "displacement is most likely to occur within close proximity to a treatment area (where familiarity is highest)" (p. 279).

Table 7. Descriptive Statistics (N=74)

Store Type/Address	n	Store Type/Address	n
Circle K	19	Sargent Market	1
4306 W. Maryland Ave.*		5601 W. Glendale Ave.	
5880 W. Camelback Rd.*		Pronto Mart	1
5907 W. Bethany Home Rd.*		5635 N. 59 th Ave	
5102 W. Camelback Rd.*		Stop in Market	1
7428 N. 51 st Ave.*		5710 N. 67 th Ave.	
4648 W. Bethany Home Rd.*		Ali Mart LLC	1
6305 W. Maryland Ave.		5820 N. 43 rd Ave.	
13843 W. Glendale Ave.		AJ Minimart & Check Cashing LLC	1
20203 N. 67 th Ave.		5828 W. Camelback Rd.	
20207 N. 59 th Ave.		Glendale Mini Mart & Gas	1
5049 W. Peoria Ave.		5904 W. Glendale Ave.	
5430 N. 59 th Ave.		Diamond Shamrock Refining Marketing Co.	1
5902 W. Bell Rd.		5905 W. Cactus Rd.	
5902 W. Camelback Rd.		Z Mart	1
5908 W. Thunderbird Rd.		5954 W. Bethany Home Rd.	
6002 W. Grand Ave.		I&D Mart	1
6937 N. 75 th Ave.		6031 N. 67 th Ave.	
7870 W. Bell Rd.		Country Market IV	1
9002 N. 47 th Ave.		6108 W. Northern Ave.	
Dollar Store	5	3 Way Stylist/Super Carniceria	1
5105 W. Glendale Ave.		6114 N. 59 th Ave.	
5275 N. 59 th Ave.		Sunset Mini Mart	1
5805 W. Thunderbird Rd.		6204 N. 43 rd Ave.	
6430 W. Glendale Ave.		Roselane Market	1
6601 W. Bethany Home Rd.		6205 N. 59 th Ave.	
Quick Trip	3	Bell Tower Market & Liquor	1
5082 W. Grand Ave.		6302 W. Bell Rd.	
6702 W. Glendale Ave.		El Gallito Market LLC	1
7802 N. 43 rd Ave.		6311 W. Maryland Ave.	
7-Eleven	2	Super Carniceria El Tarachi Inc.	1
12204 N. 51 st Ave.		6402 W. Glendale Ave.	
6010 W. Bethany Home Rd.		Happy Market	1
Chevron	2	6425 N. 47 th Ave.	
5103 W. Peoria Ave.		Upstairs Hair/Express Food Mart	1
9031 W. Northern Ave.		6445 N. 51 st Ave.	
Shell	2	Glendale Market	1
5904 W. Greenway Rd.		6448 W. Glendale Ave.	
6705 W. Bethany Home Rd.		43rd Ave. Market	1
Cactus Market	1	6520 N. 43 rd Ave.	
12252 N. 51 st Ave.		Glendale Quick Mart	1
Teeba Market	1	6530 W. Glendale Ave.	
15232 N. 59 th Ave.		Handimart Corp.	1
Geno's Market	1	6548 N. 59 th Ave.	
15414 N. 67 th Ave.		Arizona Convenience Grocers Inc.	1
Northern Mini Marts Inc.	1	6604 W. Olive Ave.	
4301 W. Northern Ave.		24-7 Go Green Pump LLC	1
Diamond D Liquors & Market	1	6614 N. 58 th Ave.	
4316 W. Bethany Home Rd.		Phoenix Market Center Corner LLC	1
Come-N-Go Market	1	6702 W. Camelback Rd.	
4432 W. Peoria Ave.		Quick Convenience LLC	1
Somer Market	1	6705 W. Bell Rd.	
4935 W. Glendale Ave.		Grand Stop 4	1
Amerigas Propane LP	1	6707 W. Glendale Ave.	
5140 W. Bethany Home Rd.		Sinclair Gas	1
Star Mini Mart	1	7504 W. Glendale Ave.	
5270 N. 59 th Ave.		Quick Stop	1
PMH Food Mart	1	7938 N. 59 th Ave.	
5438 N. 59 th Ave.		Arco AM/PM	1
Two Brothers Market	1	9920 W. Glendale Ave.	
5508 N. 43 rd Ave.			

* Denotes intervention store.

Figure 1. Location of Convenience Stores in Glendale, AZ.



(35.5%) of residents reported being Hispanic or Latino. Approximately half of the residents reported being female (50.9%). A majority of residents (83.3%) over the age of 25 reported having a high school diploma or higher, which is comparable to the national statistic (86.3%); 21.6% reported having a Bachelor's degree or higher. The median household income in Glendale was \$46,855 (in 2014 dollars), which falls below the national median income of \$53,482; 21.7% of the residents reported living in poverty.

The sample is comprised of 74 convenience stores in Glendale, AZ that were in business from January 2008 until at least October 2013. Of these stores, 19 were Circle K's (6 of which received the intervention). The convenience stores varied in type (see Table 7 for the store name and address). Most of the store types had an *n* of 1, but a few of the stores were franchised and/or had multiple locations. The stores were located throughout Glendale, although most of the stores were located near a major route (US 60). Figure 1 details the location, and type of store (i.e., Circle K intervention, Circle K comparison, or other).

Calls for Service

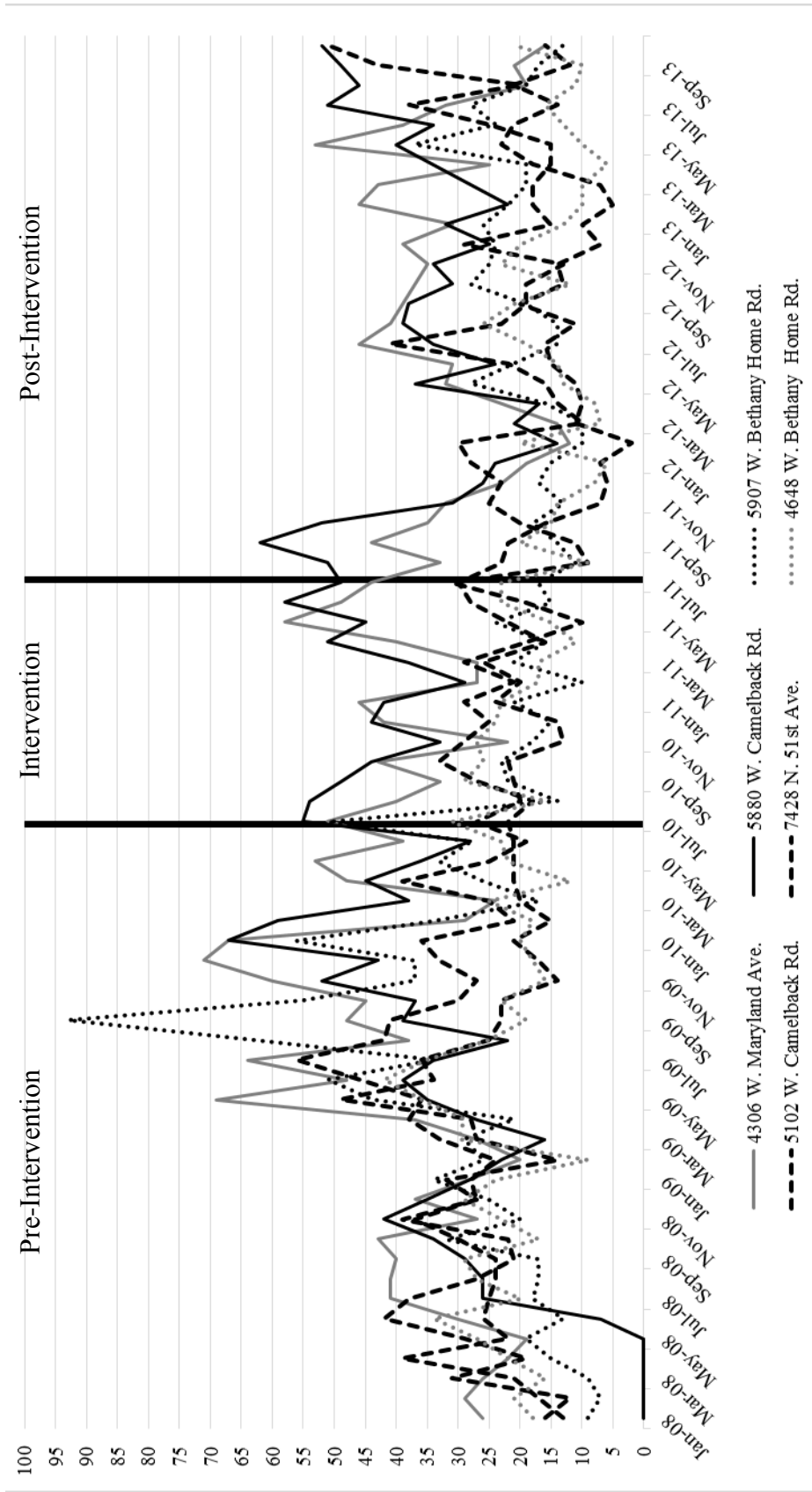
The data for these analyses were obtained from the Glendale Police Department. These calls for service occurred from January 2008 to October 2013. The calls for service at the six intervention stores (*n* = 13,295) made up more than half of all calls for service during this time (*N* = 24,549). Figure 2 displays the calls for service over time at the six intervention stores, partitioned by pre-intervention, intervention, and post-intervention periods. The calls for service appear to peak in the pre-intervention period, but drop in the intervention and post-intervention months. The average monthly calls for service for

all of the convenience stores in the sample was 4.74 ($SD = 8.97$), whereas the average monthly calls for service for the six intervention stores was 26.88 ($SD = 13.63$).

The types of calls at the six intervention stores varied from non-crimes to very serious crimes like homicide. In addition to the problematic number of calls for service the intervention stores experienced (far surpassing the number of calls for service at the other convenience stores in the sample), the Glendale Police Department and the research team chose to implement this problem-oriented policing intervention due to the severity of some of the crimes occurring at these stores (e.g., robbery, rape, aggravated assault, etc.). The calls for service were characterized as follows: non-crime, runaway, curfew and loitering, other offenses, vagrancy, disorderly conduct, liquor violations, DUI, offense against family/children, drugs, sex offenses, weapons violations, vandalism, stolen property, forgery/embezzlement/fraud, simple assault, arson, stolen motor vehicle, larceny, burglary, aggravated assault, robbery, rape, and homicide.

These calls were recoded to reflect property, violent, drug, or other types of offenses. Property crimes include: vandalism, stolen property, arson, stolen motor vehicle, larceny/theft, and burglary. Violent crimes include: simple assault, aggravated assault, robbery, rape, and homicide. Other types of offenses included calls for service related to: non-crime, runaway, curfew and loitering, vagrancy, disorderly conduct, liquor violations, DUI, offense against family/children, prostitution/sex offenses, weapons violations, forgery/embezzlement/fraud, and other offenses. Calls for service related to drug crimes were also examined. Table 8 details the number and type of calls for service at each of the six intervention stores, by study period. The data detailing the type of calls for service at the intervention stores was available from January 2009 to October

Figure 2. Calls for Service at the Intervention Convenience Stores, January 2008 - October 2013.



2013.³⁰ 5907 West Bethany Home Road experienced the most calls during this period ($n = 5521$), followed by 4648 West Bethany Home Road ($n = 2630$), 5880 West Camelback Road ($n = 2464$), 4306 West Maryland Avenue ($n = 1300$), 7428 North 51st Avenue ($n = 994$), and 5102 West Camelback Road ($n = 386$). To put this into context, 5907 West Bethany Home received about 3 calls for service per day, on average, during this time period.

Model Diagnostics

The calls for service data are non-normally distributed (with skewness of 3.17 and kurtosis of 15.28; see Figure 3), indicating that OLS regression is inappropriate. Most of the stores in the sample have very few monthly calls for service, with the intervention stores being outliers in this regard. Indeed, Figure 3 depicts 36.02% of the monthly calls for service as having values of zero, whereas 1.19% of monthly calls for service at the six intervention stores have values of zero. The variance of calls for service (80.44) is several times larger than the mean ($M = 4.74$, $SD = 8.97$), which suggests the need for a model using a Poisson or negative binomial distribution. Negative binomial regression and Poisson regression can be used for over-dispersed count data, but an additional parameter of the negative binomial distribution adjusts the variance independently of the mean. In other words, a negative binomial model is more flexible than Poisson regression and is preferable in this instance.

An assumption of difference in difference modeling is the lead/parallel assumption test. This assumption posits that the time trends, in the absence of the

³⁰ Note that one year of data is missing from the front end of the study period for this analysis.

Figure 3. Histogram of Calls for Service at All Convenience Stores, January 2008 – October 2013.

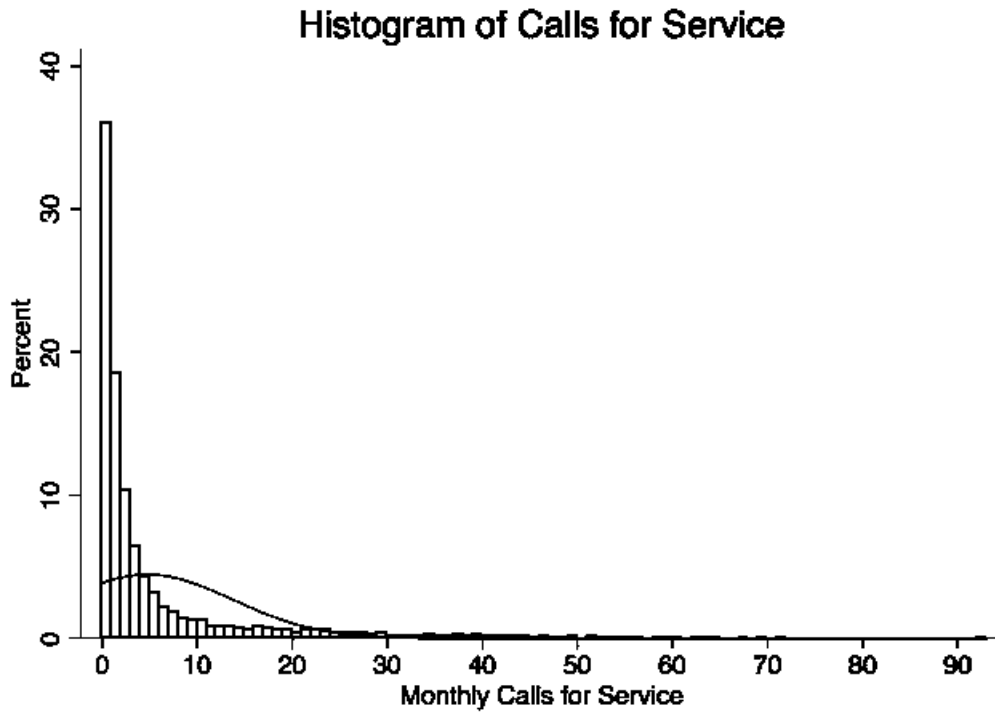


Table 8. Type of CFS at the Intervention Stores, January 2009 - October 2013

UCR Severity	4306 W. Maryland			5880 W. Camelback			5907 W. Bethany Home			5102 W. Camelback Ave.			7428 N. 51 st			4648 W. Bethany Home		
	Pre	TX	Post	Pre	TX	Post	Pre	TX	Post	Pre	TX	Post	Pre	TX	Post	Pre	TX	Post
Non Crime	45	28	46	79	65	90	199	105	152	18	11	4	54	35	21	91	55	99
Runaway	19	22	12	20	23	33	47	35	34	0	0	1	18	8	13	20	14	53
Curfew & Loitering	2	0	3	2	2	2	1	2	5	0	0	0	3	0	1	1	0	2
Other Offenses	60	37	57	139	41	87	294	148	234	24	12	12	49	23	30	112	70	108
Vagrancy	0	0	0	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0
Disorderly Conduct	20	15	17	26	22	37	85	54	58	4	4	4	13	3	8	42	20	37
Liquor Violations	3	3	0	7	5	5	48	17	19	2	0	0	3	2	0	2	1	1
DUI	2	1	4	25	8	21	79	20	40	18	6	16	17	4	4	4	10	6
Offense Against Family/Children	11	0	5	6	21	13	22	22	26	4	0	1	8	2	6	6	9	21
Drugs	34	28	31	64	26	51	170	75	120	17	8	10	21	8	10	46	24	39
Sex Offenses	10	6	5	9	9	8	29	9	23	0	0	0	8	11	4	15	5	16
Weapons Violations	7	3	5	11	3	12	8	4	22	1	0	2	2	3	1	6	5	6
Vandalism	52	41	65	92	62	81	190	140	209	10	7	9	53	40	31	165	74	159
Stolen Property	1	0	2	3	1	1	4	1	4	0	1	0	0	0	1	0	0	4
Forgery/Embezzlement/Fraud	8	7	10	25	20	38	44	28	42	3	4	0	7	9	11	13	14	30
Simple Assault	55	47	54	99	90	150	269	193	261	8	8	10	67	35	27	149	93	138
Arson	1	0	9	0	3	0	4	3	4	0	0	2	2	0	0	3	0	3
Stolen Motor Vehicle	24	21	17	22	17	26	108	72	115	12	2	6	13	11	7	53	23	77
Larceny-Theft	54	73	64	178	114	162	359	208	471	26	33	34	49	48	65	124	64	180
Burglary	47	33	40	70	41	52	113	80	126	2	4	10	41	18	39	73	40	99
Aggravated Assault	8	8	9	34	10	41	41	33	66	4	3	3	3	5	5	26	15	32
Robbery	8	4	1	17	19	21	43	31	37	3	1	1	5	3	3	10	2	11
Rape	0	2	1	0	0	1	4	1	3	0	0	0	0	0	1	6	0	0
Homicide	0	0	0	0	0	2	0	0	2	0	0	1	0	2	0	2	0	1
Total	471	379	450	928	602	934	2166	1281	2074	156	104	126	436	270	288	967	538	1125
	N = 1300			N = 2464			N = 5521			N = 386			N = 994			N = 2630		

Note. "Pre" is an abbreviation for "pre-intervention". "TX" is an abbreviation for "intervention". "Post" is an abbreviation for "post-intervention".

intervention, are the same in both groups. Violation of this assumption can over- or understate a treatment effect. According to Abadie (2005), “this assumption may be implausible if pre-treatment characteristics that are thought to be associated with the dynamics of the outcome variable are unbalanced between the treated and the untreated group” (p. 2). A t-test of the difference in average growth rates across the treatment and comparison groups during the pre-intervention period can be used to test this assumption. If the parallel trends assumption is valid, the t-test will not be statistically significant. An independent sample t-test, assuming unequal variances, found that the data violated the parallel trend assumption ($t = -25.47, p < .001$). Because of this, interpretation of the difference-in-difference results should be done with caution. Models reducing the sample from all convenience stores to solely Circle K convenience stores are estimated to lessen the selection bias effect, and are presented in addition to the models containing all stores.

CHAPTER 5: RESULTS

Difference-in-Difference Estimation

Two difference-in-difference models were estimated for the analyses. The first model examined all 74 convenience stores in the sample. As expected, the model in Table 9 shows a significant difference in calls for service at the baseline period between the treatment and comparison stores, as well as during the follow-up period. Most importantly, the difference-in-difference between the baseline and follow-up (pre- and post-treatment) is statistically significant. This indicates that a statistically significant treatment effect of the intervention is in fact observable.

Moving to the second model in Table 9, the sample is reduced to include only Circle K stores. This estimation provides similar results to the full sample, strengthening

support for the existence of statistically significant intervention effects of the POP project. The explained variance does drop slightly to 0.44 (from 0.54 in the full model) in the reduced model. These findings also demonstrate that the crime control effects extended beyond the grant period; the intervention efforts were sustainable and longer-term.

Negative Binomial Regression

Again, two models were estimated: a model including the full sample and a model including only Circle K convenience stores (see Table 10). The negative binomial models include an interaction term between the intervention stores and the post-intervention period (i.e., the difference-in-difference estimate). Negative binomial coefficients are not interpreted intuitively, and can be transformed for clarity. According to Long (1997), one way to interpret the results of the negative binomial model is by exponentiating the coefficients, subtracting one, and multiplying the result by 100 or $(100 * [\exp(B) - 1])$. This provides the estimated percentage change in calls for service associated with a one-unit change in a given independent variable.

The intervention stores and the post-intervention period both played a statistically significant role in the estimation of both models. The full model indicates that calls for service were 938.12% greater for the stores that received the intervention, compared to the stores that did not receive the intervention. This is expected, as the intervention stores are outliers in terms of the large number of calls for service they receive (comparatively). The post-intervention period also exhibited a decline in calls for service (5.82%), albeit not significantly. The interaction term is particularly relevant in understanding the overall study effects. Stores that received the intervention experienced a 16.47% reduction

Table 9. Difference-in-Difference Estimation Results

Outcome Variable	Full Sample*				Circle K Sample**			
	Calls for Service	SE	t	p> t	Calls for Service	SE	t	p> t
Baseline								
Control	2.977				8.687			
Treated	30.086				30.086			
Diff (T-C)	27.109	0.466	58.21	0.000***	21.399	0.899	23.80	0.000***
Follow-up								
Control	2.790				7.676			
Treated	26.376				26.376			
Diff (T-C)	23.586	0.341	69.11	0.000***	18.701	0.659	28.38	0.000***
Diff-in-Diff	-3.523	0.341	-10.32	0.000***	-2.698	0.659	-4.09	0.000***
R-square	0.54				0.44			

*74 convenience stores, 4292 calls for service in pre- and post-intervention periods.
 **19 Circle K convenience stores, 1102 calls for service in pre- and post-intervention periods.
 ***p<.01

Table 10. Negative Binomial Regression Results

	Full Sample			Circle K Sample		
	(b)	SE	Z	(b)	SE	Z
Intervention Store	2.34	.04	60.67	1.37	.05	26.30
Post-Intervention Period	-.06	.04	-1.72	-.17	.07	-2.62
Intervention Store*Post-Intervention Period	-.18	.06	-2.96	-.07	.09	-.77

**p<.01

***p<.001

in calls for service from the pre-intervention to the post-intervention period relative to non-intervention stores.

The results are tempered by reducing the analysis to include just the Circle K convenience stores. This may seem counter-intuitive but, because the Circle K stores are more alike than dissimilar, the intervention effects are not as pronounced in this subsample as compared to the other convenience stores (that received very few calls for service). The interaction term in this model indicates that calls for service decreased, but is not statistically significant and therefore not interpretable. The intervention Circle K stores experienced an increase in calls for service (293.54%), whereas all Circle K stores in the post-intervention period generally declined (15.63%). An assessment of the calls for service by store may provide insight into these findings.

It is likely that the intervention had differential impacts on the individual stores due to inconsistent doses of the intervention, the stores having a different magnitude of problems at baseline, and/or because the store managers responded differently to the recommended changes to store design. In their original assessment, White and Katz (2013) performed an ANOVA examining differences in calls for service between time periods and found significant differences for five of the six intervention stores (with 7428 N. 51st Ave. being the exception). Results of the t-tests in Table 11 demonstrate differences in each intervention store, by time period. The table compares calls for service in the pre-intervention and intervention periods, and in the pre-intervention and post-intervention periods. There are several statistically significant findings in Table 11 that highlight individual differences within the treatment stores.

Results of the independent samples t-tests for this analysis show that calls for service at 7428 N. 51st Ave. did not differ pre-intervention to intervention ($t = 0.47$, $df = 26.26$) or pre-intervention to post-intervention ($t = 1.07$, $df = 51.23$), similarly to White and Katz (2013). The store located at 4306 W. Maryland also did not exhibit statistically

Table 11. T-Test Results for Intervention Stores by Intervention Period

	Intervention Period				95% CI (Combined)	t	df
	Pre-Intervention		Intervention				
	M	SD	M	SD			
4306 W. Maryland	40.23	14.93	39.25	10.33	35.74, 44.17	0.24	29.01
5880 W. Camelback	29.74	17.92	44.67	8.40	28.63, 39.18	-3.70***	39.24
5907 W. Bethany Home	31.29	18.69	18.00	4.24	22.33, 32.83	3.72***	36.74
5102 W. Camelback	30.03	9.30	21.33	5.26	24.77, 30.44	3.85***	34.96
7428 N. 51 st Ave.	25.35	8.89	24.17	6.78	22.47, 27.58	0.47	26.26
4648 W. Bethany Home	23.87	7.30	20.92	5.55	20.92, 25.18	1.43	26.34
	Post-				95% CI (Combined)	t	df
	Pre-Intervention		Intervention				
	M	SD	M	SD			
4306 W. Maryland	40.23	14.93	31.85	10.78	32.72, 39.93	2.47*	54.24
5880 W. Camelback	29.74	17.92	35.11	12.15	28.14, 36.35	-1.35	52.99
5907 W. Bethany Home	31.29	18.69	19.30	6.56	21.63, 29.78	3.34**	38.21
5102 W. Camelback	30.03	9.30	13.26	5.96	19.19, 25.26	8.28***	51.68
7428 N. 51 st Ave.	25.35	8.89	22.59	10.52	21.52, 26.62	1.07	51.23
4648 W. Bethany Home	23.87	7.30	13.89	5.60	17.06, 21.39	5.88***	55.16

Note: Satterthwaite approximation employed due to unequal group variances.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

significant declines in calls for service pre-intervention to intervention ($t = 0.24$, $df = 29.01$), but did display a significant decline pre-intervention to post-intervention ($t = 2.47$, $df = 54.24$, $p < .05$). Likewise, 4638 W. Bethany Home did not have statistically significant declines pre-intervention to intervention ($t = 1.43$, $df = 26.34$), but calls for service significantly declined pre- to post-intervention ($t = 5.88$, $df = 55.16$, $p < .001$). Interestingly, 5880 W. Camelback exhibited significant *increases* in calls for service pre-intervention to intervention ($t = -3.70$, $df = 39.24$, $p < .001$). This store also experienced an increase in mean calls for service pre- to post-intervention, but this finding was not

significant. 5880 W. Camelback was the only intervention store to experience an increase in mean calls for service, possibly as a result of the intervention. 5907 W. Bethany Home and 5102 W. Camelback were the two stores that exhibited statistically significant declines in both comparative time periods. 5907 W. Bethany Home experienced significant declines pre-intervention to intervention period ($t = 3.72$, $df = 36.74$, $p < .001$), as did 5102 W. Camelback ($t = 3.85$, $df = 34.96$, $p < .001$). 5907 W. Bethany Home also experienced significant declines pre- to post-intervention ($t = 3.34$, $df = 38.21$, $p < .01$), again as did 5102 W. Camelback ($t = 8.28$, $df = 51.68$, $p < .001$).

To this point in the analyses, the support for the intervention's effects is generally positive. The difference-in-difference estimation found a statistically significant treatment effect for both the full sample and the Circle K sample. Further, this effect was sustained for 27 months after the intervention period ended. The negative binomial results for the full sample also indicated support for the POP project, with intervention stores in the post-intervention period experiencing a 13% reduction in calls for service. This finding was reduced in the Circle K sample, albeit likely due to the long follow-up period. The results might have been sustained for a period after the intervention, but could have decayed to non-significant levels by October 2013. The independent samples t-tests were used to explore store-by-store variation in impact. Results showed that four of the intervention stores experienced statistically significant declines that were sustained until October 2013 – again, over two years after the intervention period ended. To supplement these analyses, relative effect size will be calculated next.

Relative Effect Size

Relative effect size (RES) was calculated to compare: (1) the pre-intervention period with the intervention period, (2) the intervention period with the post-intervention period, and (3) the pre-intervention period with the post-intervention period. As shown in Table 12, both the full model (Model 1), including all of the convenience stores in the sample, and the Circle K model (Model 2), were examined. Beginning with Model 1 ($N = 24549$), the relative effect size for the pre-intervention to intervention period showed undesirable³¹ results, $RES < 1$, 95% CI [0.91, 1.04]. The comparisons between the intervention and post-intervention period, $RES > 1$, 95% CI [1.11, 1.28], and the pre-intervention to post-intervention period, $RES > 1$, 95% CI [1.10, 1.23], yielded desirable results. The treatment stores experienced a 16% decrease in calls for service from the intervention period to the post-intervention period, and a 14% decrease in calls for service from the pre-intervention period to the post-intervention period.

All relative effect size calculations in Model 2 ($N = 18340$) produced 95% confidence intervals hovering around 1. The pre-intervention to intervention period, $RES < 1$, 95% CI [0.88, 1.04], the intervention to post-intervention period, $RES < 1$, 95% CI [0.97, 1.16], and the pre-intervention to post-intervention period, $RES < 1$, 95% CI [0.95, 1.09], produced negligible results. These relative effect size calculations, and their corresponding confidence intervals, imply there is no difference in the POP intervention's effect between the treatment and comparison groups. Despite these mixed results, the

³¹ If the odds ratio is 1, or if the confidence interval includes 1, the relative measure of the intervention's effect is not statistically different from 0.

Table 12. Relative Effect Size Results

	Pre-Intervention	Intervention	Post-Intervention	Pre-Intervention
Model 1*				
Treatment	<i>n</i> = 5596	<i>n</i> = 2020	<i>n</i> = 3672	<i>n</i> = 5596
Control	<i>n</i> = 6276	<i>n</i> = 2205	<i>n</i> = 4780	<i>n</i> = 6276
<i>N</i> = 24549	<i>RES</i> = 0.97 [0.9072, 1.0442]		<i>RES</i> = 1.19 [1.1073, 1.2843]	<i>RES</i> = 1.16 [1.0974, 1.2277]
Model 2**				
Treatment	<i>n</i> = 5596	<i>n</i> = 2020	<i>n</i> = 3672	<i>n</i> = 5596
Control	<i>n</i> = 3501	<i>n</i> = 1212	<i>n</i> = 2339	<i>n</i> = 3501
<i>N</i> = 18340	<i>RES</i> = 0.96 [0.8828, 1.0418]		<i>RES</i> = 1.06 [0.9721, 1.1594]	<i>RES</i> = 1.02 [0.9523, 1.0886]

*Full Sample

**Circle K Sample

project did produce statistically significant results when examining the reduction in crime at convenience stores from the pre-intervention period to the post-intervention period in the full sample. The contradictory findings between the previous analyses and the inconclusive RES are not necessarily fatal. Model 2 is trending downward, indicating a decrease in calls for service. The length of the post-intervention period is potentially masking significant results in Model 2. In other words, the intervention's effects decayed sooner at the Circle K stores, compared to the full sample. Additionally, Model 2 is likely more sensitive to the anomalous store findings revealed in the independent samples t-tests, whereas Model 1 washed out these findings due to the larger sample. These mixed results are possibly due to the identified outlier, and will be unpacked further in the discussion.

Phi and Weighted Displacement Quotient

To examine the presence of displacement of crime or diffusion of benefits, phi and the weighted displacement quotient (WDQ) were calculated for each of the six intervention stores in the pre-intervention (January 2008-July 2010) to intervention period (August 2010-July 2011). Figure 4 displays the distribution of calls for service around the six intervention stores, in 250-yard concentric circles. Analysis of the calls for service in the target, buffer, and control areas around the six intervention stores revealed no association: 4306 West Maryland ($\phi = 0.003, p < .001$), 5880 West Camelback ($\phi = 0, p = .841$), 5907 West Bethany Home ($\phi = 0.004, p < .001$), 5102 West Camelback ($\phi = 0.003, p < .001$), 7428 North 51st Avenue ($\phi = 0.002, p < .05$), 4648 West Bethany Home Road ($\phi = 0.003, p < .001$). Phi values close to 0 (between 0 and 0.1) indicate that the

Figure 4. Distribution of Calls for Service in the Buffer Areas Surrounding the Intervention Stores.

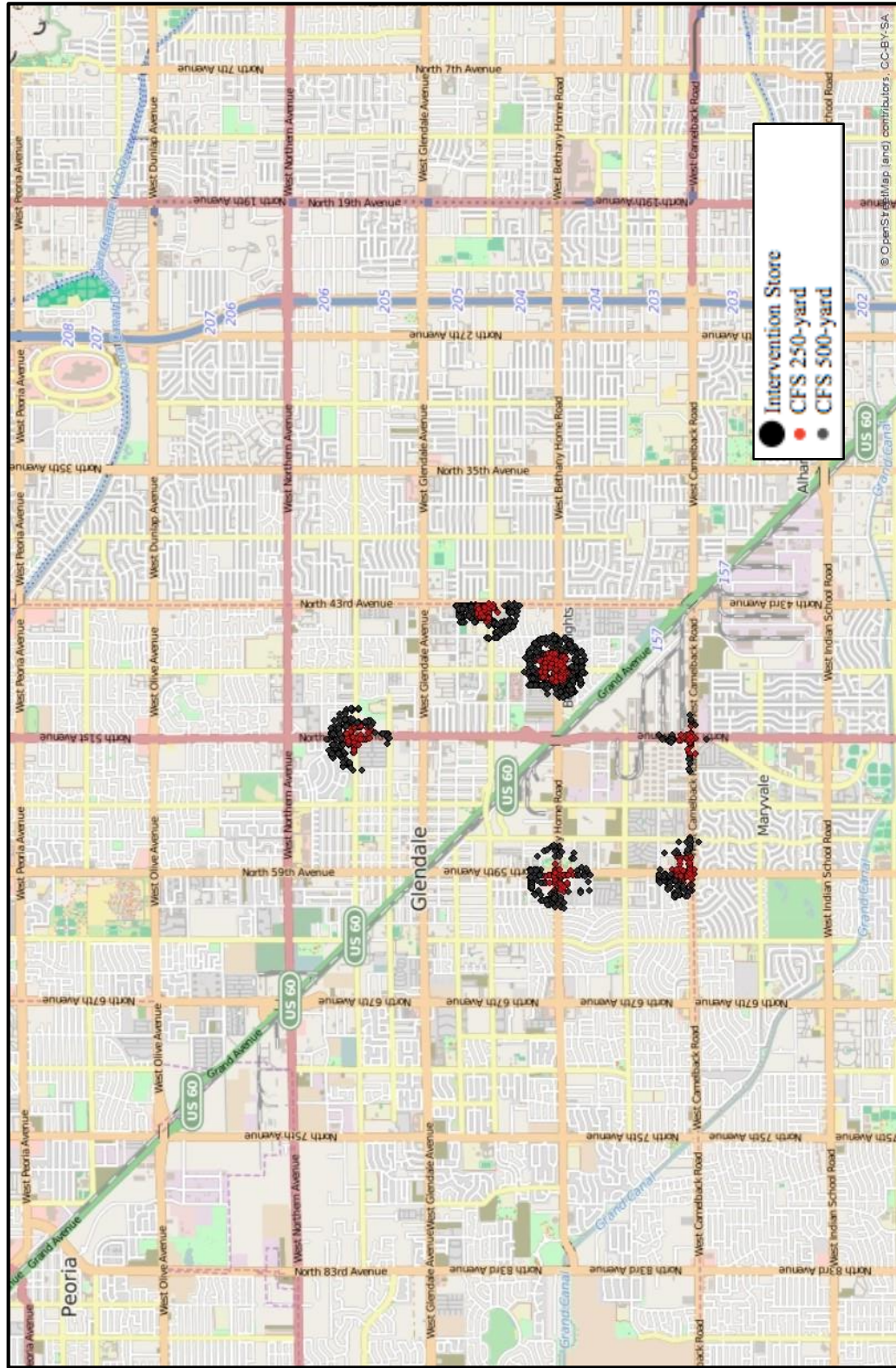


Table 13. Phi and WDQ (Pre-Treatment - Treatment Periods)

	4306 W. Maryland		5880 W. Camelback		5907 W. Bethany Home		5102 W. Camelback		7428 N. 51 st Ave.		4648 W. Bethany Home	
	Pre-TX	TX	Pre-TX	TX	Pre-TX	TX	Pre-TX	TX	Pre-TX	TX	Pre-TX	TX
Target	1247	471	922	536	970	216	931	256	786	290	740	251
Buffer	148	116	203	115	472	219	93	52	152	81	187	103
Control	200	157	450	306	1540	975	55	43	105	73	470	276
	$\chi^2 = 29.97, p < .001$		$\chi^2 = 0.04, p = .841$		$\chi^2 = 44.57, p < .001$		$\chi^2 = 14.85, p < .001$		$\chi^2 = 5.76, p < .05$		$\chi^2 = 11.65, p < .001$	
	Phi = 0.003		Phi = 0		Phi = 0.004		Phi = 0.003		Phi = 0.002		Phi = 0.003	
	WDQ = 0		WDQ = 0.253		WDQ = 0.201		WDQ = 0.044		WDQ = 0.096		WDQ = 0.037	

Note. "Pre-TX" is an abbreviation for "pre-treatment period". "TX" is an abbreviation for "treatment period".

buffer area has been delineated correctly, and there is no predictive measure of association between the target and buffer areas (Ratcliffe & Breen, 2011).

Because the target and buffer areas around the intervention stores operate independently, proceeding to the WDQ measurement is appropriate. None of the intervention stores exhibited displacement of crime due to the intervention. Five of the six intervention stores, however, had WDQ values that indicated a diffusion of benefits from the POP project (see Table 13). WDQ values at the following five stores are interpreted as demonstrating diffusion, but less than direct effects, and an overall positive net effect of the POP implementation: 5880 West Camelback, 5907 West Bethany Home, 5102 West Camelback, 7428 North 51st Avenue, and 4648 West Bethany Home Road. In other words, the area surrounding these five stores experienced fewer calls for service as a direct result of the POP intervention, but these results were not as strong as the direct effects on the intervention stores.

Crime Type

Calls for service were categorized as being related to drug crime, property crime, violent crime, or other types of crime. Examining the six intervention stores, by time period, yields interesting results about the general effects of the POP project. Table 14 displays these findings with raw counts, and Figures 5, 6, and 7 graphically represent the percentage of reported crime type for each study period. Drug crime declined from the pre-intervention period ($n = 352$) to the intervention period ($n = 169$), but increased in the post-intervention period ($n = 264$). Despite the slight increase from the intervention to post-intervention period, the raw count of drug crimes was reduced from the pre-intervention to post-intervention period. Calls for service related to drug crime made up

7% of the total calls for service in the pre-intervention period, but were reduced to 5% of the total calls in the intervention and post-intervention periods. The POP project was successful overall in decreasing drug crime from the pre-intervention to the post-intervention period. This finding lasted in duration until at least October 2013, well over two years after the initial implementation of the project. It should be noted that though the total number of calls for service in the post-intervention period (compared to pre-intervention) appear to indicate that the intervention's effects have dissipated, this is not the case. Table 11 clearly displays a sustained post-intervention decline in four of the six intervention stores. Table 14 combines crime counts for all intervention stores, including the stores with previously identified anomalous responses to the intervention.

Table 14. Count of Crime Type for Intervention Stores, by Time Period

	Pre-Intervention	Intervention	Post-Intervention
Drugs	352 (7%)	169 (5%)	264 (5%)
Property	1948 (38%)	1275 (40%)	2167 (43%)
Violent	861 (17%)	605 (19%)	882 (18%)
Other	1963 (38%)	1125 (36%)	1684 (34%)
	<i>N</i> = 5124	<i>N</i> = 3174	<i>N</i> = 4997

Property crime was the dominant type of call for service throughout the study's timeframe. Calls for service related to property crime remained relatively constant in terms of percentage throughout the pre-intervention ($n = 1948, 38\%$), intervention ($n = 1275, 40\%$), and post-intervention periods ($n = 2167, 43\%$). The raw count of calls for property offenses decreased substantially from the pre-intervention to intervention period, though, indicating that the project was particularly beneficial in addressing this type of crime. These results did not appear to be sustained in the post-intervention period, increasing slightly from the pre-intervention period.

A nontrivial fraction of the calls for service throughout the three study periods were associated with violent crime. This percentage of violent crime remained stable throughout the study, but the raw count did decrease from the pre-intervention ($n = 861$, 17%) to the intervention period ($n = 605$, 19%); and rising to baseline levels in the post-intervention period ($n = 882$, 18%). Other types of calls for service, including non-crime, vagrancy, and disorderly conduct, accounted for a large percentage of the crime at the targeted convenience stores. From the pre-intervention ($n = 1963$, 38%) to intervention ($n = 1125$, 36%) period, as well as the pre-intervention to post-intervention ($n = 1684$, 34%) period, other types of calls declined. The intervention was successful in altering these “broken windows” associated crimes. Assessing the stores individually might provide insight into these broader trends.

As depicted in Figure 5, the store located at 4306 West Maryland experienced relatively stable percentages of the four crime types throughout each of the study’s three periods. Although crime decreased slightly from the pre-intervention to post-intervention period, calls for service returned to approximately baseline levels in the post-intervention period. The calls for service at 4648 West Bethany Home provide a different picture. Figure 6 depicts the changes in crime type percentage at this location. Crime decreased in all categories in the intervention period, but property crimes and other types of offenses were larger post-intervention than at pre-intervention levels. Drug crimes, which comprised the largest percentage of calls for service pre-intervention, were replaced by property crimes as making up the largest percentage post-intervention.

Figure 5. Percentage of Calls for Service Type, 4306 West Maryland

Percentage of CFS Type, 4306 West Maryland

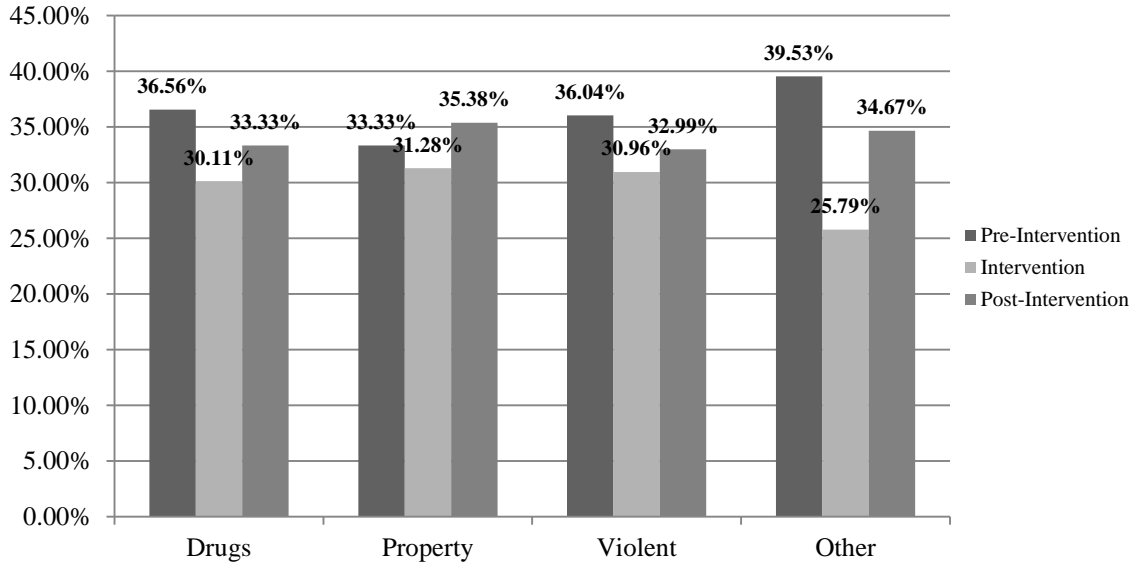


Figure 6. Percentage of Calls for Service Type, 4648 West Bethany Home

Percentage of CFS Type, 4648 West Bethany Home

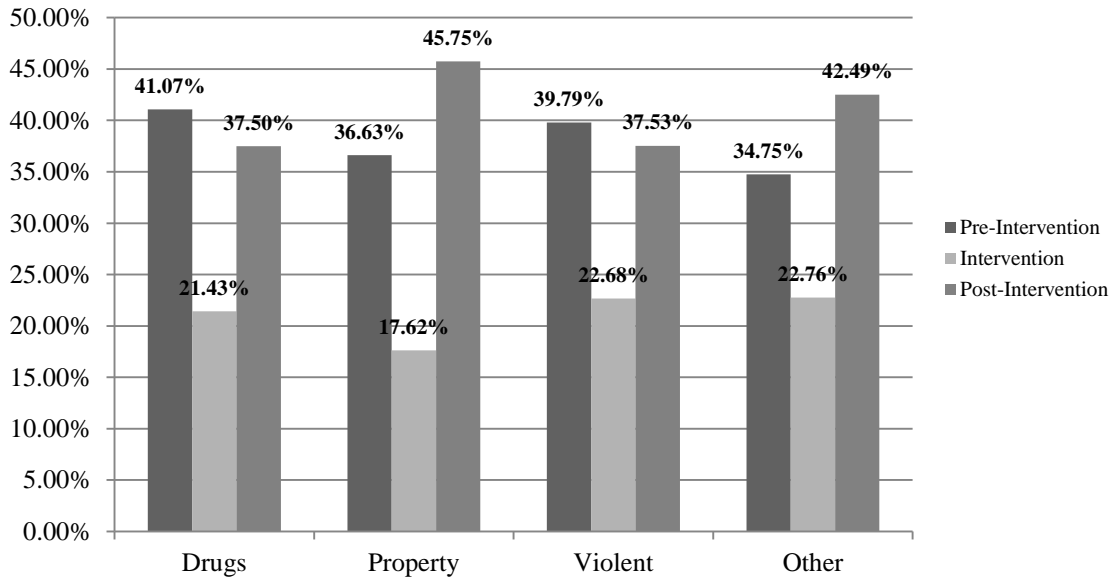
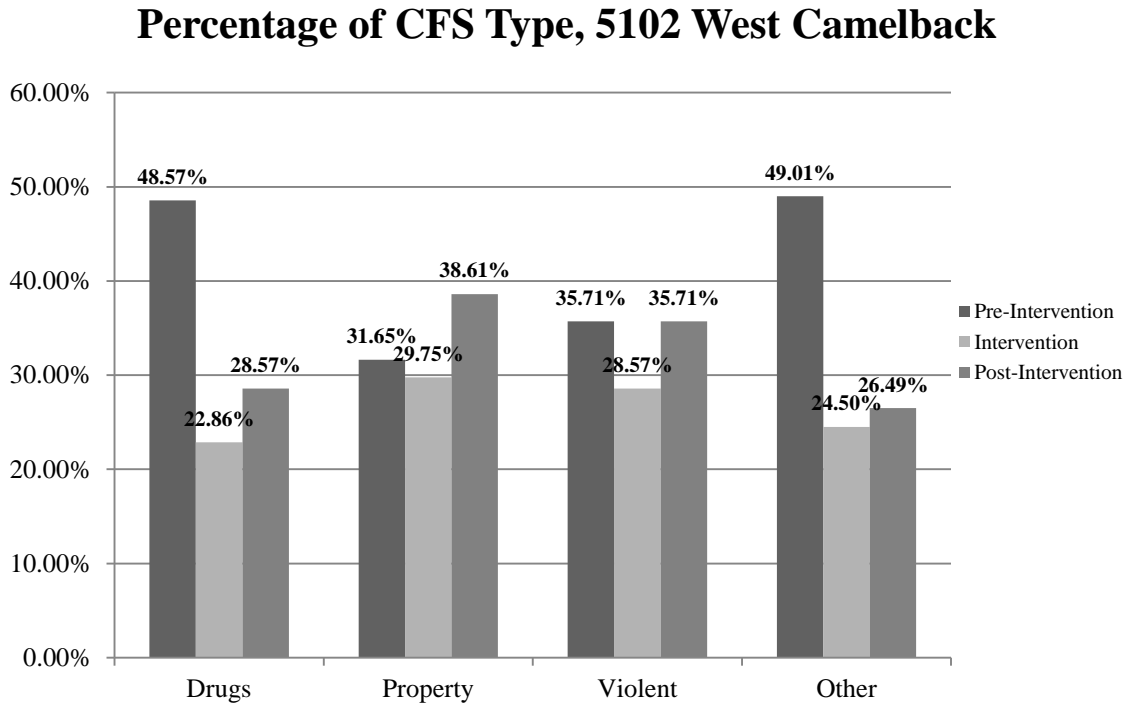


Figure 7. Percentage of Calls for Service Type, 5102 West Camelback



5102 West Camelback, arguably the least problematic convenience store of the targeted sites, saw large reductions due to the intervention. Drug crime and other types of offenses decreased by 20% or more from the pre-intervention to post-intervention period; Figure 7 displays this significant reduction. Call volume decreased during the intervention period at this location, and increased to slightly lower than or at baseline levels by post-intervention. Property crime was an outlier in this regard, and increased in both raw count and percentage from pre-intervention ($n = 50$, 31.65%) to post-intervention ($n = 61$, 38.61%). Interestingly, although decreasing slightly during the intervention ($n = 12$, 28.57%), violent crime remained constant pre-intervention to post-intervention ($n = 15$, 35.71%).

Calls for service at 5880 West Camelback related to drug and property crime, as displayed in Figure 8, decreased pre-intervention to post-intervention. Troublingly,

Figure 8. Percentage of Calls for Service Type, 5880 West Camelback

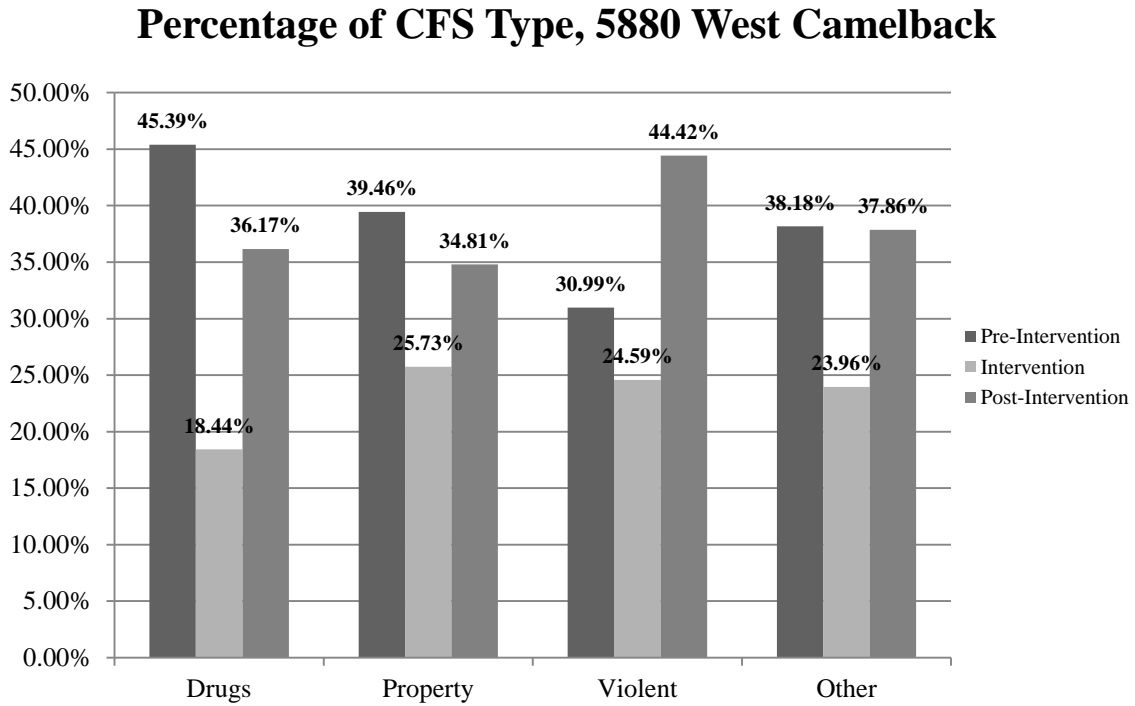


Figure 9. Percentage of Calls for Service Type, 5907 West Bethany Home

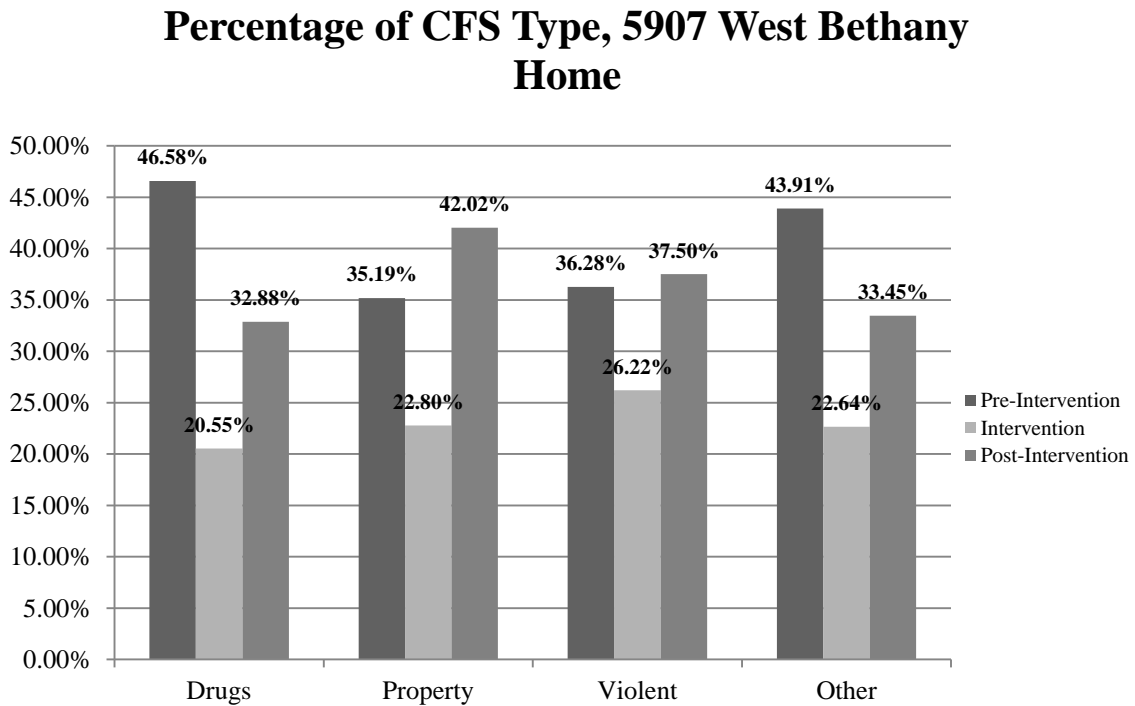
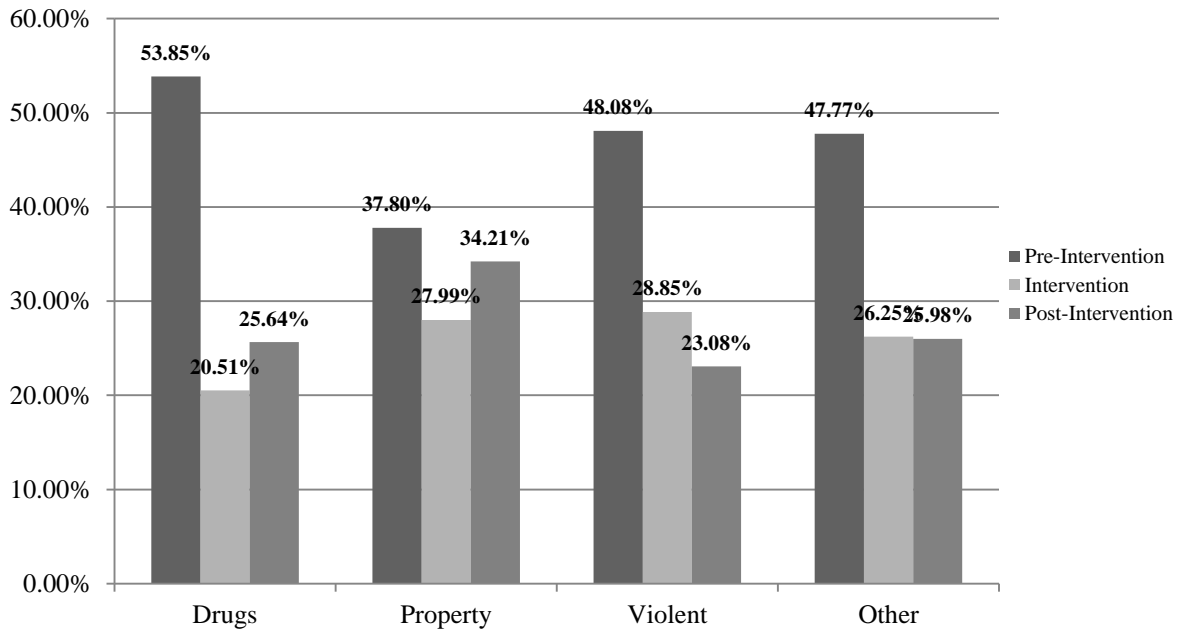


Figure 10. Percentage of Calls for Service Type, 7428 North 51st Avenue

Percentage of CFS Type, 7428 North 51st Avenue



violent crime increased by about 15% pre-intervention to post-intervention; this was the only targeted store to experience a large increase in violent crime. Other types of offenses at this location remained relatively stable pre-intervention to post-intervention, but did decrease by about 15% during the intervention.

5907 West Bethany Home, one of the most problematic stores in the sample in terms of raw counts of calls for service, experienced decreases in the percentage of each of the four crime classifications from pre-intervention to intervention. Drug and other types of offenses decreased most notably, by over 20% each, from the pre-intervention to intervention periods (see Figure 9). The percentages of each type of crime were relatively evenly dispersed in the intervention period, suggesting that the intervention affected all types of crime at this location. Post-intervention these figures returned to disparate percentages. Drug crime was the most problematic crime at this store in the pre-

intervention period, but by the post-intervention period drug crimes accounted for the smallest percentage of calls for service. Property crimes, however, represented the largest percentage of calls in the post-intervention period, whereas these were the smallest percentage pre-intervention.

Figure 10 depicts the breakdown of type of calls for service by percentage at 7428 North 51st Avenue. The intervention proved particularly effective at this store, reducing crime from pre-intervention to intervention, and pre-intervention to post-intervention. Drug crimes made up the majority of calls for service pre-intervention, but the post-intervention statistics indicate that offending became more generalized. A positive sign for the project’s generalizability and duration, raw counts of each crime type also decreased from pre-intervention to post-intervention.

Overall, the results addressing both research questions indicated effectiveness of the intervention, at least partially. For parsimony, see Figure 11 for a summary of these results by methodology. The discussion section will expand on and interpret these findings.

Figure 11. Summary of Results

Research Question	Methodology	Results
(1) Did the POP intervention generate an effect on crime at the target Circle K stores, compared to the non-target stores? (1a) What was the duration of the intervention’s effects?	Difference-in-Difference (DID)	Positive
	Negative Binomial Regression	Mixed
	Independent Samples T-Test	Positive
	Relative Effect Size	Mixed
(2) Did calls for service change over time in the area surrounding the target Circle K stores? If so, does this finding suggest displacement of crime or diffusion of benefits?	Phi & Weighted Displacement	Positive
	Crime Type	Mixed

CHAPTER 6: DISCUSSION

This dissertation sought to answer three main questions: (1) Did the POP intervention generate an effect on crime at the target Circle K stores, compared to the non-target stores? (1a) What was the strength and duration of the POP intervention's effects? (2) Did crime change over time in the area surrounding the target Circle K stores? If so, does this finding suggest displacement of crime or diffusion of benefits? The following discussion section will summarize and interpret these results. Limitations of the study design and analysis will be presented, as well as the theoretical and policy implications. Future directions and ideas for expanding this work are included throughout the discussion. Concluding statements will situate this project into the broader context of the current state of policing.

Summary and Interpretation of Results

To answer the first two research questions, difference-in-difference estimation, negative binomial regression, and relative effect size calculations were employed. Mimicking an experimental design, the difference-in-difference estimation found statistically significant declines in calls for service from pre- to post-intervention in both the full model and the Circle K only model. By answering the first research question affirmatively, this comparison between the treated stores and the non-target stores provided encouraging results regarding the intervention's effects. Use of negative binomial regression allowed for modeling the overdispersion in the dependent variable, and the inclusion of an interaction term (treatment condition by intervention period). The results here were somewhat mixed. The interaction term in the full model proved statistically significant; that is, intervention stores in the post-intervention period

experienced a 13% reduction in calls for service. Reducing the model to include only the Circle K stores, however, caused the interaction term to drop out of the model. In other words, there was some underlying mechanism occurring in the Circle K model that caused this counter-intuitive finding.

Initially it appeared as though selection bias might have been affecting the negative binomial findings. Whether this finding was due to calls for service being so pronounced at the intervention stores comparatively, or because the Circle K model included stores that were more similar than different, is unknown. Independent sample t-tests were used to parse out the nuance in this finding, and to ascertain if individual store effects were biasing the results. The results of this analysis brought to light a potential cause of these mixed findings. More specifically, one store (5880 West Camelback) experienced increases in calls for service throughout the study period. This was the only store to prove impervious to the intervention and, moreover, to become more problematic during and after the POP project. Both the number of calls for service and the type of calls increased in severity at this store.

The mixed results of the relative effect size calculation make sense in light of the identification of this store outlier. When examining the full model, the relative effect size (odds ratio calculation) revealed a negligible effect from pre-treatment to the intervention period. The effect from the intervention to post-intervention period was significant, however, as crime decreased by 16% at the target stores compared to the control stores. Most importantly, this decline was sustained (significantly) until October 2013 – a full 27 months after the intervention ended. The statistically significant effect size calculation revealed a crime decrease of 14% at the target stores, compared to the non-target stores.

The Circle K model did not produce statistically significant effect size results in crime at convenience stores in Glendale, AZ, regardless of the time period examined. In short, the strength of the intervention varied by model, but overall the effects on crime at targeted convenience stores in Glendale, AZ were strong and durable.

The third research question moved beyond the main effects to assess the existence of spatial displacement of crime or diffusion of benefits as a result of the intervention. Additionally, changes in crime type were examined. Encouragingly, none of the target Circle K stores experienced spatial displacement as a result of the POP project. Further, five of the six target stores experienced a diffusion of benefits because of the intervention. This is in line with previous research on crime displacement, and speaks to the strength and usefulness of place-based interventions. An analysis of crime type at the targeted stores produced several findings. Overall, the targeted stores appeared most responsive to the intervention through reductions in property and disorder crimes. An examination of the stores individually provided insight into the mixed main effects results. In particular, the store located at 5880 West Camelback proved, once again, to be an outlier. Similarly to the other intervention stores, drug and property crime at 5880 West Camelback decreased from pre-intervention to post-intervention. Violent crime, however, increased by 15% from the pre-intervention to post-intervention periods. Approximately 31% of the calls for service at this location were classified as violent crime in the pre-intervention period, and increased to account for approximately 45% of the calls for service in the post-intervention period. All other types of crime decreased in both raw count and percentage pre- to post-intervention at this location.

This finding is especially salient for several reasons. First, it provides further support for the hypothesis that POP projects of this nature are most effective at reducing property and disorder crimes – even at the most troublesome of locations. Second, it indicates that crime type displacement may have occurred at this store. The Circle K located at 5880 West Camelback experienced increases in both the raw count and the percentage of violent crime. Lastly, this finding suggests that some crime-prone locations, or hot spots, have a stable amount of crime despite crime-reduction efforts, or, that place managers play an integral role in the implementation and effectiveness of place-based interventions. Both of these possibilities will be fleshed out below.

Limitations

The limitations of this study do constrain the generalizability of the findings and thus warrant discussion. These limitations include study design issues (sample selection bias and the use of quasi-experimental methods over a randomized controlled trial), problems related to the use of longitudinal data (regression to the mean), and uncertainty about differential program implementation (problematically coupled with a lack of fidelity checks).

Study Design

Sample selection bias can undermine external validity, in some cases over- or under-stating the true intervention effects (Berk, 1983). Specifically, sample selection bias may affect the study outcome when longitudinal data is being analyzed. In this dissertation, the intervention stores experienced calls for service at a much higher rate than the comparison stores; the intervention stores were outliers. Regression to the mean (RTM) is the statistical phenomenon whereby initial, extreme measurements (or outliers)

tend to be closer to the average on subsequent measurements, making natural variation in the data look like a significant treatment effect. One limitation of this dissertation revolves around the stores selected for the intervention: the bias in their selection (i.e., not being randomly chosen for treatment) requires caution when interpreting any intervention effect.

RTM assumes that a measurement reflects both a true score and an error component, the latter of which varies randomly (Campbell & Kenny, 1999). Pretest – posttest designs can mistakenly make crime-reduction programs look effective, when in fact the results are a byproduct of a statistical artifact (Maltz, Gordon, McDowall, & McCleary, 1980). In a critique of research on street lighting and crime, Marchant (2005) argued three points: (1) area-based crime prevention programs should be evaluated with randomized controlled trials (RCTs), (2) yearly fluctuations in crime are so large that they are likely to mask intervention effects, and (3) when areas receiving an intervention are compared to non-equivalent control areas regression to the mean may occur. Farrington and Welsh (2006) forcefully assert that a “determined and destructive statistical assault” raising “every conceivable statistical objection” to program evaluations not using RCTs is bound to cause an increase in Type II errors. The authors ultimately conclude that RTM in area-based crime prevention research may not be all that important if using somewhat reasonable (albeit different) comparative crime rates.

This was precisely the reasoning for truncating the comparison group in this study to include only Circle K stores. These stores, although differing in crime rates, were more alike than different. The comparative Circle K stores did experience significant crime, just not the disproportionate amount experienced by the targeted Circle K stores. Sample

selection bias and RTM issues are, at times, unavoidable in the implementation and assessment of criminal justice interventions. Eliminating these statistical quandaries is impractical (unless all criminological studies begin employing randomized experimental designs, or selecting comparably matched control stores), but quantifying their effects is reasonable and will significantly alter criminologists' understanding of intervention effects.

Yudkin and Stratton (1996) suggest three approaches to minimize regression to the mean: the use of RCTs, basing selection on several measurements, and selecting on one measurement and assessing treatment effect using another. The benefits of using RCTs to evaluate police interventions are well known, but these designs are not always feasible. Reasons for choosing non-experimental methods include practical difficulties, ethical challenges, and practitioner cooperation (see: Lum & Yang, 2005). Indeed, problem-oriented policing interventions in particular are notoriously difficult to implement via a randomized design; only *four* studies in Weisburd and colleagues' (2008) systematic review of problem-oriented policing were randomized experiments. The inability to randomize is often addressed post-hoc with varying statistical corrections. These adjustment procedures are one way to reduce nonrandomization bias, but these techniques vary in their performance (Shadish, Clark, & Steiner, 2008). For example, Heckman's (1976) two-step estimator is one such approach to account for selection bias, but this procedure is known to inflate standard errors due to collinearity issues between the correction term and the model's regressors (Bushway, Johnson, & Slocum, 2007). Other techniques, like matching, are rendered improbable with a sample like the one used in this dissertation. The six intervention stores are so disparate from the

control stores in the sample that matching procedures are illogical. The use of a nonrandomized design is a limitation of this study, but adds to a growing chorus of the need for more randomized controlled trials in problem-oriented policing evaluations, and criminology more generally.

Differential Implementation and Fidelity

The effectiveness of well-designed interventions can become weakened in the field: “the intervention-as-implemented in an experiment frequently differs from the intervention-as-designed” (Nelson, Cordray, Hulleman, Darrow, & Sommer, 2012, p. 374). Unfortunately, differential implementation during this POP project was likely, as the officers conducting the suppression response were not subject to fidelity checks. The convenience stores, however, did receive follow-up visits wherein checks were done to assess the implementation of CPTED recommendations. These checks were not uniform across the stores, and therefore are not included in this analysis. There are several ways to examine implementation in interventions, though.

Fixsen and colleagues (2005) conceptualize intervention fidelity in community organizations in two ways: (1) personnel fidelity, or the implementation of the intervention, and (2) organizational fidelity, or the implementation of intervention support. The organizational fidelity in the Glendale SPI was sound – the research team worked with officers over a period of four months to ensure understanding of the SARA model, and POP more generally. Alternatively, Dane and Schneider (1998) put forth a comprehensive definition of “integrity verification” to assess five aspects of program fidelity: adherence, exposure, quality of delivery, participant responsiveness, and program differentiation.

The personnel fidelity, or exposure, is where the question of implementation arises. Dosage matters in criminal justice, and not just the presence or absence of an intervention. An intervention effect's magnitude grows with the strength of dosage (Haerle, 2016). For example, some research has found that greater implementation fidelity is associated with greater treatment effects (e.g., Dane & Schneider, 1998; Durlak & DuPre, 2008). Additionally, a study specifically examining the effects of POP on crime and disorder found that higher treatment fidelity was related to stronger effects (Weisburd et al., 2010). More recent research has found, however, that disclosure of fidelity issues is not associated with statistical power or effect size, although this finding may be due to insufficient information provided by researchers (Nelson, Wooditch, & Dario, 2015). Future studies seeking to replicate this project would benefit from checking and disclosing implementation fidelity, because the extant research suggests that potentially stronger program effects can be obtained.

The quality of treatment delivery and participant responsiveness varied by store. In fact, this may explain the unusual results at 5880 West Camelback. The researchers and practitioners implementing this POP project were aware of this particular issue, and devised approaches to combat resistance from Circle K management. This intervention with Circle K leadership culminated with public shaming in the form of presenting the results to the local media (White & Katz, 2013). This eventually facilitated further discussion of management practices. Knowing how to handle these types of limitations in the field is crucial to being able to turn the challenges of criminal justice in practice into an ultimately successful intervention.

Program adaptability is necessary if the intention is to generalize the results to other locales, as is the case here. Convenience store crime is a national problem and this POP project provided encouraging results for tackling the issue. Melde and colleagues (2006), discussing fidelity versus adaptability, propose clearly articulating acceptable degrees of variation that are reinforced through training. The POP curriculum can be amended to acknowledge this reality, and in the future, research partners can emphasize “vital versus adaptable program components” (Melde et al., 2006, p. 736).

Theoretical Implications

Overall, several of the theories used to frame this dissertation were supported. The intervention stores underwent environmental design manipulation to reduce crime opportunities. These CPTED implementations proved to be a powerful component in the Glendale POP project, increasing guardianship by improving the defensibility of the store’s layout. Another component of this POP project was the use of focused patrol, wherein officers would fill out their paperwork in the stores’ parking lots. Officers were able to maximize their efficiency by both completing necessary administrative matters and providing visible deterrence to would-be offenders. This dissertation provided support to the theoretical framework often used to guide problem-oriented policing, but also raised questions about our understanding of problem-oriented policing. Specifically, which elements of the project worked best? Did the CPTED recommendations alleviate crime in a more significant way than the focused deterrence aspects, or vice versa? This is parsed out below, by describing how understanding POP’s effectiveness in a more nuanced manner can be done via traditional crime theory assessment.

Additionally, the literature used to frame this dissertation included a discussion of hot spots, and displacement and diffusion. Supporting extant research, results indicated that displacement of crime did not occur, but rather a diffusion of benefits was likely. This is encouraging for the study of crime and place for several reasons. Problem-oriented policing focuses on specific problems in a community; in this case, convenience store crime. John Eck (1993) has concluded that “prevention and crackdown efforts focused on unique situations will have less displacement than prevention or crackdown efforts focused on general situations” (p. 537). This dissertation supported this assertion. By focusing efforts on specific places, with specific problems, the POP paradigm was successfully able to reduce crime at problematic stores without displacing criminal activity to neighboring areas. Encouragingly, these crime declines persisted for 27 months after the intervention ended, highlighting the long-term impacts possible through POP. This is likely attributable to the robustness of the POP implementation, and raises intriguing policy implications regarding the correlation between strength of implementation and sustainable crime declines.

Second, extant research on crime and place is consistent in demonstrating that a very small percentage of addresses are responsible for producing the majority of calls for service (e.g., Eck, Gersh, & Taylor, 2000; Pierce et al., 1988; Sherman et al., 1989; Spelman, 1995). Further, these crime hot spots are known to persist over long periods of time with a small group of micro-places disproportionately affecting crime trends (Weisburd et al., 2004). Circle K convenience stores were chosen for the intervention because, in 2010, 79% of calls for service at all convenience stores in Glendale were attributed to 15 Circle K stores (White & Katz, 2013). These stores, considered hot spots

of crime, were responsive to intervention efforts. Because hot spots do persist, and positive intervention effects do decay, the tactics used for this POP strategy can and should be continually implemented. For example, if officers are mandated to complete their paperwork on Circle K property, they can continue to provide deterrent effects at no added cost to the department or the store managers while simultaneously changing the perception of that location – that is, Circle K is no longer a place that will tolerate excessive amounts of crime. This also implies a certain amount of onus on place managers to work with the police and researchers to reduce persistent crime, and is discussed below in regards to policy implications.

Interestingly, one of the intervention stores experienced a significant shift in crime type due to the intervention. Although experiencing reduced calls for service, this store saw an increase in violent crime reports. In some circumstances, situational crime prevention can backfire, and even incite defiance, frustration, and ultimately violence (Grabosky, 1996). If situational crime prevention efforts are perceived as excessive constraint, unintended effects of opportunity-reduction strategies can result (Wortley, 1998). Wortley (1998) asserts that this does not dismiss the theoretical utility of situational crime prevention, but rather reinforces that counterproductive findings still support the concept that situations and design influence behavior. This store proved to be an outlier, among a group of stores that were all initially outliers, and may require further individualized attention or a different approach utilizing a different theoretical perspective.

Furthering Problem-Oriented Policing

Like all criminological theories and organizational paradigms, problem-oriented policing has several limitations. Weisburd et al. (2010), however, provide reasonable evidence that POP can reduce crime and disorder. Due to these findings, Tilley (2010) suggests that researchers move beyond the notion that POP needs to be tested for its usefulness, and that the focus shift to the improvement of reliability and efficiency. Michael Scott, director of the Center for Problem-Oriented Policing, has noted “no scholar has argued that the approach is fundamentally flawed, which is remarkable in the scholarly world where debunking theories is the norm” (Scott, 2010, p. 136). This is attributed to POP being understood as a process theory, rather than a substantive theory. Scott also suggests that POP should be evaluated “on the degree to which its process and principles improve the prospects for more effective policing” (2010, p. 137). With leading scholars in the field calling for an examination of POP’s reliability, efficiency, process, and principles, there is clear consensus that POP needs further scrutiny.

POP is a guiding organizational philosophy, grounded in criminological theory. The nature of POP encourages criminal justice to move beyond solely examining the causes of crime and criminality, to better understand “the behavior of the legal system, the operations of the criminal justice apparatus, [and] the trends in social control” (Harris, 2005, p. 324; see also: Kraska, 2004). Scott (2000) has contextualized the process in terms of the police mission, and has identified challenges to problem-oriented policing as an organizational philosophy. The following, however, seeks to outline how understanding the theoretical nuance in the theories that ground problem-oriented policing can further the reliability, effectiveness, and precision of the process.

One way to assess problem-oriented policing is to apply Tittle's (1995) features of adequate theory to our extant knowledge of the theories and strategies that inform POP. Tittle's evaluative criteria include understanding the breadth and adequacy of the theory. Breadth is in constant flux, and refers to the capacity of a theory to explain a variety of deviant behavior (Tittle, 1995). Breadth is undoubtedly one strength of POP, with the Center for Problem-Oriented Policing website providing guides on issues ranging from elderly abuse, to hate crimes, to asset forfeiture. Adequacy refers to the comprehensiveness, precision, and depth of a given theory (Tittle, 1995). The comprehensiveness component aims to account for causal explanations, and is defined by inclusiveness of all possible causal variables. For example, the comprehensiveness of POP is addressed by examining how and when it works, and if it accounts for a variety of spurious mechanisms that may be affecting crime. This dissertation did not include multiple control variables, so it is difficult to estimate the effect of all possible causal forces. The comprehensiveness issue of problem-oriented policing would be rectified by the use of randomized controlled trials, as that is the most methodologically rigorous approach in the sciences. The experimental design is best suited for identifying causal mechanisms, and would allow for a better understanding of the "how" and "why" of POP processes.

Precision seeks to answer "when" and "to what degree" a theory's causal effects operate (Tittle, 1995). Causal time lags, degree of exposure, and contingencies vary by situation (Birbeck & LaFree, 1993), and are not clearly articulated under the current problem-oriented framework. This dissertation, for example, is unable to ascertain precisely which component of the strategy worked the best to reduce crime, or if there

was an interaction effect among the theory-based strategies employed that operated differently at the intervention stores – potentially causing the anomalous violent crime finding at 5880 West Camelback. Further, precision would allow researchers to identify which strategies used in the problem-oriented process contribute to the paradigm’s durability. Depth builds on this by specifying “logical rationales for the connections among the parts” (Tittle, 1995, p. 18). So in addition to precision seeking to identify which strategies used in the implementation of POP are most useful and for what problems, depth answers the question of how these strategies may interact to accomplish the end-goal.

The Center for Problem-Oriented Policing holds an annual conference at which presenters detail the POP projects they have undertaken, in order to educate practitioners and researchers on addressing specific problems and implementing the SARA model. The conference presentations, in addition to a variety of POP guides, are included on the website to inform thousands of monthly visitors on the theoretical background and practicalities of addressing crime problems. By providing, for example, effect size estimates for the strategies used in the response guides, the Center can more precisely emphasize and disseminate “what works” in problem-oriented policing in a theoretically informed way. Ascertaining what theoretically anchored crime-control responses associated with POP contribute to the durability of the process would refine the usefulness of each technique, ultimately contributing to the understanding of problem-oriented initiatives as sustainable.

Criminality of Convenience Stores

One facet of this dissertation was to examine how the Glendale POP project impacted changes in crime type at targeted convenience stores. Encouragingly, all of the intervention stores experienced decreases in property and disorder crime because of the project. There were, however, increases in violent crime at one of the targeted Circle K stores. This crime type displacement is troublesome, especially when considering interventions should aim to “do no harm” (see: McCord, 2003). The increase in violent crime at only one store begs several questions, one being: How can criminologists weight offense type to better understand criminality at place, in order to tailor interventions to specific locations?

The literature on convenience store crime susceptibility is extensive (e.g., Bellamy, 1996; Calder & Bauer, 1992; Crow & Bull, 1975; D’Alessio & Stolzenberg, 1990; Duffala, 1976; Erickson & Stenseth, 1996; Exum, Kuhns, Koch, & Johnson, 2010; Faulkner, Landsittel, & Hendricks, 2001; Hunter & Jeffrey, 1997; Petrosino & Brensilber, 2003; Petrosino, Fellow, & Brensilber, 1992; White & Katz, 2013). Whether convenience stores experience versatile offending or unique specialization in criminality is not fully understood, but certain crimes, like robbery, are overrepresented in the literature (e.g., Bellamy, 1996; Crow & Bull, 1975; D’Alessio & Stolzenberg, 1990; Duffala, 1976; Roesch & Winterdyk, 1986; White & Muldoon, 2015). This dissertation, however, found that property and disorder crimes were more likely to be affected by intervention efforts than violent crimes, like robbery, at most stores. Does the decrease in nonviolent crime “outweigh” the increase in violent crime, though? By taking into account the severity of the crimes occurring at these locations, interventionists can

address specific problems. This also relates to the aforementioned suggestion that problem-oriented policing improve its precision. For example, if CPTED measures decrease property crime but increase violent crime, contingent strategies can be put into place to immediately address the crime type displacement. Additionally, questions are raised about offenders' perceived cost-benefit analysis of not only whether to commit a crime, but which crime type to commit.

When thinking about varieties of criminal offending at convenience stores, the issue of weighting the offenses looms. In other words, "Is one homicide to be equated with 10 petty thefts? 100? 1,000?" (Merton, 1961, p. 703). The solution to this statistical dilemma is to address the seriousness, unidimensionality, frequency, and additivity of offending (Sweeten, 2012, p. 534). A review of a century of theoretical and empirical research on criminal offending scales found that, of the available means to sum multi-item frequency or categorical measures of offending, variety scales are the preferred method because they possess high reliability, validity, and are unbiased by an overrepresentation of non-serious crimes (Sweeten, 2012). Sweeten (2012) posits that a relatively recent method, item response theory (IRT), is most closely related to variety scales in estimation.³² Sweeten (2012) also contends that:

IRT models attempt to scale a latent trait that accounts for the observed response patterns. It is not unreasonable to call this latent trait "criminality," indicating that variety of offending is more strongly correlated with criminality than frequency or volume of offending. (p. 548)

³² Because IRT can only model items as dichotomous indicators, examining 25 crime types for 74 stores at 70 time points would be arduous. Alternatively, a simpler option would be to employ Sellin and Wolfgang's (1964) seriousness scaling. See Collins (1988) for a discussion of the limitations of Sellin-Wolfgang crime seriousness scores.

Using a refined item response theory approach, recent research has found that specialization is stable over time and is associated with significant and consistent explanatory variables (Osgood & Schreck, 2007). Convenience stores share unique characteristics (explanatory variables) that contribute to their crime susceptibility: operation hours, interior store layout, exterior store environment, location, type, ownership and security procedures, staff number, cash-control procedures, and incident response policies (Altizio & York, 2007). The current emphasis in item response theory, and crime specialization literature more broadly, focuses on individual-level criminality. The extant knowledge on crime and place mirrors that of individual-level research in an important way: a small percentage of people, like places, account for a large majority of crime (Sherman et al., 1989; Wolfgang, Figlio, & Sellin, 1972). Future research should expand the current understanding of item response theory to include place-based criminality. This would greatly increase the theoretical and practical usefulness of this measurement theory.

Policy Implications

The results of this dissertation support the effectiveness of problem-oriented policing in reducing crime. One store that received the intervention arguably became “worse”, though, and saw an increase in violence-related calls for service. Cooperation with the police and research partners was notably varied among the store managers, with compliance being a crucial aspect of the project’s success. This noncompliance undoubtedly affected some of the SPI findings, and can be interpreted as willful negligence on behalf of the place manager. One promising policy implication related to crime reduction efforts at place is the implementation of regulatory approaches to

business misconduct. Additionally, it is imperative to address the methodological limitations of the study in order to strengthen future problem-oriented policing projects. This can be done via coercive grant funding that favors methodologically rigorous designs.

A Regulatory Approach to Crime at Circle K

Typically, it has been assumed that offender-centric policies should be the focus of government efforts to reduce crime, and that it is a governmental obligation to bear the full cost of crime fighting (Eck & Eck, 2012). Eck and Eck (2012) challenged these assumptions by putting forth a regulatory approach to expand crime reduction options. This regulatory approach to crime at place shifts the burden of blame and responsibility to the corporation (Circle K), instead of the government (i.e., the police). Additionally, a place-based focus requires consideration of the morality of crime facilitation by third parties (rather than simply a matter between offenders and police) (Eck & Eck, 2012). In other words, is Circle K's noncompliance and uncooperative behavior throughout the Glendale POP project indicative of criminal culpability?

Corporate malfeasance, or white-collar crime, can take the form of willful negligence. Debating if white-collar crime can even be viewed as crime, Sutherland (1945) acknowledges that the proof and evidence used to ascertain if corporate malfeasance occurred differs from that used in judgments of street, or "typical", crime. Sutherland furthers that this differential implementation of the law can be explained by "the status of the business man, the trend away from punishment, and the relatively unorganized resentment of the public against white collar criminals" (1945, p. 137). Additionally, the assertion persists that "white collar crimes are merely technical

violations and involve no moral culpability” (Sutherland, 1945, p. 139). If a business is repeatedly informed that their willful negligence is directly contributing to persistent and pervasive crime, however, that business (and specifically the people in control of that business’ actions) are morally, and potentially legally, responsible to act. The criminal blameworthiness then shifts from *the person* soliciting drugs in the Circle K parking lot, to *the corporation* for failing to remove pay phones, improve lighting outside of the store, and cooperate with police departments trying to keep customers and store employees safe.

A recent systematic review of corporate crime deterrence found that regulatory policy produced a deterrent impact at the company level, and that multiple treatment deterrence strategies were significant at the individual and company level (Schell-Busey, Simpson, Rorie, & Alper, 2016). The review suggests that because corporate crime is behaviorally varied and complex, a pulling levers approach is appropriate (Schell-Busey et al., 2016). A multi-pronged response was used for the intervention evaluated in this dissertation, and it was successful in reducing crime. At the company level it is difficult to ascertain if crime-reduction efforts will persist, because as White and Katz (2013) noted, stores were resistant to changes that required a monetary investment. Monetary sanctions are one avenue that could logically be expected to then induce corporate compliance.

Environmental regulatory policy provides a guide for our understanding of what a regulatory approach at convenience stores would look like. Corporations have been found to under-report their environmental violations offenses (Telle, 2013). Encouragingly, businesses that engage in self-reporting of regulatory violations are more willing to

cooperate (Helland, 1998). Often in the enforcement of environmental policies, the motives of the regulated and the regulator are not aligned (Oestreich, 2013). With both parties attempting to conserve resources, the effectiveness of the design and enforcement of these regulations is called into question (Oestreich, 2013). Though audits may be expensive to conduct and carry out, the threat of inspection has been found to reduce corporate violations (Telle, 2009). Many environmental protection agencies choose auditing as an enforcement method, over, for example, capping emissions (Telle, 2009). Randomly auditing Circle K locations should induce compliance with suggested crime-reduction measures; asking individuals or corporations to police themselves is unreasonable, but this method reduces excessive burden on the police.

The United States Environmental Protection Agency enforces their regulatory policies via compliance assistance, incentives, monitoring, and enforcement tools (United States Environmental Protection Agency, 2014). The formal structure of certain monitoring programs lacks elements of support and hope (Gable & Gable, 2005). The first response employed in the Glendale SPI employed these concepts. The intervention with Circle K leadership included demonstrating that convenience store crime was not just a problem in the city of Glendale (White & Katz, 2013). Following a graduated sanctions model, these elements should remain incorporated throughout the process even as enforcement begins. Responsive regulation requires engagement and collaboration with stakeholders, while simultaneously having the capacity to enforce sanctions (Braithwaite, 2011). Determining what these sanctions should be requires a careful consideration of the convenience store in question, and could vary by dominant offense type, or prior compliance. For example, in 2011 Mesa, Arizona passed an ordinance to

address convenience store crime, primarily targeting convenience stores with the highest calls for service (see: <http://mesaaz.gov/home/showdocument?id=12748>). The identified convenience stores were required to implement several security measures (e.g., changes to store design, posting “no trespassing” signs, etc.), provide employee safety training, increase general safety conditions (increased lighting for outdoor payphones, remove graffiti within 48 hours, secure alcoholic beverages, etc.), maintain surveillance cameras, and so on. The ordinance implemented graduated sanctions that ranged from warning storeowners and managers about violations, to enhanced monetary sanctions. The ordinance was deemed effective due to a decrease in calls for service at crime-prone convenience stores, while simultaneously encouraging increased communication between law enforcement and place managers.

Scholars often examine deterrence-based practices to determine the optimal dosage required. For example, Koper (1995) ascertained that police patrol stops should be between 11 to 15 minutes to maximize police presence (i.e., deterrence). If police spend more than 15 minutes at crime hot spots, diminishing returns set in. Environmental regulation has yet to determine a monetary amount that will yield maximum deterrent effects, reinforcing the utility of considering non-monetary enforcement strategies, too (Rousseau & Telle, 2010). White and Katz (2013) led a public shaming effort aimed at Circle K, which ultimately led them to reinvest in the POP project’s goals. This was a nonmonetary sanction that could be reintroduced if a store exceeds a certain amount of monthly calls for service. One plausible monetary enforcement strategy, for example, would involve determining the cost of making proposed CPTED changes at convenience

stores, and then levying sanctions that exceed the cost of compliance. These sanctions could increase, using a graduated strategy, if violations continue.

Industrial compliance is often induced through targeting (Helland, 1998). This strategy of regulatory enforcement divides corporations into those with a history of violations, and those that comply. Targeting has been used to monitor tax compliance (Landsberger & Meilijson, 1982), industrial safety (Scholz, 1991), environmental protection (Harrington, 1988; Harford & Harrington, 1991), and many other sectors. Businesses with a history of regulatory noncompliance are to be targeted for inspection more frequently, according to this model, and theoretically the violator will begin cooperating with the regulator due to the high costs of inspection (Helland, 1998). Again, these costs may be monetary, or in the form of perceived social capital. Looking at deterrence spillover effects of environmental enforcement, Shimshack and Ward (2005) found that fines for pollutant violations reduced violations statewide the following year. That is, there is a diffusion of benefits when sanctioning violators. In fact, “tightened regulation is seen as a stimulator of investment, consequently acting as a catalyst for innovation” (McEvoy, Gibbs, & Longhurst, 2000, p. 36). It is not unreasonable to think that having Circle K make corporation-wide changes once could continually decrease crime for months or years to follow, with the added strong potential of increasing their revenue.

To conclude, the police cannot be everywhere and do everything; their functionality and effectiveness would suffer. “A cardinal principle for the understanding of police organization and activity is that the police are only one among many agencies of social control” (Banton, 1964, p. 1). Outsourcing to private companies might be a viable

enforcement option, though (Millie, 2013). One strategy in this vein would be to include insurance companies in the regulation process. Corporations file insurance claims for lost revenue, and in the case of Circle K lost revenue includes unchecked theft of their products. These insurance companies can either cap their payouts at a certain number of claims, or refuse reimbursement altogether if convenience stores willfully disregard crime reduction suggestions.

Insurance companies have been used in this way before as an accountability device. In the 1980's, insurance companies would not offer police departments reasonably priced coverable *unless* those departments demonstrated that they had taken all necessary precautions to avoid exposure to lawsuits (McCoy, 2010). In fact, McCoy (2010) credits the actions of private insurance industries with being largely responsible for improving American policing in the past several decades. Similarly, a regulatory framework applied to convenience stores would substantially expand the repertoire of crime reduction and prevention strategies available to police, while producing cost-effective policy measures.

Funding for Research: Encouraging Experimental Design

In the most recent systematic review of problem-oriented policing, the dearth of experimental design in these projects was revealed. This is a problem for the evidence-base for several related reasons: the continual use of nonexperimental designs in problem-oriented policing limits understanding of the paradigms' causal mechanisms, and statistical issues associated with quasi-experimental design, such as selection bias, inhibit the reliability and internal validity of intervention findings. As Braga (2010) notes:

Much of the academic work on problem-oriented policing seeks to improve practice by refining key steps in the process such as encouraging the in-depth analysis of problems and searching for innovative responses that go beyond traditional enforcement. Unfortunately, although these academics press practitioners to conduct more rigorous assessments of implemented prevention strategies, they also tend to be dismissive of the use of more rigorous research designs, such as randomized controlled trials, in evaluating the crime prevention efforts of problem-oriented policing initiatives. This apparent bias against more rigorous research designs is certainly a contributing factor to the weak scientific evidence base for the problem-oriented policing approach. Beyond increasing the openness of problem-oriented policing scholars to include stronger research designs, investments need to be made to develop strong working relationships with police practitioners so that opportunities can be created to conduct more rigorous evaluations. (pp. 173-174)

There is a disconnect between the moral imperative to use the most rigorous research design available (Boruch, 1975; Weisburd, 2003), and the controversy associated with creating treatment and control conditions (Braga, 2010). This is a reality of criminological fieldwork – researchers are not in a position to solely dictate and demand the parameters of an intervention. With a better understanding of research design, policy-makers, practitioners, *and* funders might demand higher quality evaluations – specifically, randomized experiments (Farrington, 2003). For example, BJA now makes more funding decisions in SPI and other programs based, in part, on the rigor of the research design in the proposal. Additionally, in recognizing the importance of rigorous methodological designs and qualified research partners, BJA also now requires 20% of budget proposals be allotted to the research partner. As an illustration, BJA funded seven new sites in 2016; four of which are employing randomized controlled trials. The research partners for these funded sites include: Urban Institute, RAND, Barak Ariel, University of South Florida, and George Mason University (M. White, personal communication, March 22, 2016).

Because timing might be the most important factor when working with practitioners (Petersilia, 2008), multiple waves of graduated funding should be made available semi-annually to agencies and researchers. Hopefully, this will remove timing constraints as a reason for the implementation of less rigorous intervention design. The graduated funding should reflect a tiered system wherein more rigorous research designs reflect maximum funding potential. Lastly, implementing an incentive-based funding structure like this will still allow for problem-oriented policing to be evaluated with a variety of research methodologies, but will encourage the use of randomized controlled trials.

Policing scholars have identified the shortcomings associated with shallow problem-solving, and the incomplete implementation of the SARA model. Still, weak implementations produce noted crime reductions (Braga & Weisburd, 2006). Improving POP and growing its evidence-base will require a novel policy approach that moves beyond correctly following the paradigm put forth by Goldstein (1979). The evidence-based policing movement advocates for the use of research to inform police practice, by disseminating studies with strong scientific rigor. The above funding strategy is one method that can be used to ensure that projects properly implementing the SARA model, like the project in this dissertation, are made statistically stronger in future replications. Indeed, the positive findings in this dissertation may be tied to the robustness of the SARA model in the Glendale POP initiative. There were several core elements to this thorough undertaking: researcher involvement from start to finish, advanced training, continuous problem analysis, progressive leadership, and line-officer buy-in (whereby the officers identified the convenience store problem and devised the responses). Including

these key components in incentive-based funding decisions will further strengthen the sustainable, cost-effective potential of problem-oriented policing.

Conclusion

This dissertation statistically demonstrated the promising effects of problem-oriented policing on crime. The implementation of the project should be used as a guide for future projects seeking to follow the SARA paradigm thoroughly, in order to implement POP as originally envisioned by Herman Goldstein. This project's robust implementation likely contributed to the sustainability of results, as well as the observed diffusion of benefits, and should serve as an example of the long-term potential of problem-oriented policing efforts. Additionally, unexpected findings related to crime type displacement provide interesting avenues for future research on better understanding crime specialization at place. Not without limitations, future studies should strengthen the methodological design when replicating this project and seek to flesh out the potential precision of problem-oriented policing strategies more generally. Contextualizing this project in the current state of policing poses a dilemma, though: Why is this project noteworthy, when the police are undergoing a professional crisis?

External pressure to change, in the form of riots or scandals for example, can prompt transformation in a police department and increase susceptibility to evidence-based practices (Sherman, 2015). Now is the time to encourage police departments to implement research-based practices, to increase both their effectiveness and community relationships: pillars emphasized in the President's Task Force on 21st Century Policing (2015). Partnering with research institutions is one indication of understanding by police that thorough, just, and effective community-based strategies are the future of the

profession. The Task Force recommends the police first build trust and legitimacy by reinstating a guardian mindset (2015). To potentially quell national unrest the police should continually legitimize their work in ways that indicate their willingness to protect the communities they serve. This dissertation provides an example of the police working with community stakeholders to reduce crime, without placing undue burden on local citizens, in innovative ways. By shifting the crime-fighting focus to criminogenic places, law enforcement agencies can promote non-enforcement strategies – a Task Force recommendation designed to increase individual legitimacy perceptions. Proactive, evidence-based policing efforts in this vein will improve community engagement and cooperation with police, while simultaneously altering understanding of the police mission.

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